

**ORIGINAL ARTICLE**

**Empirical analysis of artisanal fishery practices and constraints: a synergy to poverty alleviation and sustainable fishery development in North Central, Nigeria**

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**ABSTRACT**

Agriculture production systems are highly diversified systems in which fishery play important and integral parts. Constraints to artisanal fishery development are not only of aquatic and technical in nature, but also related to fish breeding, reproduction, nutrition, health control, water quality management and technology. However, socio-economic and rural development factors such as extension contacts, credit availability, labour intensity, basic infrastructure facilities, finance and basic human needs and sanitation are also important towards artisanal fishery development. Fishery households need an in-depth scientific training and extension education in combination with a critical attitude towards aspects of fishery constraints and sustainable fishery development. The analysis has been planned and organized with these considerations. The study examined the constraints to artisanal fishery practices as a synergy to poverty alleviation and fishery sustainable development in Nigeria. Accessibility to credit, high cost of equipment and inadequate storage were perceived the most severe problems faced by the fishermen. Mobilization of fishermen into formal groups to have fair benefit of collective investment of group savings was recommended.

**Keywords:** Artisanal fishery, constraints, extension service, subsistence

## INTRODUCTION

Global economic trends have indicated the need for every nation to be self-sufficient in food production. In Nigeria, the fisheries sub-sectors contribute about 3.5% to the country's annual Gross Domestic Product (GDP), which translate to 10% of agricultural sector's GDP, employ about 4.3% of population and importantly contribute to nutritional requirements of people, constituting about 50% of animal protein intake (FAO, 2013). Artisanal fishing is being practiced by virtually all households in the coastal and riverine areas in the country. The fishing industry remains a potential to create jobs, income to fishery households, promote growth and development of rural fishing settlements, and enhance conservation and sustainability of water resources. And beneficial to the nation economy to cushion the effect of animal protein demand-supply gap and importation of fish valued about US\$ 400 million annually (Oladimeji *et al.*, 2013a). The Nigerian fishery industries consist of three broad sub sectors: the artisanal or small scale fisheries; the industrial (or large scale fisheries) and the aquaculture. Of these three sub sectors, the artisanal fisheries constitute the most significant sub sector in term of number of people employed and contribution to total fish output in the country (Oladimeji *et al.*, 2013b). Available records from FDF and FAO reveal that the total fish production

from artisanal unit in Nigeria for 25 years period (1981-2005) (FAO, 2005 and FDF, 2007) averaged about 408000 tons per annum and artisanal fisheries' contribution to total fish output in the country averaged about 90%.

Apart from fishes, other major sources of animal protein in Nigeria are ruminants, poultry, and piggery. However, fish production remained a better option of animal protein among Nigeria's populace since rapid increase can be achieved within a short time coupled with diverse sources from both cultured and wild. Furthermore, other sources of animal protein mentioned are bedevilled with one problem or the others. For example, piggery has a religious connotation and ruminants are poor candidates for rapid short increases in numbers due to low fecundity, long gestation and long generational interval (Rahji *et al.*, 2011). And poultry production experts suffered lack of inputs, technical know-how, adequate finance and basic human needs such as proper housing and sanitation which decimate the species within a very short time. There is low domestic production of poultry and beef and hence, their prices are relatively high and a shadow religious stigma attached to piggery consumption. These are potential opportunities to improve the well-being of fishermen (rural poverty) and meet animal

protein requirements from domestic sources through intensification of fish production. Therefore, to sustainably increase the production and productivities of artisanal fisheries, this study was executed to identify the constraints of artisanal fishery practices and develop a possible solution in the North Central Nigeria.

## MATERIALS AND METHODS

### Description of study areas

The study was conducted in North Central, Nigeria. The region has six States and FCT Abuja (Figure 1) with River Niger flowing along Kwara, Kogi and Niger States and river Benue in Benue State. Kwara State has a land mass covering about 32,500 square kilometres; 247,975 farm families and 2,365,353 people in 2006 with majority living in rural areas. The State's population and farm families were projected in 2014 to be about 3, 043, 221 and 306, 582 respectively representing 3.2% annual growth rate and an average density of about 94 persons per square kilometre. However, Niger State has a land mass covering about 76, 000 square kilometres, has a population of about 3, 950, 249 people in 2006 with the State's population and average density per square kilometre projected in 2014 to be about 5, 014, 358 and 66 per persons respectively.

Artisanal fisheries production is much favoured in the North Central part of Nigeria as a result of numerous tentacles of inland water and streams as well as flood plains of the River Niger that stretches from Niger State (Borgu LGA) through Kwara State (Edu LGA) to Lokoja in Kogi State. River Benue also cut across Benue State with prominence in Markudi and adjacent towns in the State. Therefore, due to its proximity to River Niger and Benue, majority of the farming households in the region are predominantly practice artisanal fisheries. In addition, the rivers are sources of water for irrigation, domestic use and transportation. The fishing activities are usually carried out by traditional fishing methods such as canoes with paddlers, gill nets, cast nets, long lines, hook and line sets, traps and outboard engine canoes. The main fish species found in the study area are *Clarias anguillaris*, *Barilius niloticus*, *Hemichromis fasciatus*, *Synodontis filamentosa*, *Gymnachus niloticus* and *Tilapia melanopleura*.

### Sampling procedure and technique

A multi-stage random sampling technique was employed for selecting the representative of rural artisanal fishery households in North Central States, Nigeria. The first stage involved the

purposive selection of 2 States: Kwara and Niger States from the list of the six States in the region (Figure 1). The second stage involved random selection of 4 fishing settlements each, in chosen States. Finally, with combined efforts of Project staff and 'SarkinRuwa' or village heads, 40 fishery households were randomly selected from each of the fishing settlements making a total of 320 artisanal fishery households for the study. The selected fishing settlements were: Yimagi, Tsonga, Ellah and Sunkuso (Kwara State); Kaya, Garafinikodo, Kokoli and Mango (Niger State). Primary data were obtained using a structures questionnaires and interview.

### Analytical tools

Descriptive statistics were used to describe the constraints militating against fishing activities in the study area. A Foster-Greer-Thorbecke (FGT) index was used to describe influence of credit and modern techniques on welfare of fishermen given in equation 1 as:

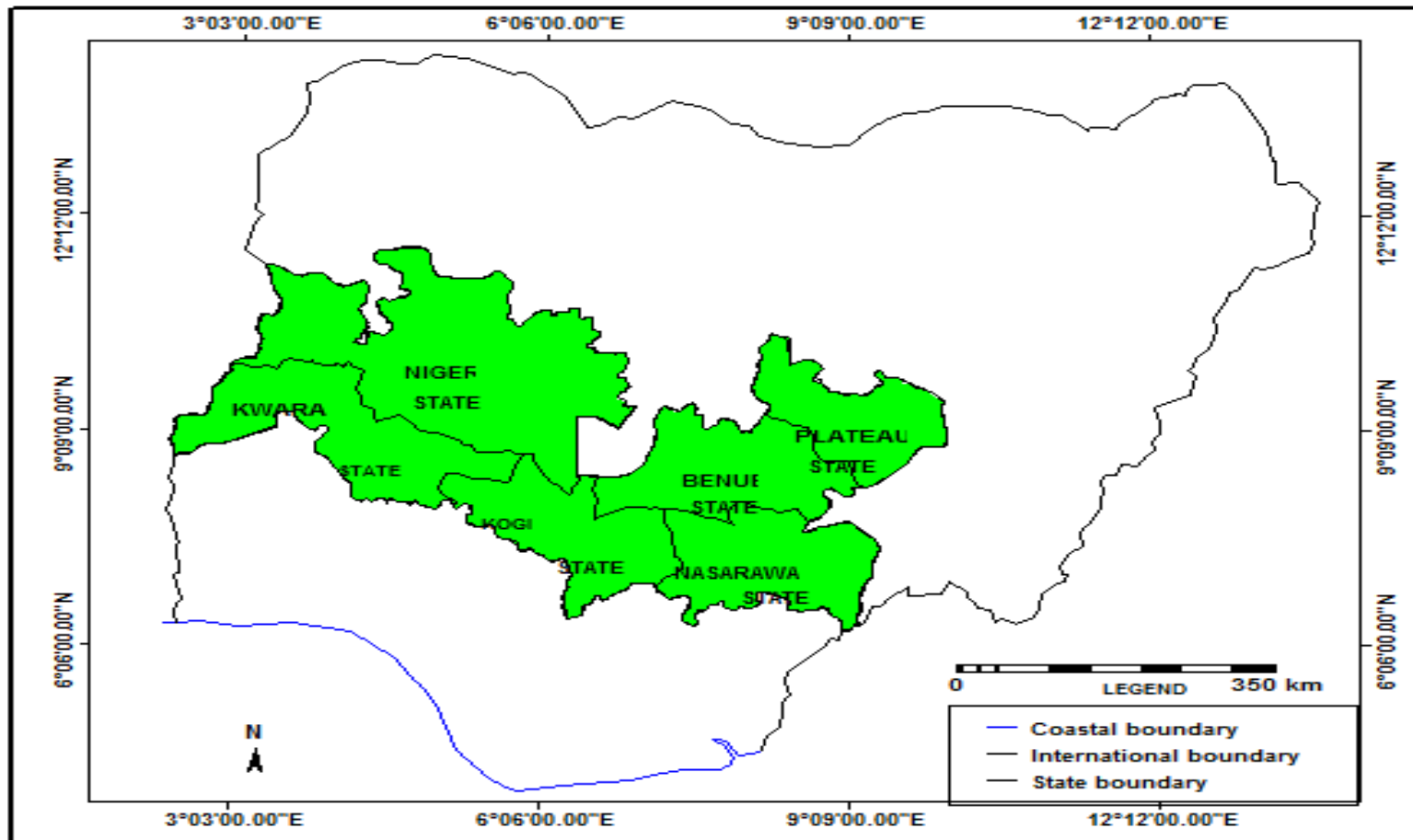
$$p_{ai} = \frac{1}{n} \sum_{i=1}^q \left( \frac{z-y_i}{z} \right)^\alpha \quad (1)$$

where:  $P_{ai}$  is the poverty index for the  $i^{\text{th}}$  sub-groups,  $n$  is the total number of households,  $Y_i$  is the per adult equivalent expenditure of  $i$ -th household,  $z$  is the poverty line,  $q$  is the number of the sampled household population below the poverty line and  $\alpha$  is the aversion to poverty, ranging from 0 to 2 (Foster et al., 1984).

The poverty line that was used for this study is defined as the two-thirds of mean household expenditure per adult equivalent. Adult equivalent was generated from Organization for Economic Corporation and Development Scale in equation 4 as follows:

$$AE = 1 + 0.7(N_{1\text{adult}} - 1) + 0.5N_{2\text{children}} \quad (2)$$

AE represents adult equivalent,  $N_1$  represents the number of adult aged 15 and above and  $N_2$  is the number of children aged less than 15. The test of robustness of poverty line was carried out by plotting the cumulative distribution functions of the two distributions against the specified range of poverty line, 0.7-1.45.



**FIGURE 1 : THE NORTH CENTRAL STATE S OF NIGERIA**

Source : Adapted and Modified from Administrative Map of Nigeria.

## RESULTS AND DISCUSSION

### Constraints faced by fishery households in North Central Nigeria

The result of the analysis of constraints faced by fishermen were summarised in Table 1.

**Table 1:** Constraints encountered by fishermen in 2013

Constraints	Frequency	Percentage (%)	Rank
Inaccessibility of credit	123	19.2	1 <sup>st</sup>
High Cost of Fishing Equipments	101	15.8	2 <sup>nd</sup>
Inadequate Storage Facilities	86	13.5	3 <sup>rd</sup>
Distance of markets	74	11.6	4 <sup>th</sup>
Extension contacts	66	10.3	5 <sup>th</sup>
High cost of hired labour	54	8.4	6 <sup>th</sup>
Accessibility to fuel	54	8.4	7 <sup>th</sup>
Climatic variability	38	5.9	8 <sup>th</sup>
Infestation by hyacinth	23	3.6	9 <sup>th</sup>
Others	21	3.3	10 <sup>th</sup>
*Total	640	100	

**Source:** field survey, 2013; \*the first two major constraints per fisherman were analysed

### Inaccessibility of credit

The result shows that inaccessibility of credit ranked the most important bottleneck indicated by 15.5%. Credit is one of the policy instruments considered to facilitate technology transfer, stimulate productivity, and generate employment and increase income (Librello and Catalla, 1987 in Ahmed *et al.*, undated). Loans are given to fishermen purposely to enable them to purchase canoes, outboard engine and fishing gears and to pay for major operational expenses. Accessibility to fishing credit was constrained by certain

factors identified in the study area (Table 2). Although, credit have always been an integral component of the overall government policy to accelerate rural development in Nigeria, the majority of rural farming households including artisanal fishermen are constrained due to the factors listed above. In addition, most formal institutional lenders in Nigeria shunned agricultural sector due to risk associated with agricultural production coupled with the fact that amount given to agricultural sector is low compared to the total loans granted to other economic sectors (Ahmed *et al.*, undated) ( Table 4).

**Table 2:** Problems encountered by household heads in obtaining credit in 2013

*Problems Encountered	Frequency	Percentage (%)
Insufficient Credit	110	34.4
High interest rate	90	28.1
Problem of Collateral	80	25.0
Delaying in obtaining credit	30	9.4
Others	10	3.1
Total	320	100

\* Only the most sought option per fisherman was computed; field survey, 2013

**Table 3:** Distribution of amount of production loans received by respondents

Amount of Loan (₦*)	Kwara State settlements	Niger State settlements
	Frequency (%)	Frequency (%)
Nil	120: (75.0)	59:(36.9)
10001-50000	18:(11.3)	40: (25.0)
50001-100000	10 :(6.2)	42: (26.3)
100001-150000	7:(4.4)	9 : (5.6)
150001 and above	5:(3.1)	10: (6.2)
Total	160: (100)	160: (100)

Source: survey, 2013; Figures in brackets were as % of total number of loans beneficiaries; Note\*: ₦ stood for naira or Nigeria currency & International discount rate: US\$1= ₦160 during the survey

The result of the analysis on fishermen credit (Table 3) revealed that only 25% and about 63% of fishermen in Kwara and Niger States respectively received various amount of productive credit from the sources (Table 4). The result further indicated that the bulk 75% of fishermen in Kwara State did not have access to obtained credit and the bulk of fishermen from both States, obtained loan of less than ₦100, 000 in 2013/2014 fishing season. Furthermore,

about half (48%) of respondents who obtained credit from Niger fishing settlements, source their finance from cooperative and 45% sampled fishermen also in Niger State obtained loans from Bank of Agriculture. This implied that the bulk of fishermen from Kwara State did not have access to production loan from both formal and informal sources. This result was supported by Olaoeye *et al.* (2012) and Oladimeji *et al.* (2013a) who observed that non-availability of a credit scheme or near

absence of fishing credit to fishermen taking into full consideration the peculiar circumstance of small-scale fisheries militate against capital intensive expansion. Since most of the fishermen were artisanal and lack the resources to acquire modern fishing gears for fishing operations, the lack of credit or its inadequacy was most likely to affect fishing operations negatively. This may not assist in reducing their poverty level and may not have enhanced the improvement in the living standards of the

fishermen. Further, the result also revealed that fishery cooperative in the study area had been established for a long time, but findings have shown that most of these associations like other farming cooperatives are grossly underdeveloped and inactive. This does not enable the group to assess most of the new innovations and have access to inputs including credit necessary to increase their output and improve their standard of living.

**Table 4:** Distribution of source of beneficiaries of loans

Source*	Kwara fishing settlements Frequency (%)	Niger fishing settlements Frequency (%)
Friends/Relative	12 :(30)	8: (7.9)
Co-operative Societies	19: (47.5)	48: (47.5)
Bank of Agriculture	9: (22.5)	45 : (44.6)
Commercial Banks	-	-
Total	40: (100)	101: (100)

Source: field Survey, 2013; \* a fisherman has only option of one major source

Generally, lack of liquidity and subsistence nature of artisanal fishery in the study area has retarded the growth and development of the industry. The availability of credit facilities for the use of the artisanal fishermen could increase the likelihood of their adopting the use of modern fishing gears such as outboard engines and sophisticated nets as against the use of traditional, manual propelled boats/canoes. The credit facilities would enable the fishermen to acquire the fishing

machines that are capable of reaching far into distant waters and thus increase fish catch levels of the artisanal fishermen. This is important because their nearby river waters are usually overexploited and depleted. Therefore, the capacity of artisanal fisheries to upturn nutritional imbalance, create employment and alleviate poverty depends on the adoption of appropriate management strategies that ensure fishery sustainability to avoid wanton exploitation which prone the



renewable resources to intense fishing pressure and depletion.

Therefore, to ensure effective utilization of available sources of credit, establishment of rural community banking services with simple procedures of securing loans is recommended. Mobilization of fishermen into formal groups to have fair benefit of collective investment of group savings, known as social capital is also recommended.

#### **High cost of equipment**

High cost of equipment ranked 2<sup>nd</sup> (15.8%) constraint that hindered effective artisanal fishing practices. Fishery households suffered from lack of suitable fishing equipment such as fishing gears, outboard engine and craft. The bulk (about 81%) of fishermen in the study area heavily relied on manually propelled canoes and the fishing gears which are out-moded (Table 5). The artisanal fisheries in the States are characterized by low capital investment and high labour intensive practices. For instance, the State investment in non-motorised canoes had a ranged of ₦5500 to ₦10000 and ₦40,000 to ₦80,000 for motorised canoes while that of fishing gears (nets) had a ranged of ₦2500.00 to ₦8000.00 respectively. The dominant gears used by fishermen across the study locations mostly consist of gill nets (41%),

cast nets (38%), hooks and lines (10%) and others such as traps and seine nets (11%). Gill nets were most frequently used in the study area in catching *Clarias spp*, Tilapia, lung fish and *Heterotis*. The findings in this study are in agreement with Oladimeji (1999) and Oladimeji *et al.* (2013a) who reported that gill nets, cast nets, Malian traps and long lines were typical of most Nigerian waters and that their catches generally included small sized fish, notably Tilapia.

The implication of scarcity of fishing gears often leads to over exploitation of near river reef fisheries and resort to cheap but destructive fishing practices. This may lead to overfishing and harvesting of immature fishes which derailed fish catch levels. Therefore, fishery households should imbibed fishery practices and technology, though that are economical and efficient but play more emphasis on maximum sustainable yield as canvassed by (Tietenberg, 2000).

**Table 5:** Distribution of types of fishing gears in North Central, Nigeria

Fishing settlements (LGAs)	No. of motorized Canoes	No. of non-motorized Canoes
*Agwara	16: (25.8%)	64: (24.8%)
*Borgu	28: (45.2%)	52: (20.2%)
**Edu	10: (16.1%)	70: (27.1%)
**Patigi	8: (12.9%)	72: (27.9%)
Total	62: (100%)	258: (100%)

\*Niger State; \*\* Kwara State and Figures in brackets are as % of total number of non-motorized and motorised. (Field survey, 2013)

This is because modern equipments are costly and the fishermen lack the necessary finance to purchase them. This situation is evidenced in the study area by the use of artificial materials such as foams and cork as floats; stones as sinkers; hook and line as fishing gears, and overdue fishing nets and canoes by some fishermen. In addition, because of lack of modern and sophisticated equipments in the study area which invariably implies limited range and capacity of the canoes used, the bulk of fishermen could only exploit resources close to their settlements. In addition, fish is landed in small quantity in these settlements and consequently cannot be handled, processed or marketed in bulk as required for maximum efficiency.

Government should encourage development of local fishery technologies by financing relevant research institutes such as National Centre for Agricultural Mechanisation among others. This way

mechanizes all fishery operations to remove drudgery, save labour and time and achieve a technological transformation of the fishermen. In the absence of this or as an interim measure, relevant agencies should network with local fishermen to import environmental compatible fishing gears and vessels, and other fishing equipments for sustainable fishery development in Nigeria. Such gears and vessels should also place premium on mending materials, efficiency, fishermen's knowledge and experience as well as economic and environmental consideration.

#### **Inadequate storage and processing facilities**

The result also indicates that inadequate storage and processing facilities is an important constraint faced by fishing households in the region. This constraint gulped about 13.5% of the problems limiting effective fishery practices in the study area. In Nigeria, fishery sub sector

employ about 4.3% of Nigerian population and has potential to produce enough fish for local consumption as well as export (FAO, 2013). However, due to lack of needed infrastructure which includes storage and processing facilities, it still provides a strictly seasonal and subsistence livelihood. Modern storage facilities such as ware house, frozen equipments, canning and processing machines are virtually non-existence in the region. Although, fishermen have devise local measures to reduce fish post-harvest loss, which include protecting catch fish from direct sun and rain and cover the fish with leaves as well as immediate processing of the fishes locally. The local methods of storage and processing such as smoking, sorting, drying and filleting seems to be cumbersome and could not preserve the fish for long time. To achieve self-sufficiency and discouraging the importation of fish and fish products in Nigeria, the need for modern storage and processing equipments becomes imperative. This will also improve the well-being of rural artisanal households.

#### **Distance to market**

Distance to market is another constraint faced by fishermen in the study area. More than 11.6% agreed that distance to market which include lack of roads is a problem in artisanal fishing. Distribution of inputs and outputs to and from farms is the most

serious infrastructural bottleneck facing agricultural development in Nigeria. Suffice to note that improved access to input and output market is a key precondition for the transformation of the fishery sector from subsistence to commercial production. Small scale fishermen must be able to benefit more from efficient market and local-level value addition, and be more exposed to competition. The studied area are characterised by lack of roads, high transport cost, long distances to market and lack of affordable, appropriate transport and poor or non-existent communications infrastructure for disseminating information on market, products and prices.

Majority of the fishermen sell low immediately after fish expedition (fish catch) and acquired their inputs at unavoidable price with little choice of where they conduct the transactions, with whom and at what price. The artisanal fishermen need access to competitive market not just for their produce but also for inputs, assets and technology, consumer goods, credit and labour. In addition, communication infrastructure for disseminating information on market, products and prices are also essential for effective input- output market in the study area.

**Lack of extension contacts**

The results also revealed lack of extension contacts (10.3%) as constraint that impedes artisanal fishing in the study area. Extension service delivery is a vehicle for spreading scientific and technology progress and transfer. It also facilitates the dissemination of improved fishing technologies through various methods. The role of agricultural extension agents is very crucial in improving fishery development in Nigeria. It does this by facilitating the education of artisanal fishermen to improve their skills, knowledge and attitude as related to fishery development.

However, the extension service deliveries in Nigeria are hampered by a number of problems. These include low extension agents to farmers' ratio. While FAO recommends a minimum of one extension agents to 800 farmers, the national average stood at 1:1986 (Ihimodu, 2002). They are also poorly motivated in remuneration and provision of transport facilities to visit the farmers including fishermen. Findings reveal that the few extension agents available in the study area reside far away from the farmers mostly urban areas, thereby minimizing interaction between them and the fishermen. The problem of language barrier between the two actors is another bottleneck. Majority of these extension agents in the study area could

neither communicate in local nor Arabic language while the bulk of artisanal fishermen could not communicate in English language. In addition, the linkages between research, extension and training are weak and collaboration between public and private partners limited. If these and other similar problems are X-rayed, extension could become an instrument for effective fishery development. Therefore, Omokhaye (2000) concluded that the main problem of agriculture development in Nigeria is not the lack of technologies and scientific findings needed for economic and social change, but inadequate information on the usage of the improved technologies. It is recommended that efficient extension service should be rendered by trained extension agents, who are under continuous training programmes. This must be supported by a dynamic system of monitoring and evaluation, and good government policy. More extension agents should be recruited to reduce the extension-farmer (fishermen) ratio. Improving on the extension services by strengthening the State and Local Government efforts through provision of manpower and material support will improve extension service delivery. Extension materials could be translated to Arabic language since the bulk of the respondents in the study area could read and communicate in Arabic language.

**Hired labour**

High cost of labour also account as constraint to about 8.4% of the artisanal fishermen in the study area. The bulk of fishery households' members in some of the fishing settlements are either in school or migrate to urban centres and nearby industrial estate for paid job. Their motive lies either in supplementing their household income or accumulating capital for further expansion of their economic activities. However, this particular job is unstable, unskilled employments opportunity which suggests availability of undeveloped domestic labour market in rural area. Given the limited capacity for labour absorption by the urban and industrial sector, it is advisable for the rural fishery households to utilize the vast potential of agriculture and fishery resources to improve their livelihood. However, government should encourage individuals and corporate organisation to create stable labour intensive agro-allied industries in the rural areas to meet this demand by encouraging location of such industries in the rural areas through provision of needed infrastructure. This will complement agricultural labour which would be highly significant in terms of improved livelihood for rural households and reduce rural-urban migration.

**Accessibility to fuels**

Accessibility to fuel is also a constraint to artisanal fishery production in the study area. More than 8% of respondents mostly motorised engine users complain of arbitrary prices and scarcity of fuel commodity in the study area. Nigeria fuel has been very volatile, in oil prices in the last two decades despite the fact that Nigeria is one of the leading net oil exporters in the world. The implication of its volatility was unprecedented increase in prices of petrol and diesel from about ₦3.25K/litre and ₦3/litre respectively in 1993 to ₦97 and ₦135/litre in 2012 (Petroleum Product Marketing Company, 2012). If fishery development is to be encouraged with high capital investment so as to mechanise artisanal fishery operation in Nigeria, government must encourage installation or building of gasoline station in the rural area and sell fuel at affordable price. This will safeguard the future of the mechanised investment and the artisanal fishery development in general.

**Problem of climate variability**

Findings also indicate that the fishermen have acknowledged existence of a significant of climate variability. About 6% of respondents agreed that climate variability such as flood, drought, variation in temperature and change in rainfall patterns or seasonality nature of fishing, high wind turbulence and duration and

variation in seasons hindered fishing activities in the study areas. Westland *et al.* (2007) in Hamdan *et al.* (2011) opined that extreme patterns of climate events affects the rivers water quality which may lead to diseases outbreak and non-conducive environment and threat to fish survival. These resulted into disappearance of some fish species and lowering catches. It can be concluded that climate variability may increase the incidence of poverty. Based on the climatic variability in the study area, fishermen should develop strategies to counteract those adverse impacts in their livelihoods. The strategies include change in fishing time that is fishing during both day time and the night; change the fishing gears from using simple fishing tools, going fishing in the deep water.

### **Infestation by hyacinth**

About 3.6% of the artisanal fishermen regarded infestation by hyacinth as one of the problem towards fishery development in the study area. The aquatic macrophyte called water hyacinth (*Eichhornia crassipes*) is not new in the ecological history of man. In fact, it has been popularly described as the most troublesome weed of the world because of its rate of multiplication (Ndimele, 2011). Water hyacinth is a native of tropical South America that has spread to more than 50 countries, five continents and has become a massive problem in waterways on both Africa (Nigeria

inclusive) and Southeast Asia (Barret, 1989 in Ndimele, 2011).

Infestation by hyacinth hindered accessibility to river which made fishing and transport as well as navigation difficult. This result in loss of fishing equipments and reduce fish catches (and subsequent loss of livelihood), especially of tilapia and mud fish which are found mainly along the shores (Mailu in Ndimele, 2011) and river reef. In addition, it also increases cost of fishing expedition due to labour requirement to remove the weed. However, the best method of controlling water hyacinth (*Eichhornia crassipes*) is integration of mechanical, chemical and biological methods because of inadequacies of each method.

### **Others**

Menace of water lords and accessibility to water and river contributed 3.3% in the study area. The accessibility to water and river plays a crucial role in fishery development in the study area. The advent of some industries near fishing settlement areas has resulted in frequent incidents of industrial waste spillage to part of these settlements which have endangered fish fauna and drastically affected the productivity of the river waters. This also made some part of the river inaccessible for fishing since the numerous gas waste have also disrupted the natural diurnal rhythm

with a resultant adverse effect on the aquatic resources in the study area. Indiscriminate and obnoxious dump of poisonous chemicals and explosives into the river or their uses for fishing can also lead to decimation of the fishes in the rivers. Unless legislation for environmental pollution control are made and vigorously enforced, the inland waters may become polluted that their usefulness for fish production will decline below the existing levels.

#### Measuring Poverty Incidences of Credit Utilization of Fishery Households

The study used and consider the relative poverty measurement among others for a number of reasons. The advantage of this method over the others lies not only in its simplicity but in the fact that the poverty

line is determined in relation to the general living standard of the whole target population and the ability to assess changes in the living standard of the people over time. Also in relation to other members of a community there would always be relative poverty. Overall more than half, (53%) of sampled fishermen fell below poverty line of ₦6050.15 per person per month. Thus, in Table 6, a fisherman that utilizes at least ₦50, 000 credits had poverty incidence of about 10% while fishery households that did not have access to credit record poverty incidence of 58%. The poverty gap and severity, and share of poverty followed the same pattern as shown in Table 6. In conclusion, the incidence of poverty was more among households that had no access to production credit than those that utilized at least ₦50, 000 credits.

**Table 6:** Identified poverty sub-groups based on credit and fishing gears used

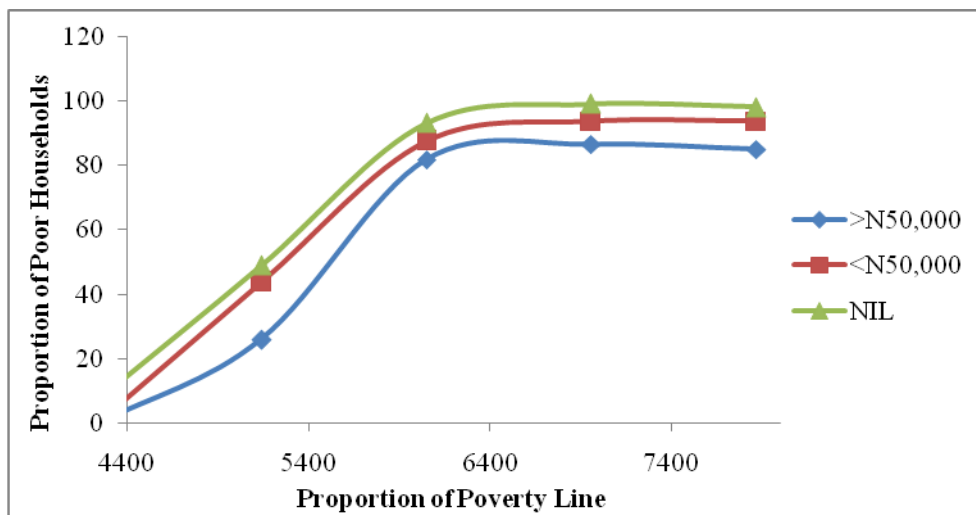
Variables	$P_0$	$P_1$	$P_2$	n	Share of poverty q	%
<b>Level of Credit (₦)</b>						
Nil	0.5809	0.0632	0.0026	272	158	97.0
< 50,000	0.2308	0.0709	0.0019	13	3	1.8
> 50,000	0.0952	0.0754	0.0036	21	2	1.2
<b>Nature of Fishing Gears</b>						
Motorised sector	0.10	0.0743	0.0030	40	4	2.5
Non-motorised sector	0.5977	0.0715	0.0173	266	159	97.5

$P_0$  is the headcount index,  $P_1$  is the poverty gap index,  $P_2$  is the squared poverty gap index

Source: field survey, 2013

Figure 2 presents the Cumulative Distribution Function (CDF) for households that have access to production credit at different levels. The CDF of households with no access to credit stochastically dominated the CDF of households with

access to credit. This shows that households with no access to credit would have more poverty incidence, depth and severity than households with access to credit over the range of the poverty line. The second order stochastic dominance also holds true.

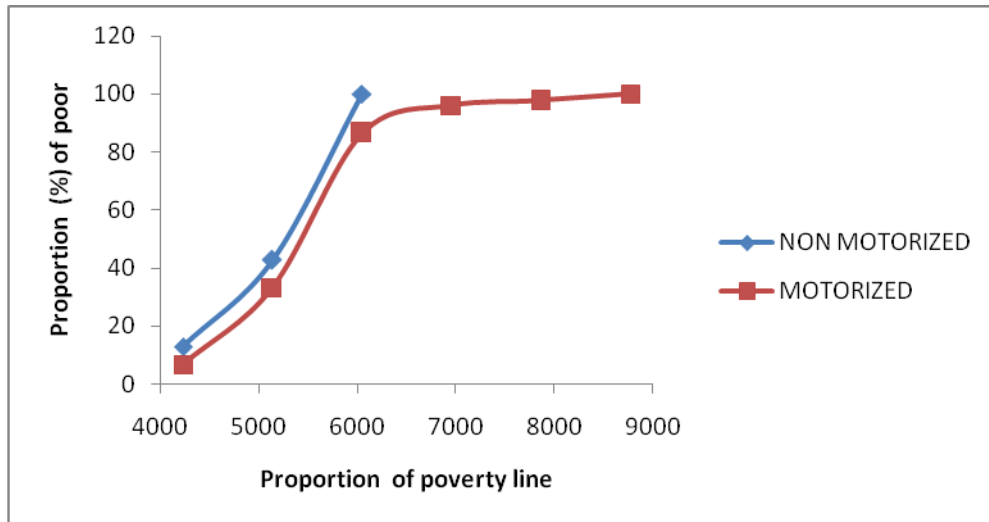


**Figure 2:** Dominance analysis by level of Credit utilization of Fishery Household Heads

Similarly, ownership and types of canoes and fishing gears (nets and outboard engines) determines to a large extent the amount of fish catch and invariably the income that accrued to fishermen (Figure 3). While the poverty incidence among motorised canoes owner was only 10%, that of non-motorised sector record about 60% level of poverty incidence. This is reinforcing in Figure 3 below where CDF by types of fishing gears of fishing households of paddled canoes users lay above that of households that uses

motorised canoes. This indicated that there were first and second order stochastic dominance and the households with non-motorised canoe would always have higher head count ratio than motorized sub-group of households within the specified poverty range. This may be attributed to increase output which invariably results in increase income and better welfare of fishermen for motorised owners. Therefore, by using improve fishing techniques; fishermen’s output and income were raised, which subsequently improves household welfare.





**Figure 3:** Distribution of dominance analysis by types of Fishing Gears of Household Heads

### Policy Issues and recommendation

From above study, it can be concluded that artisanal fishermen in North Central Nigeria are facing a myriad of problems which varies with level of severity. To achieve self-sufficiency in fish production, efforts must be made painstakingly by all stakeholders to address the growing need for production credit on the fishing enterprise. Specifically, mobilization of fishermen into formal groups in order to enjoy the benefit of collective investment of group savings is also recommended. Government should enlist more extension agents and equip them with necessary kits to function effectively.

In conclusion, this study identified that if these constraints are critically examined and their fishery cooperatives are rejuvenate, it will be easy for the government to realise the long term potential and sustainability of the artisanal fisheries sector in the North Central Nigeria and the whole nation at large: This will also be an impetus to the transformation of the fishery sector from subsistence to commercial production, to achieve the first Millennium goals of halve the percentage of people in extreme poverty and hunger, and the seventh goal of ensuring environmental sustainable development policy of global objective.

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