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Artisanal Fishers' Use of Sustainable Fisheries Management Practices in the Jebba Lake Basin, Nigeria

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Abstract

The study attempts to characterise artisanal fishers' use of sustainable fisheries management practices in the Jebba Lake Basin, Nigeria. Stratified sampling technique was used to select 402 respondents. Data were collected using semi-structured interview schedule. Data were analysed using frequency counts, percentages, mean and standard deviation. The result showed fishing in the study area was dominated by male fishers (97.0%) with the mean age of 43 years. Attitude of fishers' towards formal fishing regulations were below average (mean=3.00). Over half (57%) of the respondents never used any sustainable fishing practices, while only 39.1% used only one form of sustainable fishing practice. About 60% and 50% of the respondents reported using gill net and hook and line, respectively. The study recommended that artisanal fishers should be strengthened as key stakeholders in fisheries policy formulation, implementation and evaluation. This will entrust commitment and ownership on the part of the fishers towards the realization of fisheries policy objectives.

Keywords: *Fisheries, Policy, Environment and Management*

Introduction

Globally, inland artisanal fisheries have provided an important source of food for sustaining human well-being over the years. Fish plays an important role in improving food security and nutritional status; and is a critical source of dietary protein and macronutrient for many isolated communities in rural areas (Bene and Heck, 2005). Therefore, fish is of great importance as a direct source of protein and micronutrients lacking in plants for millions of people (LSMAC, 2003). In Nigeria, inland fisheries do not only provide an important alternative source of animal protein but is also crucial to the economy contributing 5% of agricultural gross domestic product (FAO, 2007). The inland fisheries accounted for 85% of domestic fish production between 1991 and 2003 with total annual fish production of 615,507 metric tons in 2007 (FDF, 2008). Despite this current contribution of inland fisheries and its potential in national economic development, its sustainability is being threatened due to the overexploitation of natural fish stock, which is getting to its limit (Mutume, 2002).

Also, inspite of the overwhelming potential of abundance fisheries resources, Nigeria remains a very large importer of fish. Reasons for this has been attributed to the subsistence nature of those engaged in fishing, the remoteness of fishing

communities and the difficulty in accessing and use of outdated fishing gears and craft (Ohen *et al*., 2009) including low adoption of improved fisheries technology and poor management practices adopted by fishers. Domestic fish production (in metric tons) from 1995 to 2007 has been virtually flat (FDF, 2008), reflecting both a stagnant aquaculture production and a stressed and overfished capture fisheries that can no longer sustain increased harvesting. The important issue for management of artisanal fisheries resources in Nigeria is hinged on increased fishing pressure, irresponsible fishing and pollution among others.

The need to reverse declining trend in capture fisheries resources compelled government to formulate sustainable management strategies, which incorporates a combination of management measures, mainly, technical and input controls, and, to some extent, output controls and economic incentives. These management measures are backed up by enactment of laws at Federal level and edicts at State level. The subsisting laws are: Niger and Kebbi States that formed parts of the Jebba Lake, which this study focuses on, have adopted legislation (fisheries edict) aimed at regulating fishing activities over past years. Despite this effort the fishery sector is yet to improve its performance significantly. Domestic fish production has not been able to bridge the gap. Fish supply is put at about 0.4 million tons in comparism to 0.8 million tons of demand (FAO, 2006) and supply of 0.7 million metric tons and demand of 1.7 millions tons of demand in year 2010 (FDF, 2010). This makes Nigeria one of the largest importers of fish in the developing world, importing between 600-700 metric tons annually at a cost of US$ 0.4 billion, resulting in significant loss of domestic jobs (Moehl, 2003 and USAID/Nigeria/SPDC, undated). This has been partly blamed on the fishers' lack of adoption of sustainable fishing practices. Hence, the aim of this study to examine the fishers' use of sustainable fishing practices and its implication for effective fisheries extension delivery geared towards the attainment of the objectives of the Federal Government of Nigeria Agricultural Transformation Agenda in food security, employment generation, wealth creation and the overall economic development of the rural communities. Hilborn (2007) asserted that for fisheries management to be successful, associated human factors, such as the reactions of fishermen to management measures are of key importance, need to be understood.

Objectives of the study

The overall aim of the study was to examine artisanal fishers' use of sustainable fisheries management practices in the Jebba Lake Basin, Nigeria and its implication for effective fisheries extension delivery. The specific objectives were to:

i. describe the socio-economic characteristics of fishers in the study area;
ii. ascertain the extent to which fishers have adopted sustainable fishery management practices; and
iii. examine the fishers' practice of and attitude towards fishing regulations in the study area.

Methodology

The study was carried out in fishing communities in the Jebba Lake Basin, Nigeria. Jebba Lake is situated between Latitude 9^{o} 10' and 9^{o} 55' north and longitude 4^{o} 30' and 5^{o} 00' east and was formed in August 1983 as an impoundment of River Niger

(Olufemi, 2008). It extends from the dam site at Jebba to southern tips of Kainji dam. The lake is unique as the first and the only man-made lake in Nigeria that has a direct inflow from another man-made lake located upstream to it. It is bounded by Niger State on the east and Kwara State on the west.

Multi-stage sampling technique was used for the study. The first stage was the stratification of communities within the lake basin into local government areas (LGAs). Niger state has 3 LGAs (Borgu, Magama and Mokwa) and Kwara state has 1 LGA (Moro) making a total of 4 LGAs. The second stage was the stratification of the communities around the Lake into 3 strata to have a representation of fishing communities within the Northern, Southern and Central part of the lake across the 4 LGAs of the states. Identification of active fishing communities around the Lake Basin and purposive selection of 30% of total number of identified fishing villages by stratum formed the third stage. Thus; stratum 1 included the following communities: Fakun, Bakoshi, Faransawa, Sabo Leaba and New Awuru; stratum 2 comprised Sabo Niger, Tungan Lanti, Kwaifawa, Rimaye, Tsofo Gbajibo and Tungan Maje while stratum 3 comprised Tungan Alhaji Audu, Saminaka, Tugan Dukia, Tungan Kwakwari, Ngagi 1, Gungu Zaki and Tungan Garba Bichi. The fourth step was the purposive selection of 18 percent of fishers in each of the selected fishing communities from the 3 strata. Thus, 134 fishers were sampled from stratum 1, 130 from stratum 2 and 138 from stratum 3, making a total of 402 fishers sampled for the study (Table 1).

Table 1
Sample of artisanal fishers by stratum

Stratum	Total No. of Fishing villages by stratum	Sampled fishing villages by stratum (30%)	Selected fishing Communities	Fishers population	Sampled fishers (18%)	Sampled fishers by stratum
1	15	5	Fakun Bakoshi Faransawa Sabo Leaba New Awuru	289 105 120 90 140	52 19 22 16 25	134
2	20	6	Sabo Niger Tungan Lanti Kwaifawa Rimaye Tsofo Gbajibo Tungan Maje	135 95 130 100 200 63	24 17 24 18 36 11	130
3	24	7	Tungan Alhaji Audu Saminaka Tugan Dukia Tungan Kwakwari Ngagi 1 Gungu Zaki Tungan Garba Bichi	80 180 95 115 81 130 86	14 33 17 21 15 23 15	138
Total	59	18		2,234	402	402

Relevant data were collected from the respondents through semi-structured interview schedule containing both open and closed-ended questions. Data collected were subjected to descriptive. The descriptive statistical tools included frequencies, graphs, mean, standard deviation and percentages.

Sustainable fisheries management practices

Fishing practices the fishers have practiced in sustaining or improving fisheries were identified. Respondent practice of any of the identified practice was measured as dummy viz; Yes =1, No = 0.

Taking a cue from Fakoya (2006), the degree of use of sustainable fisheries management practices was measured as a percentage of the overall score.

Thus:

$$Z = \frac{X}{Y} X\ 100$$

Where,

Z = Degree of use of sustainable fisheries management practices of the fishers.
X = Number of sustainable fisheries management practices engaged in.
Y = Total number of sustainable fisheries management practices available.

Based on the number of fisheries management practices engaged in, respondents were characterized as follows: number of practices, percentage score (z), frequency, percentage

Results and Discussion

Socio-economic characteristics of the artisanal fishers

Majority (66.1%) of the respondents fell within the age range of 40 years and above, with a mean age of 43 years. The finding suggests that fishers in the study area are ageing and fishing activities is becoming unattractive to the teeming youths. Confirming the result, Nwabeze *et al.,* (2011) reported 44-66 years as the dominant age among fisherfolk in Niger State, Nigeria (Table 2). Fishing was practiced by both sexes in the study area with most (97.0%) being males, revealing the preponderance of the male sex in fishing business (Table 2). Only few females of Ijaw origin were found to be actively involved in fishing. They either support their husband or pair with other women in fishing using lift net *(Atala net).* Most (82.1%) of the respondents were married.

Table 2 shows that majority (83.1%) of the respondents had no formal education. The finding confirms the general assertion that fishing communities are characterized by persons with low level of education (Onemolease and Erie, 2006). The mean household size was 9 persons (Table 2). The large family size was largely attributed to the extended family system in the area whereby parents, children and other relations live together as a household. Respondents mean annual fishing income of ₦81,123.11 implies low income. The mean fishing experience was 29 years.

Table 2
Socio-economic characteristics of the artisanal fishers

Variable	Categories	Frequency	Percentage	Mean
Age (years)	< 20	7	1.7	
	20 - 29	57	14.2	
	30 - 39	68	16.9	
	40 - 49	119	29.6	43
	50 - 59	128	31.8	
	60 - 69	19	4.7	
	70 – 79	4	1.0	
Sex	Male	390	97	
	Female	12	0.3	
Marital status	Single	51	12.7	
	Married	330	82.1	
	Divorced/separated	7	1.7	
	Widowed	14	3.5	
Annual income from fishing (₦)	< 25,000	7	1.7	
	25,001 - 50,000	82	20.4	
	50,001 - 75,000	88	21.9	
	75,001 - 100,000	114	28.4	81,123.11
	100,001- 125,000	75	18.7	
	125,001 - 150,000	10	2.5	
	> 150,000	26	6.5	
Fishing experience (years)	< 11	37	9.2	
	11- 20	65	16.2	
	21- 30	107	26.6	
	31- 40	157	39.1	29
	41- 50	33	8.2	
	> 50	3	0.7	
Household size	< 5	29	7.2	
	6 - 10	258	64.2	
	> 10	115	28.6	9.0

Respondents' adherence to fishing regulation

The fishing regulation was promulgated by the apex fisheries body in Nigeria (Federal Department of Fisheries) to check the excesses of fishers' fishing practices for continued sustainable yield of fishery resources. Non use of explosive was the most practiced fishing regulation by the respondents (100%) as shown in Table 3, followed by non use of poison (87.8%) and fish fence (63.7%). Only few respondents complied with regulation of gear control (49.3%), declaration of fish catch (29.1%), effort control (14.2%) and closed area and closed season (11.4%). The result suggests a low conformity to the formal fishing regulation in the study area. Reasons for this could be attributed to poor implementation of formal sanctions by law enforcement agents. The emergence of the inland fisheries decree ushered the taking over of fishing activities by the government. This could be responsible for the

breakdown of social control mechanism inherent in fishing communities. Ekong (2003) reported that centralization of the law of the land has accounted for reducing the authority of the local institutions.

> *A discussant, Mr George of Fakun, has this to say; "People are fond of using under size gear mesh to fish on the Lake especially the beach seine net. They use the beach seine nets at night and often a time when caught, they bribe their way. We the Ijaw ethnic group has reported the case of beach seine use on the lake to the Emir of Borgu Kingdom through our traditional chief".*

This has not fully changed the attitude of some of the fishers on the use of beach seine net. The use of beach seine net could be inimical to the sustainable fishery production of the lake and subsequent negative adverse effect to those who depend on it for survival. This is attributed to the fact that intensive use of beach seine net has implication in extinction of the fish stock. The beach seine nets are undersize mesh size net of less than 0.5mm and length of 100 metre and above. It is operated by no fewer than 10 fishers depending on the length and has the capacity to crop fish eggs, frys and juveniles of all fish species.

Table 3
Adherence to fishing regulation by respondents

Fishing regulations	Frequency *	%
Ban on the use of explosives	402	100.0
Ban on the use of poisons	353	87.8
Prohibition of fish fence	256	63.7
Gear control	198	49.3
Declaration of fish catch	117	29.1
Effort control	57	14.2
Closed areas and closed seasons	46	11.4

**Multiple responses*

Respondents' attitudes towards formal fishing regulation

The mean results (Table 4) show that respondents were positively disposed to formal fishing regulations. The leading attitudes were ban on the use of explosive (mean=4.47, SD=0.7),
ban on the use of poison (mean=4.41, SD=0.7), prohibition of fish fence (mean=4.25, SD=0.7) and gear control (mean=4.10, SD=0.7). In terms of percentages, over 52.0% of the respondents considered as very good the ban on the use of poison and ban on the use explosive. Almost 51.0% agreed that policy on prohibition on fence and gear control were good. More than 30.0% supported government effort control (37.8%) and declaration of catch (31.3%). However, less than 30.0% was in support of closed area and closed seasons.

Table 4
Respondents attitudes toward formal fishing regulations

Regulations	Percentages					Total	
	Very good	Good	Okay	Poor	Very poor	Mean	SD
Ban on the use of explosives	58.0	31.1	10.9	-	-	4.47*	0.7
Ban on the use of poisons	52.0	36.8	11.2	-	-	4.41*	0.7
Prohibition of fish fence	37.6	51.0	10.4	1.0	-	4.25*	0.7
Gear Control	30.3	50.7	17.9	1.0	-	4.10*	0.7
Effort control	15.9	37.8	33.8	11.9	0.5	3.57*	0.9
Declaration of catch	12.7	31.1	31.3	21.1	3.7	3.28*	1.1
Closed areas and closed seasons	16.9	23.1	29.4	22.9	7.7	3.19*	1.2

**Good (mean≥ 3.00)*
SD = Standard deviation

Effectiveness of fishing master to control fishing livelihood

Respondents rated the effectiveness of fishing master in enforcing compliance to fishing regulation in the community as good (53.7%), very good (27.1%), poor (8.5%) and very poor (0.2%) (Fig 1). The result implies that at community level fishing master is effective to controlling issues related to fishery.

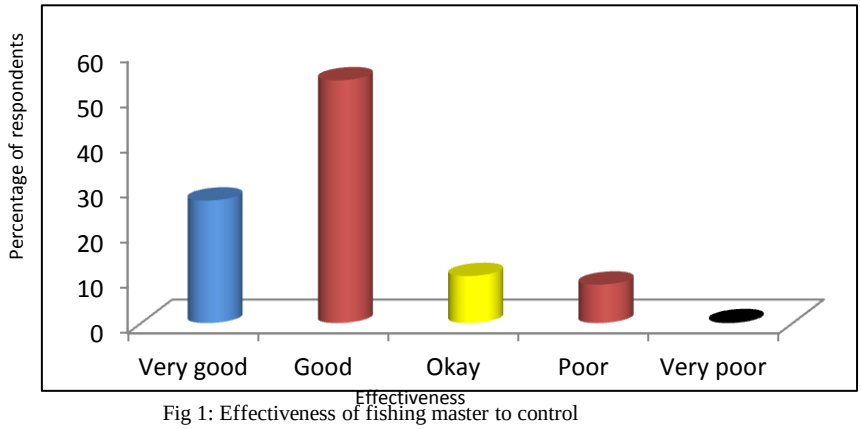

Fig 1: Effectiveness of fishing master to control fishing livelihood

Characterisation of fishers participatory score based on sustainable fishing practices used

Table 5 revealed that fishers were characterised on the basis of their use of sustainable fishing practices. The Z value qualified fishers' on the degree of sustainable fishing practices used. More than half (57.0%) of the respondents never used any sustainable fishing practices. About 39.1% adopted only one form of sustainable fishing practice and degree of use (Z) was 17.0%, 3.7% used two forms of sustainable fishing practices with 33.0% level of usage while only 0.2% adopted

three forms of sustainable fishing practices at 50.0% degree of use. The result implies that large proportion of the fishers in the area do not use fishing practices that will enhance the sustainability of the fisheries resource.

Table 5
Characterization of fishers' participatory score based on sustainable fishing practices adopted

No. of practices	Percentage score (z)	Frequency	Percent
None	0	229	57.0
One	17.0	157	39.1
Two	33.0	15	3.7
Three	50.0	1	0.2
Total	100.0	402	100.0

4.4.2 Characterization of fishers on fishing practices adopted

Table 6 shows that respondents fishing practices based on whether they are sustainable, unfriendly and damaging taking a cue from Binyotubo (2011) and FAO (1994). The most prominent sustainable fishing practices adopted by the respondents include gill net of size 76.2 mm and above (59.7%), hook and line (49.3%) and drift net (37.1%). The result revealed low adoption of most of the sustainable fishing practices by the respondents. Landing net (11.0%) and fish fence trap (4.2%) dominated the unfriendly fishing practices being practiced by the respondents. Damaging fishing practices such as the beach seine net (1.5%) and poison (gamalin) (1.5%) were hardly practiced by the respondents. The unfriendly and damaging fishing practice on the lake has a lasting effect in depleting the fish stock. This has overall negative effect in sustaining the welfare of fishers' households (Nwabeze *et al*., 2011; Deka, Goswami, and Kakati, 2005). When asked on why fishers chose to adopt destructive fishing practices, most of the respondents said, *"Fish species vary greatly in terms of habits and habitants, and as they change according to seasons, we equally have to change our gear and method of fishing so that we and our families can survive".*

Table 6
Characterization of fishers on fishing practices used

Fishing practices	Frequency*	%
A. Sustainable		
Gill net (size 76.2 mm and above)	240	59.7
Hook and line	198	49.3
Drift net (76.2mm and above)	149	37.1
Goura (Malian) trap	70	17.4
Lift nets (*Atala*)	47	11.7
Cast net	47	11.7
Long line	27	6.7
Double chamber trap	16	0.4
Fyke net	12	3.0
Open water seine	10	24.9
Pound trap	9	2.2
Spring loaded set line	9	2.2
Skimming net	8	2.0
Push net	6	1.5
Scoop net	4	1.0
Pole and line	2	0.5
B. Unfriendly		
Landing net	44	11.0
Fence trap	17	4.2
Dragged bag nets with Fixed mount	12	3.0
C. Damaging		
Beach seine net	6	1.5
Poison	1	0.2

**Multiple responses*

Implication for Effective Fisheries Extension Delivery

In all the fishing communities studied, informal institutional structures were put in place by the local people to take charge of issues relating to fishing livelihood. The traditional institution operates through the *Sarkin Ruwa* (Fishing Master) that is well respected and recognized by both communities and formal institutions. They formulate and enforced local fishing regulations and also, represented the informal link between the communities and government. Local fishing regulations observed in the area are ban on beach seine net and also moral vices (unauthorized supervision of fishing gear, fishing gear and craft theft) related to fishing livelihood. Sanction and sanction mechanism on the use of beach seine net was adopted. These were confiscation of gear, arrest of culprit and reports to formal authority for prosecution whereas, fishing gear theft are liable to forfeit their gears and banished from community. Therefore, the informal institution enhances effective extension strategy

in implementing and enforcing fisheries policy that will drive Agricultural Extension Transformation Agenda component of Agricultural Transformation Agenda of the Federal Government of Nigeria.

Conclusion and Recommendations

Based on the analysis of the data and findings of the study, the following conclusions are drawn: Low compliance of fishers with formal fishing regulations that encouraged sustainable fisheries connote weak participation of fishers at the initial stages of fisheries policy formulation.

Traditional Institution of fishing master (*Sarkin Ruwa*) are important aspect of change agents in implementation of local and formal fishing regulation that will enhance the sustainability of inland fisheries resource.

Based on the conclusions of the study, the following recommendations are made:

1. Enlightenment campaign on the use of sustainable fishing practices for continued sustenance of the fishing ground provided with the lake to the fishers. This will not only sustain the maximum production yield of the lake but also encourage the youth to invest in fishing livelihood.
2. There is need to strengthen artisanal fishers as key stakeholders in fisheries policy formulation, implementation and evaluation. This will entrust commitment and ownership on the part of the fishers towards the realization of formal fisheries policy objectives.
3. Recognition of the Traditional Institution by government in enforcing formal fishing regulations is step towards controlling obnoxious fishing practices. Their effort will complement that of the formal law enforcement agents whose manpower are grossly inadequate coupled with the challenges in reaching the scattered inland fishing terrain within the lake basin.

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