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Poverty and Income Inequality among Fish Farming Households in Oyo State, Nigeria

Bola Amoke Awotide
Department of Agricultural Economoics, University of Ibadan, Ibadan, Nigeria

Abstract: This study presented empirical findings on the poverty status and its determinants and income inequality among the fish farming households in five selected LGAs of Oyo state, Nigeria. The study utilized primary data collected in 2009 through multistage random sampling techniques. Data were collected using well structured questionnaire administered on a total sample of 70 fish farmers, out of which only 65 were useful for the analysis. The Foster, Greer and Thorbecke (FGT) class of poverty measures, Logistic Regression Model and Gini-coefficient were used to analyse the data. The results showed that 43% of the respondents were below the relative poverty line of ₦29041.33 annum^{-1}. The poverty depth and severity was 17 and 8%, respectively. Female headed households were poorer than the male headed households. The results of the Logistic Model estimates revealed that gender of household head (-3.013), household size (0.880), total cost of production (2.898) and total output (-0.002) were the significant determinants of poverty. Income inequality was higher among the male (0.3615) than the female headed households (0.1610). The cost of inputs should be reduced and policies that could lead to an increase in output should be put in place. The existing family planning programs should be intensified.

Key words: Poverty, determinants, income inequality, fish farmers, households, Nigeria

INTRODUCTION

Agriculture is the mainstay of Nigerian economy, providing the food need of the teeming population and employing close to 75% of the people who are mostly rural dwellers (NBS, 2005). Agriculture is subdivided into: food, livestock and fishery subsector. The fisheries sector accounts for about 25% of national GDP, 40% of the animal protein intake and a substantial proportion of employment, especially in the rural areas; the sector is a principal source of livelihood for >3 million people in Nigeria (Ekunwe and Emokaro, 2009). Recently, the role of the fishery sector in meeting the protein need of man and animals for the building and repair of tissues has been widely recognized. Increasing the total dietary intake of animals protein by man has been a great concern to both the government and international agencies, especially in developing countries where a wide gap exist between food production and human population. Bater contends that no country can safely forgo essential requirements without endangering its economic development as a whole. If basic food requirements are not met, the health and working capacity of the population are impaired. Fish happen to be the cheapest source of protein available to man.

Fish production in Nigeria can be divided into capture fishery which involves fishing in oceans, seas and streams and fish farming which is the rearing of fish from juvenile to adult stages in man-made ponds, cages and reservoirs under controlled environmental condition (Tobor, 1985). The dwindling in the population size of fresh water fish species and the resultant low catch per unit efforts as a result of over fishing had been reported since 1998 by Olaniran and Akinyemi. In addition, the decline in the population size of fishes has also been attributed to exploitation, habitat loss due to sand filling and uncontrolled year trawling for fishes (Tobor, 1985). Nigeria being a coastal country has about 1280 km^2 marine areas and about 124878 km^2 of inland waterways. In spite of this potential, domestic fish production is grossly inadequate to meet even domestic demand, therefore local fish supply has been supplemented with heavy importation of frozen fish at a colossal foreign exchange. Food and Agricultural Organization (FAO, 2007) reveal that Nigeria imports about 560,000 ton of fish estimated at about US$400 million annually while annual domestic fish supply in Nigeria stands at about 400,000 ton. The implication of these is that the national demand for fish can no longer be met through the natural means, hence fish farming holds the promise of becoming a viable alternative to capture fishes with increasing depletion of fish from natural sources and overall demand for fish is increasing as population demand diets which are richer in animal protein.

Fish farming has thus become an important venture in the quest for food security and eradication of malnutrition particularly among the infants. However, one notable constraint to the sustainable development of this

vital sector is the issue of poverty which is particularly endemic in the rural areas and prevalent among the resource poor farmers. It has been widely reported that for a sustainable increase in food production, poverty and its determinants among the farming households needs to be addressed (Okunmadewa *et al*., 2010). However, literature search reveals that there have been few studies investigating the determinants of poverty in Nigeria (Ogwumike and Ekpeyong, 1995; Omonona, 2001; Olaniyan, 2002; Awoyemi and Adeoti, 2004; Oyekale *et al*., 2006; Awotide *et al*., 2011). Observably, these studies did not examine poverty and its determinants among the fish farming households in Nigeria, creating a gap in the literature. In addition despite the important roles played by even distribution of income in poverty reduction, very few studies (Oyekale *et al*., 2006) exist on income inequality in Nigeria and none in relation to the fish farmers to the best knowledge of the researcher. One important fact that have been overlooked by the policy maker is that no any meaningful poverty reduction can be achieved without first understanding the degree of income inequality and the determinants of poverty. Against this backdrop, this study was conducted to assess poverty and its determinants and the level of income inequality among the fish farming households.

Literature review

Poverty and income inequality in Nigeria: World Bank (1990) defines poverty as inability to attain a minimum standard of living. Poverty has been measured in various ways. These include the use of monetary approach, Human Development Index (HDI), Head Count Ratio and Physical Quality of Life Index (PQLI). The conventional approach to poverty analysis has classified the population into 2 dichotomous groups of poor and non-poor, defined in relation to some chosen poverty line based on household expenditure or income (Foster *et al*., 1984). Poverty and income inequality are closely related and it has been argued that income inequality is a manifestation as well as a strong cause of poverty (UNU/WIDER, 2000). Poverty is captured over a censored distribution while income inequality and welfare are defined over the whole distribution (Litchfield, 1999). The issue of poverty and income inequality in many developing countries is a very crucial one going by its intensity, incidence and severity. The situation in Nigeria presents a paradox because despite the fact that the nation is rich in natural resources, the people are poor. World Bank (1996) referred to this situation as poverty in the midst of plenty. In 1992 for instance, 34.7 million Nigerians (representing one-third of the population) were poor while 13.9 million people were extremely poor (World Bank, 1996). The incidence of poverty grew so worse in the 1990's such that in 1996, about 65.6% of the population were poor while the rural areas account for 69.3% (FOS, 1999). However between 1996 and 2004, the total poor declined by 17.1-54.4%. It is also evident that despite the decline in the proportion of the population in poverty between 1996 and 2004, in absolute terms the population in poverty rose from 67-68.7 million (Aigbokan, 2008).

One notable characteristics of Nigerian poverty situation is that the incidence of poverty is usually higher among the rural dwellers, hence poverty in Nigeria has been described as a rural phenomenon (World Bank, 1995; Fields, 2000). For instance, poverty incidence in the rural area was 46.0, 69.3 and 63.3% in 1992, 1996 and 2004, respectively. While the corresponding figures for the urban area was 37.5, 58.2 and 43.2% for the same periods (NBS, 2005). Furthermore, the Human Development Index (HDI) of 0.448 ranks Nigeria 159th among 177 nations in 2006, portraying the country as one of the poorest in the world). The existence of a high income inequality for the overall population in Nigeria has been reported by several researchers (Aigbohkan, 2008; Awoyemi and Adeoti, 2004; Oyekale *et al*., 2006). Also, documented is the worsening income inequality situation in the rural areas (Canagarajah *et al*., 1996). The Gini-coefficient was 0.4882 for the national, 0.554 and 0.5187 for urban and rural areas respectively (NBS, 2005). Furthermore while population is growing at the rate of 3.5% annum^{-1}, the food growth rate is still as low as 2.5% annum^{-1}. Thus generating a wide gap in demand and supply of basic food and threatening the food security of the nation. Consequently, increase in food production, reduction of poverty and income inequality is the most difficult challenge facing Nigeria and the greatest obstacle to the pursuit of sustainable economic growth (NBS, 2005).

Presently, both national and international community now have an unprecedented focus on poverty reduction embodied in the Poverty Reduction Strategic Paper (PRSP) and their commitment to achieving the Millennium Development Goals (MDGs) to halve the proportion of people living in extreme poverty by 2015. This has necessitated the development of several strategies, policies and programmes aim at poverty reduction in Nigeria. Some of these measures and programmes include the National Poverty Eradication Programme (NAPEP), the National Economic Empowerment and Development Strategy (NEEDS) (NBS, 2005). Meanwhile, no meaningful poverty reduction or eradication can be achieved without a firsthand knowledge on the causes of poverty and inequality in income.

Correlates of poverty: Poverty is a problem affecting every nation of the world and it is multifaceted, hence there is no single universally accepted definition of poverty. Glewwe and Gaag (1988), World Bank (1995), Ravallion and Chen (1997), Salman and Sayyid (1999), Okunmadewa (1999), Chen and Ravallion (2004) and Coudouel *et al.* (2001) have provided different definitions, measurements and analyses of poverty.

Rowntree (1902) in his classical study on poverty at York, distinguishes 2 types of poverty, primary poverty and secondary poverty which later came to be known as absolute poverty and relative poverty, respectively by Townsend (1979). He attributes 6 causes for primary poverty; death of chief wage earner, incapacity of chief wage-earner through accident, illness or old age, chief wage-earner out of work, chronic irregularity of work, largeness of family and lowness of wage (Rowntree, 1902). He assigns 2 causes for secondary poverty; habit drink, betting and gambling and careless housekeeping or improvident expenditure (Rowntree, 1902). In his famous notion of culture of poverty, Lewis identifies a few cultural traits that are related to poverty: unemployment and underemployment, low wages, unskilled labour, child labour, absence of savings, chronic shortage of cash, absence of food reserve, the pawning of personal goods and borrowing from local money lenders at usurious rates of interest, etc. Although, this study provided a good but vague insight into the issue of poverty determinants from a sociological perspective, 2 important causes of poverty can be discerned from the study, unemployment and low income.

Other major determinants of poverty in the Western literature include gender (Millar and Glendinning, 1989; Graham, 1987; Dex, 1985; Lewis and Piachaud, 1992), race and ethnicity (Moore and Wallace, 1975; Cohen and Tarpey, 1986; Brown, 1984; Amin and Oppenheim, 1992), old age (Walker, 1986; Baldwin and Cooke, 1984; Falkingham and Victor, 1991) and disability (Oliver, 1991; Dalley, 1991; Groves 1988; Topliss, 1979). Using household data from 5 successive national surveys, Wodon analyzed the micro-determinants of poverty in Bangladesh from 1983-1996 and finds education, household size, land ownership, occupation and geographic location affecting poverty. Also, the BBS (2002) utilized a survey on household income and expenditure in 2002 to examine those factors that are related to poverty in Bangladesh. Several factors such as; household size, structure of dwelling unit, land ownership, age, gender, marital status, religion, education, occupation and geographic location were discovered to be related to poverty. In a study conducted by Yusuf *et al.* (2008) to asses poverty among urban farmers in Ibadan metropolis, Nigeria, they discovered that the type of crop farming activity engaged in household size, age of urban farmers, educational status, years of experience in farming and livestock farming was the major determinants of poverty among the urban farmers. The study on the determinant of poverty among farming households in Kogi State of Nigeria by Omonona and Okunmadewa (2009) revealed that poverty is higher among households that have male heads and polygamous have farming as the only occupation, have no formal education and have no access to extension services and improved farming inputs. Poverty also rises with the increase in household size and dependency ratio. On the other hand, poverty was discovered to be inversely related to the extent of output commercialization, farm size and credit.

In a more recent study on poverty and income inequality among rural households in Nigeria by Okunmadewa *et al.* (2010) discovered that the key socio-economic determinants of rural poverty in Nigeria include human capital variables, households characteristics, economic activity of the household head and the spatial locations of the households. Despite the importance of poverty reduction among the fish farming households in Nigeria, little is known about their poverty profile and the determinants of poverty. Therefore, this study was conducted to assess poverty and its determinants among the fish farming households in Oyo state, Nigeria. If their poverty situation is known and also what causes poverty among them then appropriate policy can be put in place to either reduced or completely eradicate poverty, this can engendered an increase in fish production to the level of self sufficiency and for export.

MATERIALS AND METHODS

Analytical framework and estimation techniques

Determination of the poverty line: Poverty line is generally defined as the per-capita monetary requirements an individual needs to afford the purchase of a basic bundle of goods and services. It is a minimum acceptable standard of the welfare indicator (Ravallion and Chen, 1997) and it is usually adopted to classify the population into poor or non-poor. Thus, a farming household may be categorized as poor if its consumption expenditure falls below the poverty line and non-poor if it is above the poverty line. The poverty line according to Ravallion and Huppi (1991) and Kanbur and Lustig (1999) separate the poor from the non-poor. In Nigeria, official poverty line does not exist. Consequently, majority of poverty related studies adopted the relative poverty lines which are proportions of the average Per Capita Income (PCI)

(Canagarajah *et al*., 1996; FOS, 1999; Okunmadewa *et al*., 2010). This study also utilized the relative poverty line approach, defined as the two-thirds of the mean value of the per capita consumption expenditure among the rice farming households in the study area. Thus, households with per capita consumption expenditure below the poverty line are classified as poor and non-poor otherwise.

Measurement of poverty indices: There are criteria for a desirable poverty measure that are widely accepted by development economist; the anonymity, population independence, monotonicity and distributional sensitivity principles. The anonymity principle simply means that the measure of poverty should not depend on who has the higher consumption expenditure. The population independence principle implies that the poverty measure should not depend on whether the expenditure was measure in dollar or naira. The monotonicity principle means that if there is an addition to the expenditure of someone below the poverty line, all other expenditure held constant and poverty can be no higher than it was. The distributional sensitivity principle states that other things equal the transfer of expenditure from a poor person to a non-poor person will make the population poorer. The standard Foster-Greer-Thorbecke often refers to as the class of poverty measures adopted to generate the poverty profile of the respondents satisfies all the four criteria. The FGT takes the form:

$$P_\alpha = \frac{1}{n}\sum_{i=1}^{n} q\left[\frac{Z - Y_{pi}}{Z}\right]\alpha \quad (1)$$

Where:

Z = The poverty line
q = Number of individual below the poverty line
n = Number of individuals in the reference population
Y_{pi} = Per capita consumption expenditure of the ith household
α = FGT index which takes values 0, 1, 2
$Z - Y_i$ = Poverty gap of the ith household
$Z - Y_i/Z$ = Poverty gap ratio

This class of poverty measure is flexible in 2 ways; α is a policy parameter that can be varied to approximately reflect poverty aversion and the P_α class of poverty indices is sub-group decomposable. When, α = 0 in Eq. 1:

$$P_0 = 1/n\,(q) = q/n = H \quad (2)$$

The head count is the number of people in the population who are poor while the Headcount ratio (H) is the fraction of the population who are poor. The poverty gap measures the total amount of money necessary to raise everyone who is below the poverty line up to that line. When α = 1, the poverty measure becomes the Poverty-Gap index (PG):

$$P_{\alpha-1} = PG = \frac{1}{n}\sum_{i=1}^{n} q_i\left[\frac{Z - Y_{pi}}{Z}\right] = HI \quad (3)$$

Where:

$$I = \frac{1}{q}\sum_{i=1}^{n} q\left[\frac{Z - Y_{pi}}{Z}\right] = HI \quad (4)$$

is the expenditure gap ratio. I is the mean of the poverty gaps expressed as a portion of the poverty line. This measure is insensitive to income distribution among the poor.

When, α = 2, the Squared Poverty Gap index (SPG) is generated given by:

$$P_{\alpha-2} = SPG = \frac{1}{n}\sum_{i=1}^{n} q_i\left[\frac{Z - Y_{pi}}{Z}\right]^2 \quad (5)$$

$P_{\alpha-2}$ measure is increasingly used as a standard poverty measure by the World Bank, the regional development banks, most United Nation agencies and it is used in most empirical research on poverty because of its sensitivity to the depth and severity of poverty. The incidence is measured by the number of people in the total population living below the poverty line while the poverty intensity is reflected in the extent to which the incomes of the poor fall below the poverty line. Another advantage of the P_α measure is that it is decomposable by population subgroups. That is:

$$P_\alpha = \sum_{j=1}^{m} K_j P_{\alpha j} \quad (6)$$

where, j = 1, 2, 3, ……m, k_j is the population share of each group is the poverty measure of group j. The contribution of each group C_j to overall poverty can be calculated as follows:

$$C_j = \frac{K_j P_{\alpha j}}{P_\alpha} \quad (7)$$

This property of the index implies that when any group becomes poor, aggregate poverty will increase. Hence, poverty can be disaggregated by subgroup such as gender and region.

Determinants of poverty among the fish farming households: This study adopted the logistic regression to

assess the factors that determines the farmers' poverty status. The respondents were classified into poor and non-poor using the poverty line. The relative poverty line of 2/3 of mean per capita income was used. Farmers that have per capita income below the poverty line were classified as poor and non-poor otherwise. The response variable was binary, taking values of one if the farmer is poor and zero otherwise. However, the independent variables were both continuous and discrete.

Although, several methods have been adopted in the literature to analyze the data involving binary outcomes, for this particular study; Logit Model was selected over discriminant and linear probability models. The justification for using logit is its simplicity of calculation and that its probability lies between 0 and 1. Moreover, its probability approaches zero at a slower rate as the value of explanatory variable gets smaller and smaller and the probability approaches 1 at a slower and slower rate as the value of the explanatory variable gets larger and larger (Gujarati, 1988). The probability that a farmer will fall below the poverty line was postulated as a function of some socioeconomic, demographic characteristic and institutional factors. Therefore, the Cumulative Logistic Probability Model is econometrically specified as follows:

$$P_i = F(Z_i) = F(\gamma + \sum \lambda_i X_i) = \frac{1}{1+e^{-Z_i}} \quad (8)$$

Where:

P_i = The probability that a farmers will fall below the poverty line or not given X_i

e = The base of natural logarithms which is approximately equal to 2.718

X_i = The ith explanatory variables and are parameters to be estimated

Hosmer and Lemeshow (1989) pointed out that the Logit Model could be written in terms of the odds and log of odds which enables one to understand the interpretation of the coefficients. The odds ratio implies the ratio of the Probability (P_i) that a farmer is poor to the probability (1 - P_i) that the farmer is not poor:

$$(1-P_i) = \frac{1}{1+e^{Z_i}} \quad (9)$$

Therefore:

$$\frac{P_i}{1-P_i} = \frac{1+e^{Z_i}}{1+e^{-Z_i}} = e^{Z_i} \quad (10)$$

The natural log of Eq. 10 will give:

$$Z_i = \ln\left(\frac{P_i}{1-P}\right) = \gamma + \lambda_1 X_1 + \lambda_2 X_2 + ... + \lambda_m X_m \quad (11)$$

Table 1: Description of the variables used in the Logit Model

Variables	Types	Description of variables
Dependent		
Y_1	Dummy	1 if farmer is poor, 0 otherwise
Explanatory		
Age	Continuous	Age of household head in years
Gender	Dummy	1 if household is male, 0 otherwise
Household size	Continuous	Total no.of people in the household
Member of any organization	Dummy	1 if farmer belong to any organization, 0 otherwise
Years of establishment	Dummy	No. of years of establishment
Total production cost	Continuous	Total cost of production in Naira
Total output	Continuous	Total quantity produced in kg
Education	Continuous	No. of years of formal education

If the disturbance term (U_i) is taken into account, the Logit Model becomes:

$$Z_i = \gamma + \sum_{i=1}^{m} \lambda_i X_i + U_i \quad (12)$$

Equation 10 was estimated by maximum likelihood method. This procedure does not require assumptions of normality or homoskedasticity of errors in predictor variables. This analysis was carried using STATA Version 11.0. The definition of the variables included in the logistic regression is shown in Table 1.

Measurement of income inequality: Poverty and income inequality are closely related and it has been argued that income inequality is a manifestation as well as a strong cause of poverty (UNU/WIDER, 2000). Hence, this study also assessed the level of income inequality among the fish farming households. Income inequality can be measure by using the Gini-coefficient. Following, Morduch and Sicular (2002) where income are ordered so that $y_1 \leq y_2 \leq y_3 \leq y_4 \leq y_n$. The Gini-coefficient is computed as:

$$I_{Gini}(Y) = \frac{2}{n^2 \mu} \sum_{i=1}^{n} (i - \frac{n+1}{2}) y_i \quad (13)$$

Where:

n = Number of observation

u = Mean of distribution

Y_i = Income of the ith household

Gross margin analysis: The gross margin analysis is a measure of profitability of an enterprise and it is usually calculated using the following equation:

$$\text{Gross Margin (GM)} = TR - TVC \quad (14)$$

TR = Total Revenue

TC = Total Variable Cost

Data and descriptive statistics: This study was conducted in Oyo state, Nigeria. Oyo state is one of the

states in Southwestern Nigeria. The capital of Oyo state is Ibadan. Ibadan is the largest city in West Africa. Using multistage sampling technique, a total of 70 fish farmers selected from 5 Local Government Areas (LGAs) and 2 villages each from each of the LGAs. Information pertaining to production activities for 2009 was obtained through well structured questionnaire administered on the fish farmers in the study area. However after thorough data cleaning and management, only 65 representing 93% of the questionnaires were useful for the analysis. The data were analyzed using descriptive statistics such as: mean frequency counts and percentages, FGT poverty measures and logistic regression estimation technique. The result of the descriptive statistics is shown in Table 2.

Majority (85%) of the respondents were males while only 15% were females. A larger percentage of the respondents (55%) had 6-10 members in the household. The mean household size was 7.

Majority (62%) of the respondents were within the age group of 41-60 years. While 31% of the respondent were ≤40 years old, only 8% were >60 years. This implies that the respondents were still young, active and still within the productive years.

Years of establishment of the fish farm was used as proxy for the level of experience, it is believed that the longer the farmer has been practicing fish farming, the higher the experience. The higher the numbers of years of experience, the more efficient in the use of productive resources the farmer could be. Efficient input utilization can generate increase in output and lead to an increase in income, thereby reducing the propensity of the farmers to fall into poverty. The result of the analysis showed that only 6% of the respondents had between 16-20 years of experience. About 26% of the respondents had between 11-15 years of experience and 31% had <5 years of experience. The average year of experience was 8 years. Hence, it could be concluded that the level of experience of majority of the fish farmers in the study area is still very low and this can have a negative implication on poverty unless the farmers undergo specific production enhancing training.

In terms of the number of years of formal education obtained by the household head, the result showed that more than half (51%) of the respondents had between 6-10 years of formal education. About 42% had ≤5 years of formal education while only 15% had <10 years. The average year of formal education was 7 years. Since education is major determinant of welfare, this level of formal education can have a poverty reducing effect on the respondents. Social capital has been reported to positively influence household's welfare. Membership of any association was used as proxy for social capital. Majority (65%) of the respondents belong to at least one organization such as cooperative society. This is expected to have a poverty reducing effect.

Table 2: Distribution of respondents according to some socioeconomic characteristics

Distribution	No. of respondents	Percentage
Gender		
Male	55	84.62
Female	10	15.38
Household size		
≤5	21	32.30
6-10	36	55.38
11-15	8	12.30
Age		
≤40	20	30.77
41-60	40	61.54
>60	5	7.69
Years of establishment		
≤5	20	30.77
6-10	24	36.92
11-15	17	26.15
16-20	4	6.15
Years of formal education		
≤5	27	41.54
6-10	33	50.77
>10	10	15.38
Membership of any organization		
Yes	42	64.62
No	23	35.38
Methods of land acquisition		
Purchase	30	46.15
Inherited	20	30.77
Lease	15	23.07
Type of ponds		
Earthen	55	80.62
Fish tank	5	7.70
Fish tank and earthen	5	7.70
Type of fish farming practised		
Fish fattening (production)	60	92.31
Breeding and fattening	5	7.69

Field survey (2009)

About 46% acquired their land through purchase at an average cost of ₦36,933 annum^{-1} while about 31% of the respondents inherited their land and about 23% acquire their own land through lease at an average cost ₦2,657 annum^{-1}. Land acquisition through purchase or lease is a disincentive to production and could actually aggravate the poverty situation of a fish farming household through its negative effect on household income.

The size of ponds in the study area was found to be a function of the methods of land acquisition, cost of pond construction and water availability. The largest size of pond was 0.85 ha while the smallest size was 0.023 ha. The average size of the ponds was 0.26 ha. The size of pond is also directly proportional to the cost of construction of the pond. In order words, the larger the pond sizes the higher the cost of construction. Therefore, majority (95%) of the farmers had ponds of small sizes.

Majority (81%) of the respondents used earthen ponds mostly constructed in areas where water is usually not a problem. In most cases they the earthen ponds were constructed near streams, rivers and springs. About 13% of the respondents used fish tank and 10% used both fish tank and earthen ponds. The fish tanks were in most cases used as supplementary ponds. Those that used fish tanks use wells as the main source of water.

Majority (92%) of the respondents practiced fish fattening (production) in monoculture system. This is because the process of fish breeding is more complex and requires the help of technical personnel but fish production is less tedious and requires less experience. About 7% of the respondents practiced both fish production and breeding, this implies that they started from breeding and reared the fish to marketable sizes. The most commonly cultured species include catfish (*Clarias gariepinus*, *Clarias lazera* and *Heterobrachus* sp.) and tilapia. Majority of the fish farmer focused on catfish as they can have a market value of 2-3 times that of tilapia. In addition, tilapia was not commonly cultured due to the fact that it is highly prolific and thus has to be semi-intensively cultured with a predator that can control the excess offspring produced. Majority (65%) of the respondents were members of cooperative society. This could serve as form of social capital and could enhance productivity.

RESULTS AND DISCUSSION

Quantity of major inputs used: The major production inputs utilized by the fish farmers and the average quantity used were assessed and the result is shown in Table 3. The major production inputs utilized as reported by the respondents included; fingerlings with an average stocking rate of 1818, inorganic fertilizer, lime and feed with an average quantity of 16, 32 and 907 kg, respectively.

Cost of production: The analysis of the variable cost of production is shown in Table 4. The result showed that the cost of labour represented about 57% of total variable cost of fish production and thus made the cost of labour the highest cost of production. The cost of fingerlings was high, representing about 34% of total variable cost of production. The average TR was ₦256950 annum^{-1} and the average GM was ₦161, 237 annum^{-1}.

Total revenue, total cost and output by gender: The analysis of TR, TC and output was disaggregated by gender and the result is shown in Table 5. The male headed households had a higher TR and GM than the female headed households. The major reason for this as can be deduced from Table 5 could be due to the fact that the female headed households had on the average a higher cost of production than the male headed households. Since labour represented the highest cost of production as shown in Table 4, the female headed households could be using more hired labour than the male headed households and this could have a depressing effect on the TR and the GM.

Table 3: Quantity of major production inputs

Variables	Average quantity
Stocking rate (No.)	1818.00
Fertilizer (kg)	16.00
Lime (kg)	32.00
Feed (kg)	907.38

Table 4: Cost of production

Variable input	Cost	Percentage of TVC
Fingerlings	15575.15	34.46
Fertilizer	323.00	0.71
Lime	181.69	0.40
Labour	25635.92	56.71
Diseases	884.31	1.96
Others	2603.39	5.76
Gross margin analysis		
Total Variable Cost (TVC)	45204.00	-
Total Fixed Cost (TFC)	50508.00	-
Total Cost (TC)	95713.00	-
Total Revenue (TR)	256950.00	-
Gross margin	161,237.00	-

Table 5: Total revenue, total cost and output by gender

Variables	Male	Female
Total Revenue (TR)	270000.00	185175.00
Total cost of production	92993.29	110671.40
Total output	677.62	561.00
Gross Margin (GM)	225535.00	135902.00

Table 6: Poverty profile of the respondents

Poverty indices	Total	Male	Female
Incidence	0.43	0.38	0.70
Depth	0.17	0.16	0.20
Severity	0.08	0.08	0.09

Field survey (2009)

Poverty profiles of the respondents: The result of the poverty measurement is shown in Table 6. The result showed that 43% of the respondents were below the poverty line.

The depth and severity of poverty among the respondents was 17 and 8%, respectively. However, the analysis revealed that poverty incidence, depth and severity were higher among the female headed households in the study area. While the incidence of poverty among the female headed households was 70% that of the male headed households was 38%. This implies that as much as 70% of the female headed households were poor while on 38% were poor among the male headed households. The depth and severity of poverty among the female headed households was 20 and 9%,

Table 7: Logit Model estimation of poverty determinants

Variables	Coefficient	SE	z-values	P>|Z|	Marginal effect
Age	0.0180	0.042	0.43	0.670	0.004
Household size	0.8800***	0.231	3.81	0.000	0.188***
Education	-0.3000	0.152	-0.20	0.842	-0.006
Member of any organization	-0.8710	0.829	-1.05	0.293	-0.192
Years of establishment	-0.0480	0.109	-0.44	0.662	0.010
Total production cost	2.8980**	1.299	2.23	0.026	-0.618**
Gender	-3.0130**	1.269	-2.37	0.018	-0.632**
Total output	-0.0020**	0.001	-2.04	0.042	-0.004**
Constant	26.4210*	14.105	1.87	0.061	-
Number of observations	65.0000	-	-	-	-
Log likelihood	-22.1330	-	-	-	-
LR Chi^2 (8)	43.9700	-	-	-	-
Prob. >Chi^2	0.0000	-	-	-	-
Pseudo R^2	0.4983	-	-	-	-

Field survey (2009). Significant level: ***1%,**5%

respectively while the corresponding figure for the male headed households was 16 and 8%, respectively. The incidence, depth and severity for the female headed households were higher than those of the entire population.

Determinants of poverty among the fish farming households: The logistic regression result of the determinants of poverty among the fish farmers is shown in Table 7. An additional insight was also provided by analysing the marginal effects which was calculated as the partial derivatives of the non-linear probability function, evaluated at each variable sample mean.

The log-likelihood of -22.133, the Pseudo R^2 of 0.4983 and the LR (Chi-square) of 43.97 (significant at 1% level) implies that the overall model is fitted and the explanatory variables used in the model were collectively able to explain the correlates of poverty among the rice farming households in Nigeria.

Poverty among the rice farmers was discovered to be determined by some socio-economic/demographic variables. Gender of the household head, household size, total cost of production and total output were found to be statistically significant.

Gender of household head was negative and significant ($p<0.05$) which implies that poverty is high among the female headed households. The coefficient of household size was positive and significant ($p<0.01$), this implies that as household size increases the probability of a fish farmer falling below the poverty line also increases. A large household size indicates that a farmer would have more mouth to feed and this will reduce the household income. The total cost of production also increases the probability of falling below the poverty line among the fish farming households in the study area. The increase in the cost of production is a disincentive to fish farming. High cost of production could drive some resource poor farmers out of business. The larger the total output, the lower the probability of a farmers falling below the poverty line. This is however expected due to the fact that the more a farmer produced the higher the income. An increase in income will decrease the propensity of a farmers falling below the poverty line. The result of the marginal effect showed that a 1% increase in the household size will increase the probability of being poor by 19%. In the same vein a 1% increase in the cost of production will increase the probability of being poor by as much as 62% while a 1% increase in total output will reduce the probability of being poor marginally by 0.4%.

Table 8: Income inequality among the fish farmers

Variables	Gini-coefficient
Gender	
Male	0.3600
Female	0.1600
Age group	
≤40	0.3600
40-60	0.4000
>60	0.3500
Total	0.3479

Field survey (2009)

Income inequality among the fish farmers: The issue of income inequality among the fish farming households was assessed due to the fact that the link between income inequality and poverty has been the focus of discussion of poverty. To this end, an attempt was made to decompose the Gini-coefficient by gender and by age group in order to be able to identify the contribution to overall income inequality. The result of the Gini-coefficient showed that income inequality was 35% in the population. In terms of gender, income inequality was higher among the male headed households (36%) than the female headed households (16%). The age group with the lowest income inequality index was >60 age group with a Gini index of 35%. The highest income inequality index was recorded for the households headed by individuals whose age was between 40 and 60. This showed that gender and age are important determinant factors in explaining income inequality among the fish farming households in the study area (Table 8).

CONCLUSION

This study assessed poverty and income inequality among the fish farming households in Oyo state, Nigeria using data collected in 2009 through multistage sampling procedure. Several analytical techniques such as descriptive statistics, FGT poverty measures, Gini-

coefficient were adopted to analyse the data. The results of the analysis showed that fingerlings, lime, fertilizer and feed were the major production inputs in fish farming. The cost of labour represented the largest percentage (57%) of total variable cost followed by the cost of fingerlings (34%).

The male headed households had higher TR and Gm than the female headed households. On head count basis, 43% of the respondents were below the relative poverty line of ₦29041.33 (US $194) annum^{-1}. Poverty incidence, depth and severity were all higher among the female headed households than the male headed households in the study area.

The logistic regression result of the determinants of poverty among the fish farmers showed that poverty among the fish farmers was determined by gender of the household head, household size, total cost of production and total output. Gender of household head was negative and significant ($p<0.05$) which implies that poverty is high among the female headed households.

The coefficient of household size was positive and significant ($p<0.01$), this implies that as household size increases the probability of a fish farmer falling below the poverty line also increases. According to this study, poverty is still prevalent among the fish farming households and more predominant among the female headed households, this was aggravated by the high cost of labour and fingerlings.

RECOMMENDATIONS

However, income is more evenly distributed among the female headed households than the male headed households. Fish farmers' income will increase if the cost of labour and fingerlings is reduced. Households' size and total cost of production statistically increase the probability of a fish farmer falling below the poverty line. Therefore, this study recommended that policy that will lead to a reduction in the cost of labour and fingerlings should be put in place.

In addition, the existing family planning programs should be intensified and the farmer should further be enlightened on the need to reduce their family size so as to reduce poverty.

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