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Fish Farming Enterprises and Poverty Reduction in Adamawa State- Nigeria

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Abstract
The paper investigated the impact of fish farming on poverty reduction in the northern region of Adamawa State. The study specifically examined the poverty status of the farmers before and after engaging in the farming activities. Sample size of 162 farmers was drawn using simplifies Yamane model. Questionnaire was the major instrument used to collect the required date and was administered personally by the researcher. Out of the 162 questionnaire administered, 153 were dully completed, returned and were found useful for the study. Descriptive tools, Foster-Greerer-Thorbeck, Gini-coefficient and logit regression were statistical techniques used to analyze the data collected. The result shows that on a whole, fish farming impacted positively on the life of the farmers, there by reduces poverty among them. On this note, it was recommended that government particularly in Adamawa State should double its efforts in the development of Aquaculture sub-sector of the economy.
Keywords: Fish Farming, Impact, Enterprises, Poverty reduction, Northern region, Adamawa State

INTRODUCTION

Disturbing facts recently seem to reveal a phenomenal rise in the prevalence and severity of poverty in the world. This development is viewed as a serious threat to humanity and indeed a great challenge to policy makers all over the world especially on the efficient definition of the socio-economic determinants of poverty and the needed policy choice for sustainable poverty reduction (UNDP, 2006; Salvia, 2007).

Based on this situation, many policies/programmes were initiated, developed and embarked on by governments at different phases and times. This policies/programme are diverse spanning all sectors of the economy some are incorporated into various development plans of the country while others are policies and programmes of successive governments in the country. With due regard to the agrarian nature of the economy, most of the policies and programmes were more agriculturally oriented. These programmes among others includes Green Revolution Programme (GRP),the Directorate for food Road and Rural Infrastructure (DFFRI), the National Agricultural Land Development Authority (NALDA), Others includes the National Economic Empowerment Development Strategy (NEEDS), the Seven- Point Agenda and the present administration transformation agenda under which we have the National Initiative for Sustainable in Agriculture (NISDA) (Gokum, 2007; Salvia, 2007). Each of these programmes, were introduced with some specific farming scheme aimed at reducing the incidence of poverty and ensure food security among other things in the country.

However, with all these efforts, poverty indicators in the country are still on the increase. As revealed by the UNDP- Human Development Index of 0.462 in 2005; 0.471 in 2012 and 0.504 in 2013. This shows that between 2005 and 2013, the HDI in Nigeria increase on an average of 0.98%. In fact, the 2013 HDI of 0.504, places Nigeria among the low category of countries. This report indicates that Nigeria is above the average of 0.493 for countries in the low Human Development group and above the average of 0.502 for countries in Sub-Saharan Africa (UNDP, 2006; 2013; 2014). This phenomenon called for a policy re-think particularly in area of agriculture that has many linkage effects. Fish farming according to Olatoye (2012) has both backward and forward linkages and is currently a very lucrative business in Nigeria which has both wholesale and retail value of over $1billion per year with demand further increasing as the population increases and hence investment in commercial fish farming is expected to expand rapidly at 25 –33% per year.

On this note, government at different levels and time initiated programmes/projects aimed at boosting fish production with the view to ensure food security and poverty reduction in the country. Among the programme/projects are the African Regional Aquaculture Review Strategy (1999), formed to among other things Promote Farmers Associations, improve national coordination on aquaculture (FAO, 2003; Miller *et al,* 2006). the Aquaculture and Inland Fisheries Project (AIFP)(2003); established to ensure sustainable development of Nigeria Fisheries for National Food Security, Self-sufficiency in fish production, optimized resource utilization and conservation. It was to centred on employment generation, wealth creation, poverty alleviation and reduction in rural – urban migration among others in line with the National Economic and Empowerment Development Strategy (NEEDS) of the Federal Government and the New Partnership for African's Development (NEPAD) initiative (Ovie and Rahji, 2006; FAO, 2007; Atanda, 2008). AIFP was a component of the Nigerian Special Programme for Food Security (NSPFS) (Onebuntin, 2012).

All these efforts were in recognition that fish farming have social, economic and nutritional benefits with minimal environmental cost. It can also make an important contribution to poverty alleviation, food security and social well-being as already done so in many developing countries (FAO, 2003). According to William

(2007), fish farming industry provides crucial farm-industry linkage that helps to accelerate agricultural development by creating backward linkages (supply of credit facilities, seeds, feeds and production of enhancement services) and forward linkages (processing, packaging, marketing and distribution) which adds value to the farms produce, generates employment opportunities and increase the farmer's net income. This by implication indicates that fish farming can reduce poverty and improve the social –well being of the farmers.

It is on this understanding that this study investigated the contribution of fish farming to poverty reduction in the northern region of Adamawa State.

Specifically, the study:

i. Examined the socio-economic characteristics of the respondents
ii. Examined the poverty indices and income inequality of the respondents before and during fish farming

The Null hypothesis tested was that H_0: Fish farming has not reduced the probability of being poor among fish farmers in the northern region of Adamawa State.

METHODOLOGY

Area of the Study

The study was carried out in the northern region of Adamawa state. Specifically, in three (3) local government areas of the region namely Mubi-North, Mubi-South and Maiha local government areas. These local governments shared boundaries with Cameroon Republic in the north, to the south they are bordered with Hong local government while to the east of Mubi-North is Michika local government and to the west of Maiha is Song and Fufore local government areas of Adamawa state. The local governments were created out of the former Mubi local government in 1996 with their respective headquarters as follows: Mubi town for Mubi-North, Gella for Mubi-South and Maiha for Maiha local government. The local governments have a total of thirty one (31) council wards. Out of this, Mubi-North has eleven (11) wards while Mubi-South and Maiha shared ten (10) wards each.

The area is dominated by agricultural activities because it enjoys fairly sufficient rainfall, adequate sunshine and very minimal cloud cover which favour healthy growth of crops. The major crops grown in all the local governments are maize, rice, guinea corn, sweet potato, ground nut, beans and cocoyam whereas activities such as livestock production, apiculture, hunting and blacksmithing are also observed by few people. The seasons of rainy and dry periods prevailed in the local governments; a normal rainy season period extends from April to October with peaks in August/September each year, while the dry season is from November to March each year.

Sources and Instrument for Data Collection

For the purpose of this study, both primary and secondary data were used. The field survey used questionnaire as its main instrument to source for the primary data. However, informal but structured interview in areas of general contribution of fish farming to income generation, job creation and the general impact on poverty reduction was conducted to support information gathered through the questionnaire. The secondary data were sourced through intensive review of literature from journals, materials from internet, and seminar papers. This source provides background information and pertinent experience of other researchers in the area under consideration.

Sample Size and Sample Selection

Sample size of one hundred sixty two (162) respondents was determined using the simplified Yaro Yamane model. Specified as:

$$n = \frac{N}{1+N.e^2} \quad \text{----------1}$$

Where: n= required sample size, N= Total Population, e = error margin

Procedures for Sample Selection

Multi-stage purposive random sampling techniques were used to select the 162 respondents. specifically The stages involve the purposive selection of the Northern Zone of the Adamawa state, the purposive selection of the three (3) local government areas of the zone, purposive selection of six (6) wards from the three (3) local governments, and the random selection of nine (9) fish farmers from each of the eighteen (18) wards. (9 . 18 = 162)

Techniques for Data Analysis

Descriptive statistics, Foster-Greer-Thorbecke (FGT), Gini-coefficient and logit regression models were used to analyse the data collected for the study.

Specifically, descriptive statistical tools such as tables, frequency distribution and simple percentage were used to present and analyse the socio economic characteristics of the respondents.

The FGT model was used to examine the poverty indices. This model according to Awotide (2012) is increasingly used as a standard measure of poverty by World Bank, the regional banks and most of the United Nation (UN) Agencies. The model is specified as:

$$P_\alpha = (1/n) \sum_{J-i}^{q} \frac{(Z - Y_i)}{Z})^\alpha \text{ ----------1}$$

Where:

Z =the poverty line; q = number of individuals below the poverty line; n = number of individuals in the population, Y_i = per- capita income of the ith farmer; α = FGT index which takes values 0.1.2; $Z\text{-}Y_i$ = poverty gap of the ith farmer Z – Y/Z = poverty gap ration. This measure is flexible and determined by P_α which is sub-grouped into decomposable.

Gini-coefficient was employed to analyse income inequality among the fish farmers because Poverty and inequality are closely related and according to World Bank (2000), income inequality is a manifestation as well as a strong cause of poverty. The Gini-coefficient was specified as:

$$G = \frac{N+1}{N-1} - \frac{2\sum_{j=1}^{n} P_i X_i}{N(N-1)\mu} \text{----------2}$$

Where, μ = Mean income of the population

Pi = income rank of P individual i, with income Xi such that the richest

Person receives a rank of 1 and the poorest a rank of N. This effectively gives higher weight to poorer people in the income distribution, which allows the Gini to meet the transfer principles.

The logit regression model was used to test the relationship between fish farming and poverty reduction in the northern region of Adamawa state. According to Awotide (2012), the model holds that the dichotomous variables which represent whether or not a household is poor were regressed on a set of exogenous explanatory variables which econometrically specified as:

$$P_i(Z) = \frac{e^{\beta o + \beta k Xki}}{1 + e^{\beta o + \beta k Xki}} \text{----------3}$$

Where:

P_i = the probability that a farmer will fall below the poverty line

Z = Measure the poverty status (with code 1 if poor and 0 if non-poor)

e = the base of natural logarithms which is equal 2.71828

X_{ki} = the ith explanatory variables (set of household socio-economic Characteristics)

B_o= the intercept of Z

β_k = the regression coefficients (the parameter to be estimated)

The parameters β_o and β_{ki} in this study were estimated by the maximum likelihood (ML) method. This method was proffered over the weighted least squares approach because the method was designed to maximise the likelihood of reproducing the data given the parameter estimates (Chao-ying *et al,* 2002).

Thus, taking the natural log of equation 3.1 above and simplifying the log likelihood the logit model become

$$Z = \ln\frac{P_i}{1-P_i} = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 ..... \beta_k X_k \text{----------4}$$

Including the disturbance term (μ_i) and taking the sum, the model becomes:

$$LnZ_i = \beta_0 + \sum_{j=i}^{k} \beta_k X_{ki} + \mu_i \text{ ----------5}$$

Based on the specified model in equation 8 above, the model for this study was taken as a function of the socio-economic characteristics which was specified as:

$$PSH = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + U_1 \text{ ----------6}$$

Where:

β_0= the logistic regression constant (intercept of the model)

β_1—β_9 = the regression coefficients (parameters of the independent Variables)

μ_1= the random disturbance term

X_1 to X_9 = the variables of the model detail as:

X_1 = Annual income from fish farming

X_2 = Educational qualification of the respondent (1 if respondent

attends at least a secondary school, 0 if otherwise)
X_3 = Family access to clothing (1 if new cloths are purchase at least one in a year, 0 if otherwise)
X_4= Family access to education (1 if a child has access to formal education, 0 if otherwise)
X_5 = Family access to medical health care (1 if household has access to maternity, general and specialist hospitals, 0 if otherwise)
X_6= Family Size
X_7= House type (1 if zinc roof with cemented wall and floor, 0 if otherwise
X_8 = Number of meals taken per day (1 if three times a day, 0 if otherwise)
X_9= Number of dependents (1 if less than two, 0 if otherwise)

Decision Rule

The criterion for acceptance or rejection of result was based on the LR-Statistics. If LR-Statistic is significant, the null hypothesis be rejected or otherwise accepted. Meaning that there is a strong correlation between the dependent variable (PSH) and the independent variables(X_1 to X_9).

RESULTS AND DISCUSSIONS

Socio-economic characteristics of the sampled fish farmers in the study area

Table 1 below examines gender, age, marital status, family size, level of education, number of dependents and years of farming experience. The result shows that Males constituted the majority with 139 representing 90.9% as compared to the female counterpart of 14 which represents only 9.1%. This suggests that fish farming is dominated by males in the northern region of Adamawa State.

Table 1 : Analysis of Socio- Economic characteristics of the Sampled Fish Farmers in the Study Area

Socio-economic characteristics	Frequency	Percentage
Sex		
Male	139	90.9
Female	14	9.1
Age		
≤ 20	-	-
21- 35	23	15
36- 50	88	57.5
51- 60	31	20.3
>60	11	7.2
Marital Status		
Single	3	2
Married	136	88.9
Divorce	8	5.2
Widow/Widower	6	3.9
Family Size (Person)		
≤ 2	26	17
3 – 5	103	67.3
6 – 8	14	9.2
9 – 11	8	5.2
>11	2	1.3
Level of Education		
No formal education	2	1.3
Primary	14	9.2
Secondary	42	27.4
Tertiary	84	54.9
Post graduate	11	7.2
Years of Farming experience		
≤ 2	46	30.1
3-5	101	66
6-9	5	3.3
≥10	1	0.6
N0 of dependents		
None	19	12.4
1-2	100	65.4
3-4	24	15.7
>4	10	6.5

Source**:** Field Survey, 2014

The findings above, agreed with Agbebi (2011) who also found that male dominates fish farming

because of the rigorous activities that are involved in it. It also indicates that the fish farmers whose age fell between 36-50 years constituted the majority of 88 (57.5%). But on the whole, 142 (92.8% of the respondents fell into the economically active group of 21-60 years. This is in agreement with Akwu and Acheneje (2011) who found that most of fish farmers are in their economic active years. The table further revealed that majority 136 representing 88.9% of the sampled fish farmers in the study area were married with an average (mean) family size of 3 persons. While 8 (5.2%) were divorcee; 6 (3.9%) were widows/widowers and 3 (2%) were single. This result is in line with Olawumi *et al* (2010) who found that most of fish farmers are married. With regards to level of educational, the result showed that majority of the respondents 84 representing 54.9% had tertiary education; 42 (27.4%) had Secondary education; 14 (9.2%) had Primary education; 11 (7.2%) had Postgraduate education while 2 (1.3%) had no formal education. This implies that the fish farmers in the study area are literate since only 2 (1.3%) of them had no formal education. The result agrees with Olawumi *et al* (2010); Akwu and Acheneje (2011) who observed that the level of education attended by a farmer to a large extent determines the strategies he/she may use to adopt new innovation without difficulties that could increase his/her profit. It was also discovered that 101 (66%) of the respondents had been involved in fish farming between 3-5years; 46 (30.1%); 5 (3.3%) and 1 (0.6%) had been in fish farming enterprises for 2 or less years, 6-9years and for 10 or more years respectively. This shows that the fish farmers were not too old in the enterprise. And level of experience determines the level of knowledge and management practice. Implying the older they get in the enterprises, the more they get to know and understand the management practice of fish farming. This result also agrees with Kudi *et al* (2008) who reported that farming experience is a major element in understanding and knowing the practice of farming. Furthermore, the study shows that 100 (65.4%) of the respondents had between 1-2 dependents; 24 (15.7%) between 3-4 while 19 (12.4%) and 10 (6.5%) had none, and more than four (4) dependents respectively. This means that majority of the respondents had less burden on their income.

Estimation of poverty status of the respondents

Foster-Greer-Thorbecke (FGT) model was used to estimate the poverty status of the respondents' before and when they joined fish farming. 1/3 average annual mean income per year and 2/3 average annual mean income per year poverty lines was used to classify the respondents in to core-poor, moderate poor.

Emerging from these groups separately are lines for either core-poor, moderate – poor and non- poor

Thus, applying the above criteria and the FGT index, the dimensions of poverty P_o, P_1, P_2 and the Gini-coefficient were estimated and presented in Table 2 below

Table 2: Distribution of Sample respondents' by their poverty indices before and after joining fish farming

Index	Before Joining fish farming	After joining fish farming
1**). Total Average Annual Income**	**N18,300.000**	**N46,100.000**
Mean Average Annual Income	N119,607.84	N301,307.19
1/3 Mean Annual Income	N39,869.28	N100,435.73
2/3 Mean Annual Income	N79,738.56	N200,871.46
2). Head Count Index (P_0)		
Core-Poor	0.296 (29.6%)	0.064 (6.3%)
Moderate- Poor	0.274 (27.4%)	0.168 (16.5%)
Non-Poor	0.43 (43%)	0.772 (77.2%)
3). Poverty Gap (P_1)	**0.38**	**0.19**
4). Severity of Poverty (P_2)	**0.144**	**0.036**
5**). Gini – Coefficient**	**0.513**	**0.121**

Source: Field Survey: 2014

Table 2 above shows that before joining fish farming enterprises, the mean average annual income of the respondents' was N119, 607.84 but when they joined fish farming, the mean average annual income increase to N301, 307.19. Furthermore, the table shows an upper poverty line of N79, 738.56. This means that any respondents' with average annual income greater or equal to N79,738.56 before he/she joined fish farming business was considered to be non-poor (rich). However, any respondent with average annual income below N79, 738.56 but greater or equal to N39, 869.28 before joining fish farming was considered moderately poor. The core-poverty line of N39, 869.28 implies that any respondent with average annual income below N39, 869.28 before he/she joined fish farming was considered core-poor.

Meanwhile, when they joined fish farming enterprises, table 4.17 further shows that both the upper and the lower poverty line increased to N200, 871.46 and N100, 435.73 respectively. This suggests that any respondent with average annual income greater or equal to N200,871.46 was considered to be non-poor (rich) and any respondent with average annual income below N200,871.46 but greater or equal to N100,435.73 was

considered moderately poor. However, respondents with average annual income below N100, 435.73 were considered core-poor,

Thus, in line with the result above, the P_0, P_1 and P_2 using the FGT model was estimated and the result revealed that P_0 which explain the poverty head count was 0.296 (29.6%); 0.274 (27.4%) and 0.43 (43%) for the period before fish farming. These figures are accredited to the status of those who were core-poor, moderately poor and non-poor respectively. However, when they joined fish farming enterprises, the result further indicates that P_0 was 0.063 (6.3%); 0.165 (16.5%) and 0.772 (77.2%). This implies that fish farming activity, reduces poverty by 34.2%. This was revealed by the decrease in the percentage of core-poor; moderately poor to non-poor before and after joining fish farming activities respectively.

The poverty gap (P_1) on the other hand, shows that before joining fish farming, the poverty depth was 0.38 (38%). But when they joined fish farming, the depth dropped to 0.19 (19%). This revealed that fish farming has impacted positively on the quality of life of the respondents' because before joining fish farming, poor farmer(s) required 38% of poverty line to get out of poverty. However, when they joined fish farming, the percentage required to get out of poverty dropped to just 19%.The estimate of the sensitivity of income re-distribution among the poor and non-poor was revealed by the Severity of poverty (P_2).The result shows that before joining fish farming, P_2 was 0.144 but when they joined fish farming, it was reduced to 0.036. This conveys that the severity of poverty among the poor farmers was reduced by 0.108 (10.8%).

The Gini-coefficient revealed that income inequality has also dropped to 0.121 (12.1%) after joining fish farming from 0.513 (51.3%) before joining fish farming.

Estimation of the Probability of Poverty

Logistic regression model was fitted to the data to test the relationship between fish farming and poverty reduction in the northern region of Adamawa State. The logit estimates is shown in table 3 below:

Table 3: Logit regression model estimates of the poverty determinants

Variable	Coefficient	Std. Error	Z – statistic	Probability
ANI	-0.002319	0.000747	-3.106695	0.0019*
EDUQREP	-10.11069	3.411331	-2.963855	0.0030*
FACCLTH	-0.757162	6.861783	-0.110345	0.0121*
FANAEDU	-2.511467	4.212276	-0.596226	0.0510**
FAMHC	-6.613356	3.488806	-1.895593	0.4580
FAMSZE	0.291641	0.637778	0.457277	0.0075*
HOUSTYP	-0.772027	2.568129	-0.300618	0.0237*
NMTPDAY	-2.548439	2.435638	-1.046313	0.0154*
NUMDEP	7.909622	5.193237	1.523062	0.0077**
C	129.4564	40.47204	3.198661	0.0014*

McFadden R – squared	=	0.8987
Akaike info criterion	==	0.232199
Schwarz criterion	=	0.431138
Hannan – Quinn criterion	=	0.313015
LR statistic	=	135.7125
Prob (LR statistic)	=	0.00000
Log likelihood	=	-7.647110

Source: Field Survey, 2014. Significant level - * 1%, ** 5%, ***10%

From the above results, the Mc Fadden R – squared is 0.8987 which suggests that the explanatory variables of the model accounts for 89.9% variation in the dependent variable. This implies that the variables which seem from the activities of fish farming in the northern region of Adamawa State influence the poverty level of the respondents by 89.9%. The log likelihood of -7.647110 means that inverse relationship is expected to hold between the activities of fish farming and the poverty reduction of the participants is fulfilled.

The null hypothesis (H_0) that fish farming has not reduced the probability of being poor among fish farmers in northern region of Adamawa State was tested using the LR statistics. The LR statistics which measures the joint effect of the explanatory variables on the dependent variable has a value of 135.7125 and it is statistically significant at 1% level of significance which suggest that the explanatory variables of the model reduces the probability of being poor. Therefore, the null hypothesis was rejected and the alternative hypothesis was accepted. This implies that fish farming has reduced the probability of being poor among fish farmers in the northern region of Adamawa State.

Summary of the Findings

Based on the analysis, it was found that majority of the sampled fish farmers were male and within their economically active years of (21 – 60) years. The table also revealed that most of the farmers are married with an

average family size of three (3) persons. It was further revealed that the respondents' were educated and were in the farming business for less than or equal to five (5) years.

The study also discovered that the poverty status of the respondents' specifically, the incidence dropped from 29.6% to 6.3% for core-poor, 27.4% to 16.5% moderate-poor, but raises the non-poor from 43% to 77.2%. Also the poverty gap declined from 0.38 to 0.19. While the severity of poverty and income inequality both indicates a decline of 0.062 from 0.189 and 0.121 from 0.513 respectively.

The test of hypothesis conveys that fish farming has reduces the probability of being poor among the fish farmers in Adamawa state.

CONLUSION/RECOMMENDATIONS

The result of the analysis and the test of hypothesis, on the relationship between fish farming and poverty reduction in Adamawa State confirmed that fish farming have significantly reduced poverty among fish farmer in Adamawa state. This was revealed by the improvement in the respondents' poverty status, socio-economic characteristics and test of hypothesis. Therefore, based on these findings, it can further be conclude that one way of reducing the poverty level of the poor agriculturally oriented people in Adamawa State, is to put in more effort in the promotion/development of the fish farming sub-sector.

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