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# PROFITABILITY AND SOCIOECONOMIC CHARACTERISTICS OF FISH PRODUCTION IN ANAMBRA STATE, NIGERIA

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**Abstract**

In recent decades the impact of agriculture towards achieving a sustainable economy in Nigeria cannot be under emphasized, though, in time past it has been a subject of several debates amongst development economists, food security and stability is key to the developmental economy of any nation thus, the need to investigate fish production and management in Abia state. Three (3) zone comprising of Awka zone, Onitsha zone and Aguata zone were investigated with a pooled sample inclusive as standard and the analysis was based on the following parameters: Socio-economic Characteristics of Fish farmers, Systems of Fish Production, Management and the Level of Fish Production Associated with the Fish Management Systems, Price of Fish and Net Return from Fish Production. The result obtained showed that fish farming is practiced by both male and female with 96.67% and 3.33% respectively; majority (24.17%) of the fish farmers are within the age bracket of


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51-55 years, while 23.33%, 22.50%, 17.50%, 11.67% and 0.83% of the farmers are within the age brackets of 41-45, 51-60, 46-50, 36-40 and 31-35 years respectively; 100.00% of the farmers had basic formal education with an average of 6 years farming experience; 67.50% purchased the fingerlings stock, while 32.50% of them hatched their fingerlings; 60.00% of the farmers produce heterobranchus, 27.50% of them produced heterobranchus and clarias, while 12.50% of the farmers produced heterobranchus and tilapia; 12.50% of the farmers were below 40 years of age, signifying the need to empower and encourage the youth to go into fish farming. the mean output of a fish farmer per year in Awka, Onitsha and Aguata Zones are 3.88 tonnes, 3.81 tonnes and 3.35 tonnes of fish respectively with grand mean output of 3.71 tonnes in Anambra state. Since there is need to increase protein intake level of people of the state and nation in general, fish production has to be developed and all the constraints militating against its effective production be checked so as to meet up with the protein need of the people.

**Keywords**: Fish, Heterobranchus spp, clarias, Anambra, agriculture, nutrient, output

## INTRODUCTION

The contribution of Agriculture to economic development cannot be over emphasized. As a component of agriculture, fish production contributes to Food security and development through the provision of well-balanced food, employment creation and nutrients supply (Baba, 2005; FAO, 2003).

The diet of the average Nigerian is protein deficient (Seki and Bonzon, 2005) and there are no indications that the protein intake of the average Nigerian has reached the recommended daily intake even though, previous studies, has shown that Nigeria has rich vegetation and abundant water resource capable of supporting a large population of livestock and fishes, with about 214 billion $m^3$ of surface water (Oladimeji *et al.*, 2016) and 87 km3 of ground water (Oladimeji *et al.*, 2014) both of which can be used partly for aquaculture and artisanal fishing. Findings from Federal Department of Fisheries (FDF) and Food and Agriculture Organization (FAO) records also show that Nigeria's self-

sufficiency ratio in fish production was as high as 98.8% in 1983 but dwindled between 40% and 19.2% in 2005 and 2014 with an annual average of about 49% and standard deviation of 19.1. Statistical surveys (FAO, 2012) have shown that the current fish demand in Nigeria put at over 1.5 metric tonnes has not been met which led to annual fish importation of about US$ 400 million annually. Therefore, increase in fish production will help to combat hunger and malnutrition, which remains one of the most devastating problems facing the majority of the poor in the world (WHO, 2000).

To solve the state's high demand for fish, it must explore her craftsmanship in fisheries and aquaculture resources via research and innovative ideas, which have been found to be under-utilized. Data available also indicate that this volume of fish production deficit cannot be met from the coastal waters as they are already near depletion (Nwosu *et al.*, 2007). Also, the importation of fish to meet this deficit involves a huge amount of foreign exchange. For instance, between 1980 and 1990 Nigeria spent 4.2% of her total food expenditure on fish importation, and between 1991 and 2001 Nigeria's average expenditure on fish importation was 5.8% of her total food expenditure, and for the past five years it has averaged 6.2% indicating that domestic fish production is on the decline (FAO, 2007; NBS, 2007). The decline in fish production and their underlying causes are of interest to the fish industry, as well as to policy makers. This study aimed to assess the profitability and socioeconomic characteristics of fish Production in Anambra State, Nigeria using a translog stochastic frontier production function approach.

## METHODS

### Study area

This study was conducted in Anambra State of Nigeria. The state is one of the thirty six states of Nigeria. It is located in the South-Eastern part of the country. It is divided into four agricultural zones, namely; Aguata, Anambra, Awka and Onitsha. This division is expected to aid agriculture and rural planning. Anambra State is a humid ($87^0$F mean) tropical rain forest zone. It is located between longitude $6^0 35^1$ and $8^0 30^1$E and between latitude $5^0$ $40^1$ and $7^0$ $05^1$N. It has boundaries with Abia, Imo, Delta, Enugu and Kogi States. It has a total land area of about 4, 415.54 square kilometers, 70% of which is devoted to agricultural production. Anambra State has 21 local government areas (LGA) and estimated 2006 population figure of 4.18 million people, more than 45% of the people

live in the rural areas (NPC, 2006) and 75% of the people engage in agricultural production of arable crops, tree crops, livestock, fisheries, processing and preservation of food stuff (ASADP, 2002). Given the above data, Anambra State, therefore, has population density of 840 persons per $km^2$ (Egboka and Nwafor, 2007). The state has two seasons – rainy and dry seasons. The rainy season starts in April and ends in October while dry season starts in November and ends in March (ASADP, 2002).

The state has two landforms; River Niger–River Anambra lowlands and Awka-Idemili uplands. The lowlands are extensively covered by fresh water alluvium, and have the tendency for seasonal flooding which could get to height of 2 – 3 meters between August and November annually. They are deep, poorly drained and slightly acidic ($P^H$ 6.3). The highlands are deep, well drained and strongly acidic ($P^H$ 5.2 – 5.4) (ASADP, 2002).

## Data sources and analytical techniques

### *Sample selection*

A multi-stage stratified sampling technique was employed for this study. The study consist of three sampling frames from the four Agricultural zones of Anambra State (Aguata, Anambra, Awka and Onitsha). The list of fish farmers in each zone was compiled with the assistance of zonal extension officers of the Agricultural Development Programme (ADP).

Proportionate sampling technique was employed to select sample from each agricultural zone, due to unequal population of fish farmers in the four agricultural zones. Through this sampling technique 42 out of 65 farmers, 46 out of 72 farmers and 32 out of 49 farmers were selected from Awka, Onitsha and Aguata agricultural zones respectively giving a sample size of 120 fish farmers. Simple random sampling was applied in each agricultural zone to select the sample after proportionately determining the sample size. In Anambra Zone, there are few fish ponds, so this zone was dropped.

## Method of data collection

Data were collected from primary and secondary sources. The primary data were collected by the use of questionnaire administered to the fish farmers through personal interview, alongside with personal observations by the researcher.

The secondary data were obtained from relevant texts, past research reports, documents from Ministry of Agriculture and Natural Resources, bulletins, journals and other relevant literature materials.

The restructured questionnaire helped for easy understanding and allowed necessary questions to be included. Therefore, the validity of the questionnaire was ascertained.

**Test of reliability**

In order to estimate the reliability of the questionnaire, test-retest method of estimating reliability was used. The questionnaire was pre-tested by administering it on a random sample of 12 fish farmers composed of four farmers from each agricultural zone, at an interval of one month. The sample selected for the reliability test did not form part of the sample for the main field work. A correlation analysis was performed on the two sets of data using fish output, and the result produced a correlation coefficient (r) of 0.74, which gave a t-value of 3.475, which was significant at 5% level when compared with the tabulated value of 2.228 for t at 10 degrees of freedom. Therefore, the reliability of the questionnaire was estimated.

**Method of data analysis**

The analytical tools employed in this study were developed to analyze the data that were collected in order to fulfill the stated objectives of the study. Therefore a combination of analytical tools including descriptive, statistical and econometric procedures was utilized. Descriptive statistical tools such as mean, frequency distribution and percentages were employed. The Net income model was used to estimate the net return of fish farmers, while the analysis of variance model was used to test for significant differences in outputs of fish farmers in the three agricultural zones of Anambra state.

***Estimation of Net Return***

Net returns are the difference between costs of production and revenue. Costs are of profound importance in any farm business since they enable the farmer to make choices among present alternative actions. Farm costs comprise expenditures in money and imputed terms which a farmer incurs in the operation of his business. Total costs can be

grouped into variable and fixed costs. Variable costs are those costs which vary with the output, while fixed costs are those costs which do not vary with the level of output (Payne, 1990; Pandey, 2002). Mathematically, it is calculated as;

$TC = FC + VC$ …… (1)

TC = total cost, FC = fixed cost and VC = variable cost

Revenue refers to all money income accruing to a farm from the sale of goods and services, assets or investment (Pandey, 2002). The profits earned by a farm depend on the relationship between its costs and revenue. If the farm's total revenue exceeds its total cost, the farm makes profit, if otherwise, no profit is made.

Revenue can be grouped into Gross revenue or Total revenue and Net revenue. Total revenue is the sum of all money incomes from the sale of products. It is directly dependent on the quantity of goods or outputs sold, so that the higher the quantity sold, the higher the Total Revenue (TR). Mathematically, total revenue is the product of the quantity of the commodity sold and the selling price per unit, i.e;

$TR = P_x Q$ ……. (2)

Net Revenue (NR) represents the actual profit obtained from any farm business enterprise. It is the value obtained when total cost incurred in farm production is subtracted from total revenue earned from the farm enterprise (Pandey, 2002). Mathematically, it is calculated as;

$NR = TR - TC$ …….. (3)

Where: NR = Net Revenue, TR = Total Revenue, and TC = Total Cost.

The net income model was used to estimate the net return in fish production. The net return model is specified as follows:

$NR = TR - TC$……..... (4)

$TC = TVC + TFC$……..... (5)

$NR_i = TR_i – (TVC_i + TFC_i)$ ……..... (6)

n n m z

$$NR_i = \sum_{J=1} P_j Q_j - \sum_{J=1} \left( \sum_{K=1} P_k X_k + \sum_{t=1} P_L F_L \right) \ldots\ldots\ldots\ldots (7)$$

Where: $NR_i$ = net return of the $i^{th}$ fish farmer in naira per tonne, TR = total revenue from fish output in Naira per tonne, TVC = total variable costs (Naira/tonne), TFC = total fixed costs (Naira/tonne), $P_j$ = unit price of the $i^{th}$ farm output (Naira/kg), $Q_j$ = quantity of fish produced by the $i^{th}$ farm (tonne), $P_k$ = unit price of the $k^{th}$ variable input used in fish production (Naira/kg), $X_k$ = quantity of $k^{th}$ variable input (number of variable inputs), $P_L$ = unit price of the $L^{th}$ fixed input used in fish production, $F_L$ = quantity of the $L^{th}$ fixed input used in fish production input, n = number of farmers, j = unit farms, m = number of variable inputs, k = variable inputs, L = Fixed inputs, and Z = number of fixed inputs

**Test of significant differences in outputs of fish farmers**

To test for significant differences in outputs of fish farmers in the three agricultural zones of Anambra State. The analysis of variance (ANOVA) model as used by Ohajianya and Onyenweaku (2003) was adopted as follows:

$$F = \frac{MSSB}{MSSW} = \frac{SSB}{SSW} \frac{(n - k)}{(K - 1)} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

$$SST = SSB + SSW \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

$$SSB = \sum_{J=i}^{n} n_j (X - X)^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$$SSW = \sum_{J=i}^{n} n_j \sum_{i=1}^{k} (X_j - X_j)^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (11)$$

$$SST = \sum_{j=i}^{n} n_j \sum_{i=1}^{k} (X_j - X_j)^2 + \sum_{j=i}^{n} n_j (X - X)^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Where: F = value by which the statistical significance of the mean differences in fish outputs would be judged, SSB = Sum of squared deviations between the sample means, SSW = sum of squared deviations within the samples, n = number of fish farmers, k = number of samples, $n_j$ = sample size from agricultural zone, $X_j$= mean fish output, from agricultural zone j (tonne), X= grand mean output of fish (tonne), $X_{ij}$ = $i^{th}$ mean output from agricultural zone j (tonne), k – 1 = degrees of freedom for between samples, n – k = degrees of freedom for within samples, and X = output of fish farmers (tonne).

**Decision Rule:** Reject Null Hypothesis if F calculated is greater than F tabulated.

## RESULTS

Table 1. Distribution of fish farmers according to sex.

| Sex | Frequency | Relative frequency |
|---|---|---|
| Female | 4 | 3.33 |
| Male | 116 | 96.67 |
| Total | 120 | 100.00 |

**Table 2.** Distribution of fish farmers according to age.

| Age (Years) | Frequency | Relative frequency |
|---|---|---|
| 31-35 | 1 | 0.83 |
| 36-40 | 14 | 11.67 |
| 41-45 | 28 | 23.33 |
| 46-50 | 21 | 17.50 |
| 51-55 | 29 | 24.17 |
| 56-60 | 27 | 22.50 |
| Total | 120 | 100.00 |

Mean Age: 49 Years.

**Table 3.** Distribution of fish farmers according to marital status.

| Marital status | Frequency | Relative frequency |
|---|---|---|
| Married | 115 | 95.83 |
| Widow | 2 | 1.67 |
| Separated | 3 | 2.50 |
| Total | 120 | 100.00 |

**Table 4.** Distribution of farmers according to household size.

| Household size (No of persons) | Frequency | Relative frequency |
|---|---|---|
| 1-5 | 24 | 20.00 |
| 6-10 | 62 | 51.67 |
| 11-15 | 22 | 18.33 |
| 16-20 | 7 | 5.83 |
| 21-25 | 5 | 4.17 |
| Total | 120 | 100.00 |

Mean: 9 Persons.

**Table 5.** Distribution of farmers according to farming status.

| Farming status | Frequency | Relative frequency |
|---|---|---|
| Full time | 36 | 30.00 |
| Part time | 84 | 70.00 |
| Total | 120 | 100.00 |

**Table 6.** Distribution of farmers according to educational level.

| Level of education (Years) | Frequency | Relative frequency |
|---|---|---|
| 1-6 | 12 | 10.00 |
| 7-12 | 65 | 54.17 |
| 13-18 | 25 | 20.83 |
| 19 above | 18 | 15.00 |
| Total | 120 | 100.00 |

Mean: 11.58Years.

**Table 7.** Distribution of farmers according to occupation.

| Occupation | Frequency | Relative frequency |
|---|---|---|
| Farming | 33 | 27.50 |
| Civil servant | 18 | 15.00 |
| Trading | 69 | 57.50 |
| Total | 120 | 100.00 |

**Table 8.** Distribution of fish farmers according to years of experience.

| Years of experience | Frequency | Relative frequency |
|---|---|---|
| 1-5 | 64 | 53.33 |
| 6-10 | 45 | 57.50 |
| 11-15 | 6 | 5.00 |
| 16-20 | 5 | 4.17 |
| Total | 120 | 100.00 |

Mean: 6 Years.

**Table 9.** Distribution of Farmers according to type of fish pond.

| Type of pond | Frequency | Relative frequency |
|---|---|---|
| Earthen | 17 | 14.17 |
| Concrete | 103 | 85.83 |
| Total | 120 | 100.00 |

**Table 10.** Distribution of Farmers according to Sources of fingerlings stocked.

| Source | Frequency | Relative frequency |
|---|---|---|
| Purchase | 81 | 67.50 |
| Hatchery | 39 | 32.50 |
| Total | 120 | 100.00 |

**Table 11.** Distribution of Farmers according to Type of Fertilizer used.

| Type of fertilizer used | Frequency | Relative frequency |
|---|---|---|
| Organic | 48 | 40.00 |
| No fertilizer | 72 | 60.00 |
| Total | 120 | 100.00 |

**Table 12.** Distribution of farmers according to species of fish produced.

| Fish species produced | Frequency | Relative frequency |
|---|---|---|
| Heterobranchus | 72 | 60.00 |
| Tilapia/Heterobranchus | 15 | 12.50 |
| Clarias/Heterobranchus | 33 | 27.50 |
| Total | 120 | 100.00 |

**Table 13.** Distribution of farmers according to mating procedure used.

| Mating procedure used | Frequency | Relative frequency |
|---|---|---|
| Artificial Insemination | 30 | 25.00 |
| Live Fish | 9 | 7.50 |
| Purchase | 81 | 67.50 |
| Total | 120 | 100.00 |

**Table 14.** Distribution of Farmers according to Type of Feed used.

| Type of feed used | Frequency | Relative frequency |
|---|---|---|
| Pellet | 120 | 100.00 |
| Total | 120 | 100.00 |

**Table 15.** Distribution of Fish Farmers according to Management System used.

| **Management System** | **Frequency** | **Relative frequency** |
|---|---|---|
| Intensive system | 100 | 83.30 |
| Semi-intensive system | 20 | 16.70 |
| Total | 120 | 100.00 |

**Table 16.** Distribution of fish farmers according to fish output.

| **Fish output (Ton of fish farmer/ year)** | **Awka Zone (FQ/%)** | **Onitsha Zone (FQ/%)** | **Aguata Zone (FQ/%)** | **Pooled sample** |
|---|---|---|---|---|
| ≤ 2.0 | 6/14.29 | 5/10.87 | 8/25.00 | 19/15.83 |
| 2.1-4.0 | 14/33.33 | 20/43.48 | 12/37.50 | 46/38.33 |
| 4.1-6.0 | 19/45.24 | 18/39.13 | 10/31.25 | 47/39.17 |
| 6.1above | 3/7.14 | 3/6.52 | 2/6.25 | 8/6.67 |
| Total | 42/100 | 46/100 | 32/100 | 120/100.00 |
| Mean output/farmer | 3.88 tons | 3.81 tons | 3.35 tons, | 3.71 tons |

FQ = Frequency, % = Percentage**.**

**Table 17.** Distribution of fish farmers according to price of fish.

| Fish Output | Awka Zone | Onitsha Zone | Aguata Zone | Pooled sample |
|---|---|---|---|---|
| (N/kg/farmer) | FQ/% | FQ/% | FQ/ % | FQ/% |
| ≤ 600 | 5/11.91 | 3/6.52 | 0/0 | 8/6.67 |
| 601-650 | 30/71.43 | 27/58.70 | 18/56.25 | 75/62.50 |
| 651-700 | 4/9.52 | 11/23.91 | 10/31.25 | 25/20.83 |
| 701 above | 3/7.14 | 5/10.87 | 4/12.50 | 12/10.00 |
| Total | 42/100 | 46/100 | 32/100 | 120/100.00 |
| Mean Price/kg | N 596.91 | N 624.44 | N 650.56 | N 621.77 |

FQ = Frequency, and % = Percentage.

**Table 18**. Computed Net Return of Fish Farmers.

| Item | Value (N/tonne/farmer/year) | | | |
|---|---|---|---|---|
| | **Awka Zone** | **Onitsha Zone** | **Aguata Zone** | **Pooled Sample** |
| Total Revenue | 596910.00 | 624440.00 | 650560.00 | 621770.00 |
| Variable Cost | | | | |
| Feed | 28507.56 | 39765.71 | 36972.66 | 35081.98 |
| Medication | 1352.00 | 1531.00 | 1317.00 | 1400.00 |
| Fertilizer | 1032.80 | 1735.00 | 1107.00 | 1291.60 |
| Fingerling | 21512.00 | 19242.00 | 20544.67 | 20880.00 |
| Electricity | 1092.86 | 1820.20 | 1336.04 | 1416.37 |
| Water | 38980.00 | 36760.00 | 40050.00 | 38596.67 |
| Transportation | 3869.60 | 3276.00 | 3650.10 | 3598.57 |
| Labour | 8016.00 | 11000.00 | 10210.00 | 9742.00 |
| Other Costs | 3388.00 | 2076.00 | 3572.00 | 3012.00 |
| TVC | 105480.82 | 119475.91 | 119094.80 | 114683.86 |
| Fixed Cost | | | | |
| Dep. on farm House / fence | 10468.00 | 10587.00 | 10892.00 | 10649.00 |
| Dep. on pond Construction | 15148.00 | 19358.00 | 18556.00 | 17687.33 |
| Dep. on equip. | 3126.48 | 3461.00 | 3183.00 | 3256.83 |
| Dep. on vehicle repair | 0.00 | 7168.00 | 7280.00 | 4816.00 |
| Maintenance of vehicle | 0.00 | 633.60 | 2192.00 | 941.87 |
| Repairs & maintenance of pump | 3924.00 | 4011.00 | 4904.00 | 4279.67 |
| Interest on loan | 13404.00 | 13000.00 | 13472.00 | 13292.00 |
| Overhead Cost | 8728.00 | 8720.00 | 8582.00 | 8676.67 |
| Total Fixed Cost | 54798.48 | 66938.60 | 69061.00 | 63599.37 |
| Total Cost | 160279.30 | 186414.51 | 188155.80 | 178283.23 |
| Net Return/Tonne | 436630.70 | 438025.49 | 462404.20 | 443486.77 |
| ROI | 2.72% | 2.35% | 2.46% | 2.49% |

## DISCUSSION

The distribution of fish farmers according to sex is presented in Table 1. The table shows that most (96.67%) of the fish farmers are males, while 3.33% are females. This result implies that fish production is practiced by both females and males but males are more involved in fish production than females in the study area.

The distribution of fish farmers according to age is presented in Table 2. The table shows that majority (24.17%) of the fish farmers are within the age bracket of 51-55 years, while 23.33% of them are within the age range of 41-45 years. Also 22.50%, 17.50%, 11.67% and 0.83% of the farmers are within the age brackets of 51-60, 46-50, 36-40 and 31-35 respectively. The age of a farmer is important in determining productivity and the rate of adoption of innovation (Olomola, 1988). In the study area, the mean age was found to be 49 years. This is an active age in agriculture and it implies that fish farmers should account for high production and record high levels of income. This result also indicates that 12.50% of the farmers were below 40 years of age, signifying the need to empower and encourage the youth to go into fish farming.

The distribution of fish farmers according to marital status is presented in Table 3. The table shows that most (95.83%) of the farmers are married. This implies that fish production is practiced by the married, separated and widows but the married are more involved in fish farming than both the separated and widows in the study area.

The distribution of farmers according to household size is presented in Table 4. The table shows that most (51.67%) of the farmers have household sizes in the bracket of 6-10 persons, while 20.00% of them have household size range of 1-5 persons. Also 18.33%, 5.83% and 4.17% of the farmers have household sizes in the brackets of 11-15, 16-20, and 21-25 persons respectively. A household unit consists of a household head, wife, children and other dependent relatives. The mean household size of the farmers was found to be 9 persons. Household size affects the availability and use of family labour in place of hired labour that requires large sum of money.

The distribution of farmers according to farming status is presented in Table 5. The Table shows that majority (70.00%) of the farmers are engaged in part time farming while 30.00% of them engaged in full time fish farming. This result shows that farmers engaged in both part time and full time farming but more of the fish farmers are part time operators.

The distribution of farmers according to educational level is presented in Table 6. The table indicates that majority (54.17%) of the farmers spent 7-12 years in school, while 20.83% of them spent 13-18 years in school. Also 15.00% of the farmers spent 19 years and above in school and 10.00% of them spent 1-6 years in school. This result implies that all (100.00%) of the farmers had basic formal education. The mean number of years spent in school was 11.58 years. This implies that majority of the fish farmers completed or attempted secondary school. This also reveals that the farmers are mentally equipped and alert to adopt innovations.

The distribution of farmers according to occupation is presented in Table 7. The table indicates that majority (57.50%) of the farmers are traders, while, 27.50% of them are full-time farmers, and 15.00% of them are civil servants. This finding implies that farming was not the primary occupation of most fish farmers.

The distribution of farmers according to years of experience is presented in Table 8. The table shows that most (53.33%) of the farmers have farming experience ranging between 1-5 years, while 37.50% of them have farming experience range of 6-10 years. Also 5.00% and 4.17% of the farmers farming experience ranging between 11-15 years and 16-20 years respectively. The number of years a farmer has spent in farming business could give an indication of the practical knowledge acquired. It could have considerable influence on production efficiency. The average number of years of experience is 6 years. This suggests that majority of the fish farmers have practical knowledge in fish production.

The distribution of farmers according to type of fish pond is presented in Table 9. The Table shows that most (85.83%) of the farmers use concrete ponds while 14.17% of them use earthen ponds. This result implies that farmers use both concrete and earthen ponds but concrete ponds are mostly used.

The distribution of farmers according to sources of fingerlings stocked is presented in Table 10. The table shows that most (67.50%) of the farmers purchased the fingerlings stocked while 32.50% of them hatched their fingerlings. This result implies that majority of the farmers purchase fingerlings from other farms mainly as a result of lack of knowledge of hatchery technology.

The distribution of farmers according to type of fertilizer used is presented in Table 11. The table shows that majority (60.00%) of the farmers do not use fertilizer while 40.00% of

them use organic manure. The respondent's preference for not using fertilizer was mainly to prevent toxicity of water (water pollution).

The distribution of farmers according to species of fish produced is presented in Table 12. The table indicates that majority (60.00%) of the farmers produce heterobranchus, while 27.50% of them produced heterobranchus and clarias, and 12.50% of the farmers produced heterobranchus and tilapia. This result indicates that all (100.00%) of the farmers produce hetrobranchus specie due to easy management and profitability.

The distribution of farmers according to mating procedure used is presented in Table 13. The table shows that majority (67.50%) of the farmers are not involved in hatchery, while 25.00% of them use artificial insemination and 7.50% of them use live fish. This result implies that most fish farmers are not into hatchery while those that are into hatchery often use artificial insemination because it is more reliable and easy to monitor.

The distribution of farmers according to type of feed fed is presented in Table 14. The table indicates that 100.00% of the farmers use pellet feed, and the reasons given are for easy management, convenience and profitability.

The distribution of fish farmers according to management systems used is presented in Table 15. The table indicates that 83.30% of the fish farmers use intensive system while 16.70% of them use semi-intensive system in their fish production. This result implies that more fish farmers use the intensive system because it gives higher output but relatively costlier to use than the semi-intensive system which is cheaper to use but does not give as high output as the intensive system.

The distribution of fish farmers according to fish output is presented in Table 16. The table shows that the mean output of a fish farmer per year in Awka, Onitsha and Aguata Zones are 3.88 tonnes, 3.81 tonnes and 3.35 tonnes of fish respectively with grand mean output of 3.71 tonnes of fish for fish farmers in Anambra State.

The distribution of fish farmers according to price of fish is presented in Table 17. The table shows that the mean price of a fish farmer in a year in Awka, Onitsha and Aguata Zones are N596.91, N624.44 and N650.56 respectively with grand mean price of N621.77 for fish farmers in Anambra State.

The computed net return of fish farmers is presented in Table 18. The Table shows that the fish farmers in Awka, Onitsha and Aguata Zones earned average revenue per

tonne per year of N596910, N624440 and N650560 respectively with mean revenue of N621770 per tonne for fish farmers in Anambra State. Total cost of production of a fish farmer/tonne/year in Awka, Onitsha and Aguata Zones are N160279.30, N186414.51 and N188155.80 respectively, while the average Total cost of fish production in Anambra State was N178283.23 per tonne. The difference between Total Revenue and Total Cost yielded net return per tonne per year of N436630.70, N438025.49, N462404.20 and N443486.7 for Awka, Onitsha, Aguata and Anambra State respectively. This result implies that fish production is a profitable farm enterprise in Anambra State. Results on Return in investment shows that one naira invested in fish production in Awka, Onitsha, Aguata and Anambra State would return N2.72, N2.35, N2.46 and N2.49 respectively. This implies that fish production in Anambra State is highly profitable.

## CONCLUSION

This study analyzed fish production and management amongst farmers in four agricultural zones of Anambra State. The results gotten from the analysis revealed that fish production was dominated by men below 55 years of age. The mean household size among farmers was found to be 9 persons. Distribution of respondents by status of farming revealed that majority of them was part time farmers. It was found that the farmers spent an average of 11.58 years in school. Distributions of farmers by major occupation showed that majority (57.50%) of them were primarily traders. The farmers on the average had 6 years' experience in fish production. About, 85.83% of the farmers used concrete pond. It was found that most (67.50%) of the respondents purchased fingerlings and 60% of them did not use fertilizer. Investigation into the species of fish produced indicated that 60% of the farmers produced heterobranchus specie. The result also showed that 67.50% of the farmers were not into breeding. All (100%) of the farmers used pellet feed and most of the farmers practiced intensive system of farming.

In addition, it was found that mean output per farmer per tonne was 3.71 fish, mean price per kg per farmer was ₦621.77 and mean total revenue was ₦621770 per tonne per farmer per annum. The mean total cost of production was ₦178283.23 per farmer per tonne per annum, while the net return was found to be ₦443486.77 per tonne per farmer per annum. Since there is need to increase protein intake level of people of the state and nation in general, fish production has to be developed and all the constraints militating

against its effective production be checked so as to meet up with the protein need of the people.

## REFERENCES

Bada A S (2005). Strategies for Bridging the Supply Demand Gap in Fish Production in *Nigeria". In: Ogisi, O. D; Okuneye, P and W. J. Oyaide (eds). Economic Reforms and Management of Nigerian Agriculture. Proceedings of the 19th Annual Conference of the Farm Management Association of Nigeria (FAMAN),* 329 – 337.

FAO (2003). The state of fisheries and food insecurity in the world. *Food and Agriculture Organization, Rome.*

FAO (2007): Fisheries statistics: Capture Production, *FAO Rome, Italy* Volume 92/1627.

Nwosu F O, Oguoma N N O, Ohajianya, D O, Ibekwe, U C. (2007). Factors Influencing output of fish in Imo State, Nigeria. *International Journal and Agriculture and Rural Development,* 10: 37 – 40.

NBS (2007). Annual Abstract of Statistics. National Bureau of Statistics Abuja, Nigeria.

NPC (2006). National Population Commission.

Payne W J A. (1990). "An Introduction to Animal Husbandry in the tropics*". English Language Book Society, 4th Edition*, 627 – 644.

Pandey I M. (2002). "Financial Management". 5th Edition. *Vikas Publishing House, PVT Ltd, New Delhi*, 43 – 45.

Seki E, Bonzon A. (2005). Selected aspects of African fisheries. A continental overview, *FAO fish bulletin,* 810:158 – 159.

WHO (2000). Malnutrition – the global picture. Online at http://www.who.org/nut/welcome.htm.

Egboka B, Nwafor U E J. (2007): River Boundary Agricultural Lands in Anambra State. *Agricultural Forum, National Light News Paper, August 10th P .11.*

Oladimejl, Y.U., Damisa, M.A., Abdulsalam, Z and Omokore, D.F. (2014). A Micro Level Analysis of Poverty among Artisanal Rural Fishery in Kwara State, Nigeria, Ethiopia. *Journal of Environment Studies & Management*, 7(4): 423-433.

Oladimeji YU, Abdulsalam Z, Muhammed-Lawal A, Adefalu LL, Adepoju SA. (2016). Effects of Water Hyacinth (Eichhornia Crassipes) on Artisanal Fishery of River Niger in North- Central Nigeria. *Journal of Animal Production and Research*, 28(2):338-349.

Ohajianya D O, Onyenweaku C E. (2003). Demand for Community Bank Credit by Small Holder Farmers in Imo State, *Nigeria. Journal of Sustainable Research*, 7:26-32.