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# Socioeconomic correlates of catfish production status in Ido Local Government Area of Oyo State, Nigeria

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## Abstract

Knowledge of the socioeconomic characteristics of fish farmers is crucial for increased output in fish production so as to bridge the gap between the current level of production and ever-increasing demand for fish due to its contribution to human population growth and development. The study examined the relationship between farmers' socioeconomic characteristics and output in catfish production in Oyo State, Nigeria. A multistage sampling technique was used in the selection of 120 catfish farmers. Primary data were collected through structured questionnaire from the selected catfish farmers. The data obtained from the farmers were analysed using descriptive statistics and ordinary least square (OLS) regression. Findings revealed that majority (63.3%) of the farmers were male, 65% were within the active and productive age of 31–40 years, capable of withstanding the stress in catfish production. Majority (82.4%) of the farmers were married with an average household size of five individuals. The fish farmers were highly educated with most (91.8%) of them having tertiary education. Two-thirds of the farmers were members of a cooperative society out of which 52.5% were loan beneficiaries. Most (62.5%) of the farmers operated on a part-time basis and managed between 1–2 ponds with output worth below N 500,000 ($1,315.79) per production cycle. The OLS regression result revealed that fish output was significantly determined by age ($p < 0.01$), marital status ($p < 0.05$) of fish farmers, education ($p < 0.05$), and cooperative membership ($p < 0.05$). Although there were indications of economic prosperity in catfish production in the study area, efforts to promote access to education and participation in cooperative society are critical to output expansion. This will engender knowledge acquisition and sharing, promote capacity building and synergies that will advance production outputs and business performance.

**Keywords:** catfish; questionnaire; cooperative society; production status; socioeconomic

## INTRODUCTION

The search for adequate food supply in particular protein-rich diets to ensure nutrition security for the ever-soaring population in developing countries like Nigeria has been a serious concern for both the government and many international agricultural agencies. The protein deficiency in the diet of most consumers in developing countries is equally associated with the inability of fish farming industry to supply the required quantity of fish (Jangampalli, 2019). Despite the increase in the major sources of animal protein such as livestock and poultry industries, the problem of protein deficiency still continues unabated, thus, the target of increasing the animal protein supply and meeting the protein demand in the nation through

provision of fish as a source of protein could be achieved by improving the productivity of fish farms.

Nigerians are large consumers of fish with an estimated demand of 1.4 million tons and it remains one of the main products consumed in terms of animal protein (Olagunje et al. 2007; Ali et al. 2008). Fish appears to be the cheapest source of protein as a result of its low cholesterol level compared to meats (beef, pork and chicken), thus making it medically acceptable to young and old people. It contributes about 55% of the dietary intake of animal protein of the average Nigerian (Agbo, 2015). In addition to nutritional benefits of fish, it is also important in animal feed formulation and source of raw materials for agro-allied industries (Esu et al. 2009)

The fishery subsector plays a notable role in the Nigerian economy as it ranked third after the crop and livestock sub-sectors which ranked first and second, respectively, in terms of contribution to the gross domestic product (Bassey et al. 2015). In Nigeria, the fishing industry is divided into three major sub-sectors, which are the artisanal, industrial and aquaculture. There has been an increasing awareness on the inherent benefits of aquaculture in contributing to fish production domestically due to various needs (Food and Agricultural Organization, 2015).

Aquaculture (fish farming) as a branch of agriculture is one of the fastest growing livestock production sectors in Nigeria with about 29% growth rate in 2006 due to increased demand brought about by rapid population growth. In recent time, it has grown to 12% per year making the country to be the largest producer in sub-Saharan Africa as it surpasses the world average growth rate of 8% (WorldFish, 2018). Furthermore, according to Olagunje et al. (2007), the fishery sub-sector provides direct employment to over 12 million people (3% of the active population) as well as indirect employment through numerous valued activities along the production line to 11 million people. However, despite the great potentials inherent in fish farming, Nigeria is still one of the largest importers of fish in the developing countries as the demand for fish still far outweighs the market supply. The demand for fish protein in Nigeria according to USAID (2014) was 2.66 million tons but was partly augmented by massive importation of frozen fish of about 740,000 tons in that same year, hence the concerted efforts to ensure self-sufficiency in fish production through fish farming is necessary.

The most commonly reared fish species in Nigeria include catfish, tilapia and carp. However, catfish appears to be the most commonly reared species among the Nigerian farmers due to high chances of survival in different culture systems and diverse environments, fast growth rate and fecundity, improved fry survival and high adaptation to supplemental feed (Osawe, 2007; Iheke and Nwagbara, 2014). Consequently, catfish farming is vital to the sustainability of the aquaculture industry in the country due to the above qualities and also make the country self-sufficient in terms of fish supply. Therefore, aquaculture remains the only viable alternative for increasing fish production in order to meet the protein need of the people through the optimal utilisation of the available water resources. Furthermore, local production of fish would increase and save much of the foreign exchange being used for fish importation. Specifically, provision of animal protein can be guaranteed which will eventually reduce food insecurity and poverty levels.

Few previous studies have attempted to examine the reasons for low level of catfish production currently experienced in Nigeria. Such studies (Adeogun et al. 2007; Ugwumba and Nnabuife, 2008; Oluwatayo and Adedeji, 2019) attributed the low level of production to high cost of feed, shortage of trained manpower, inadequate knowledge on profitability of aquaculture as an enterprise, low level of funds (or capital), inadequate data base on the biology and ecological requirements of endemic fish species with aquaculture potentials, insufficient data on production and management techniques, inadequate infrastructures (access roads to farm sites and electricity) and lack of rational aquaculture development planning. But none of these studies examined the influence of socioeconomic variables on catfish production. In the light of this, the present study aimed to describe the socioeconomic characteristics of catfish farmers, examine the output from catfish farming and establish the relationship between farmers' socioeconomic characteristics and their output in catfish production in the study area.

### Hypothesis of the study

$\mathbf{H_0}$ – there is no significant relationship between farmers' socioeconomic characteristics and quantity of catfish produced.

$\mathbf{H_1}$ – there is significant relationship between farmers' socioeconomic characteristics and quantity of catfish produced.

## MATERIALS AND METHODS

### Study area

The study was carried out in Ido Local Government Area, Oyo State. It is located in the tropics, has a land

area of 986 km², lies between longitude 3°47′34.99″E and latitude 7°30′44.49″N and an estimated population of 103,261 in 2006 (National Population Commission, 2006). It shares boundaries with Akinyele local government in the east, Ibarapa east local government in the west, Ibadan south-west in the north and Egbeda local government in the south. The study area consists of 10 wards which include Alaro, Apete, Awotan, Akufo, Ayobo, Abidogun, Apata, Ido, Omi-adio and Owode. Its annual rainfall is 1,800 mm with a peak from April to June, July break and second peak from August to October. There is also high humidity and average daily temperature between 25 °C and 35 °C throughout the year. Large areas of grasslands abound which support livestock production as well as many rivers and water bodies to practice fish farming, though the predominant occupation of the people is farming.

### Sampling technique and data collection

Multi-stage sampling technique was employed to select catfish farmers in the study area. Stage one involved a purposive selection of six (6) wards known for engaging in catfish farming while stage two involved the simple random selection of two (2) communities from each ward which give the total sum of twelve (12) communities. The third stage involved a simple random selection often (10) catfish farmers from each community to give a total of 120 catfish farmers. Finally, primary data through the administration of a structured questionnaire vis-à-vis interview guide was employed to elicit information from the fish farmers.

### Analytical techniques

**Descriptive statistics:** descriptive statistics in form of tables, frequencies and percentages were employed to summarise socio-economic characteristics.

**Ordinary least square (OLS) regression analysis:** OLS regression was used to examine the determinant catfish production in the study area. The collected data were analysed using statistical package for social science (SPSS) version 20.

### Socioeconomic determinants of catfish production

OLS multiple regression model was employed for this study. The models were explicitly specified in the linear, semi-log and double-log forms as follows:

**Linear function:**

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e_i$$

**Semi-log function:**

$$Y = Lnb_0 + b_1LnX_1 + b_2LnX_2 + b_3LnX_3 + + b_4LnX_4 + b_5LnX_5 + b_6LnX_6 + e_i$$

**Double-log function (Cobb Douglas):**

$$Ln(Y) = Lnb_0 + b_1LnX_1 + b_2LnX_2 + b_3LnX_3 + + b_4LnX_4 + b_5LnX_5 + b_6LnX_6 + e_i$$

Where:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, e) \quad (1)$$

Y = Output of catfish produced (value of fish production in Naira)

$X_1$ = Age of the fish farmer in years

$X_2$ = Marital status of the fish farmer, dummy (married = 1; 0 otherwise)

$X_3$ = Number of adult members in the household (number of individuals)

$X_4$ = Educational level of the fish farmer (years of education)

$X_5$ = Fish farmer is a member of cooperative society, dummy (member = 1; 0 otherwise)

$X_6$ = Extension contact, dummy (yes = 1; 0 otherwise)

e = Error term

Ln = Natural logarithm.

Following Olayemi (1998), the relationship between the dependent variable and each of the independent variables were examined using linear, semi-logarithm and double-logarithm forms. Based on the value of the coefficient of determination ($R^2$), statistical significance and economic theory that support fish production, the lead equation was chosen.

***A priori* expectations** were for $X_1$, $X_2$, $X_4$, $X_5$and $X_6$, to be positively correlated with value of catfish output (Y) whereas $X_3$ could either be positively or negatively correlated depending on whether the family (household) is a production or consumption unit.

## RESULTS AND DISCUSSION

### Socioeconomic characteristics of catfish farmers

The socioeconomic characteristics of catfish farmers are presented in Table 1. Majority (65%) of the farmers were between 31 and 40 years of age; 18.3% were between 41 and 50 years, and the 51–60 age group constituted the least (1.7%) proportion. This means that majority of the farmers were in their economically active and productive age, thus could withstand the stress and make decision to enhance their productivity which suggests a better future for catfish production in the study area. This conforms to the findings of Maina et al. (2014). Also, a relatively high percentage (63.3%) of the farmers were male, and 36.7% were female. This indicates the dominance of men involvement in agriculture and in particular fish farming. This could be due to the fact that fish farming requires acquisition of fixed assets/ high level of investment, constant supervision and

**Table 1.** Socio-economic characteristics of catfish farmers

| Characteristics | Frequency | Percentage (%) |
|---|---|---|
| **Age** | | |
| ≤30 | 18 | 15.0 |
| 31–40 | 78 | 65.0 |
| 41–50 | 22 | 18.3 |
| 51 and above | 2 | 1.7 |
| Total | 120 | 100 |
| **Sex** | | |
| Male | 76 | 63.3 |
| Female | 44 | 36.7 |
| Total | 120 | 100 |
| **Marital status** | | |
| Single | 11 | 9.2 |
| Married | 101 | 84.2 |
| Widow/widower | 2 | 1.7 |
| Separated | 6 | 5.0 |
| Total | 120 | 100 |
| **Household size (number)** | | |
| 1–4 | 53 | 44.2 |
| 5–8 | 65 | 54.2 |
| 9 and above | 2 | 1.6 |
| Total | 120 | 100 |
| **Level of education (years)** | | |
| Primary | 4 | 8.3 |
| Secondary | 6 | 5.0 |
| Tertiary | 110 | 91.8 |
| Total | 120 | 100 |
| **Farming experience (years)** | | |
| 1–3 | 62 | 51.7 |
| 4–6 | 26 | 21.7 |
| 7 and above | 32 | 26.6 |
| Total | 120 | 100 |
| **Access to extension services** | | |
| Yes | 51 | 42.5 |
| No | 69 | 57.5 |
| Total | 120 | 100 |
| **Membership of cooperative society** | | |
| Yes | 77 | 64.2 |
| No | 43 | 35.8 |
| Total | 120 | 100 |
| **Cooperative loan status** | | |
| Beneficiary | 63 | 52.5 |
| Non-beneficiary | 57 | 47.5 |
| Total | 120 | 100 |

Source: Computed from field survey

monitoring, adoption of new technology as opined by Brummett et al. (2010), Olaoye et al. (2014) and Kumar et al. (2018). Furthermore, women's role in aquaculture is not widely acknowledged due to the fact of being at home most of the time, which eventually made their involvement in fish farming to be viewed as an extension of domestic activities and as such are not recognised and rewarded as opined by Ndanga et al. (2013).

Majority (82.4%) of the farmers were married with a mean household size of five persons. This result corroborates the findings of earlier studies of Ekong (2003) and Olawumi et al. (2010) who reported that being married is a highly cherished value among farming households in Nigeria, not only because of the need for children and the continuation of the family, but due to the fact that the spouses and children form a vital source of unpaid family labour which can improve and boost fish production. This also implied that fish farmers had higher obligations to play in their families and as such they would be eager to improve their agricultural productivity in order to earn more income so as to actualize their various responsibilities. Information elicited from the collected data revealed that literacy level was high among the farmers with majority (91.8%) having tertiary form of education whereas 5.0% and 8.3% had secondary and primary education, respectively. The level of education could determine the level of opportunities available to improve livelihood strategies, enhance food security and reduce the level of poverty. High educational status of the farmers will also enable them acquire knowledge and skills for budgeting, saving, adoption of innovations and resources usage. Education plays a vital role in agricultural production as it promotes better exposure and access to vital information that enhances optimal performance as opined by Aromolaran (2000); Onuabugu and Nnadozie (2005) and Erie (2008). In terms of farming experience, 51.7% of the farmers had a farming experience of 1–3 years whereas 21.7% had between 4–6 years farming experience. This suggests that a considerable portion of the farmers were relatively new in the business. Nwaru (2004) noted that the number of years a farmer spends in the farming business may give an indication of the practical knowledge he has acquired. This implies that the experience gained enables the farmers to use their resources prudently and consequently enhance their production status. Access to extension services showed that less than half (42.5%) of the sampled farmers had access to extension services but majority (57.5%) of them did not have access during the last

production season in the study area. This may have affected their productivity as farmers that had access to extension services had the opportunity of being exposed to new and improved technologies and other benefits above those who did not have it. Distribution of farmers according to membership of cooperative society revealed that majority (64.2%) belonged to one cooperative society or the other while a minority (35.8%) did not belong to any cooperative. This may be attributed to the fact that credit or loan could be easily accessed from cooperative society compared with other formal sources such as banks. In terms of cooperative loan status, majority (52.5%) of the farmers were loan beneficiaries from the cooperative society. This could enhance and improve their productivity status.

## Quantity and value of catfish production

As shown in Table 2, majority (62.5%) of the farmers were into fish farming on a part-time basis and very few (37.5%) engaged in fish farming on a full-time basis. This implies that most of the farmers engaged in other forms of income generating activities. Also, majority (69.2%) of the farmers had between 1 and 2 ponds. This suggests that most of the farmers operate on a small-scale, thereby making the value realised from production to be less than 500,000 naira per production season. In addition, majority (83.3%) of the farmers harvested less than 500 fishes in the last production season while very few (12.5%) harvested between 500–1,000 fishes in the last production season. Also, majority (82.5%) managed a pond size of ≤500 m$^2$.

Furthermore, findings on source of funding fish production in the study area revealed that most (54.2%) of the farmers financed their business from cooperative society, 20% sourced their capital from friends/relatives, 13.3% from banks, and12.5% financed through personal

**Table 2.** Quantity and value of catfish production

| Variables | Frequency | Percentage (%) |
|---|---|---|
| **Mode of farming** | | |
| Full time | 45 | 37.5 |
| Part time | 75 | 62.5 |
| Total | 120 | 100 |
| **Number of ponds owned (number)** | | |
| 1–2 | 83 | 69.2 |
| 3–4 | 30 | 25.0 |
| ≥5 | 7 | 5.8 |
| Total | 120 | 100 |
| **Size of pond (m$^2$)** | | |
| ≤500 | 99 | 82.5 |
| 501–1,000 | 18 | 15.0 |
| >1,000 | 3 | 2.5 |
| Total | 120 | 100 |
| **Quantity of fish harvested (number)** | | |
| ≤500 | 100 | 83.3 |
| 501–1,000 | 15 | 12.5 |
| >1,000 | 5 | 4.2 |
| Total | 120 | 100 |
| **Value of fish harvested (naira)** | | |
| <500,000 | 105 | 87.5 |
| 500,000–1,000,000 | 8 | 6.7 |
| >1,000,000 | 7 | 5.8 |
| Total | 120 | 100 |
| **Sources of finance** | | |
| Cooperative society | 65 | 54.2 |
| Bank | 16 | 13.3 |
| Friends/Relatives | 24 | 20.0 |
| Personal savings | 15 | 12.5 |
| Total | 120 | 100 |

Source: Computed from field survey

**Table 3.** Factors influencing the status of catfish production in the study area

| Variable | Estimated coefficient | *t*-value | *p*-value |
|---|---|---|---|
| **Ln (Age)** | 1.992*** | 4.540 | 0.000 |
| **Marital status (Married Dummy)** | –0.505** | –2.150 | 0.034 |
| **Ln (Number of adult household members)** | 0.388 | 1.570 | 0.118 |
| **Ln (Educational level)** | 0.870** | 2.030 | 0.045 |
| **Membership of cooperative (Dummy)** | 0.470** | 2.150 | 0.034 |
| **Extension contact (Dummy)** | –0.002 | –0.010 | 0.993 |
| **Constant** | 1.944 | –1.090 | 0.276 |
| **R-squared = 0.312** | | | |
| **F-value = 10.13 Prob > F = (0.000)** | | | |

Source: Computed from field survey
*** and ** denote statistical significance at 1%, and 5%, respectively.

savings which were mostly accrued profits from previous earnings.

**Socioeconomic determinants of fish production**

Ordinary Least Square (OLS) regression analysis was carried out to examine the socioeconomic influencers of status of catfish production in the study area. All the three functional forms (linear, semi-log and double log) of the models were estimated. The double logarithm form was chosen as the lead equation (presented in Table 3) based on the econometric and statistical criterion like number of statistically significant variables, the magnitude of F-ratio and $R^2$ value. The model that has the highest number of significant variables as judged by the *t*-values and highest $R^2$ with significant F-value was considered a good fit for the model. The result of the analysis showed that four explanatory variables (age, marital status, education and membership of cooperative society) were significant at different probability levels not greater than 5%.

The estimated coefficients conform to the *a priori* expectation. The coefficient of multiple determination, $R^2$ value of 0.312 indicated that 31.2% of the variation in the value of catfish output is explained by all the explanatory variables in the model.

Specifically, the estimated coefficient for age of the catfish farmers ($X_1$) was positive and statistically significant at 1% probability level. The sign of the coefficient was consistent with *a priori* expectation. This means that as the farmer's age increases, so also the output level of the catfish farmers would increase possibly due to perfection in production activities. This further implies that a 1% increase in age of the farmer will increase the output of fish by approximately 2% in the study area. This finding conforms to the earlier report of Onyenweaku et al. (2010) who reported that a direct relationship with technology adoption for high production increases with age of the farmer. They opined that such relationship is possible as a result of accumulated knowledge and experience gathered from years of observations and experimentations with various technologies.

The coefficient of marital status ($X_2$) was negative and statistically significant at 5%. This suggests that unmarried farmers are more likely to have higher output in the study area. This may be so especially if such farmers had members who could work to substantially raise production or have greater access to resources that can enhance output.

The coefficient of farmer's educational level ($X_4$) was positive and significant at 5%. This implies that additional years of education are expected to increase output of catfish in the study area. Specifically, a 1% increase in educational attainment by the farmer is expected to increase fish output by 0.87%. This finding agrees with earlier submission of Umeh et al. (2015) who reported that education is important for achieving effective utilisation of inputs in agricultural production in Nigeria.

The coefficient of membership of cooperative society ($X_5$) was positive and statistically significant at 5% implying that being a member of cooperative society will substantially enhance fish production. This agrees with Okike (2000) and Onyekuru et al. (2019) who reported that farmers who belong to cooperative society have access to good quality inputs, information, organised marketing of production and increased business performance (output) than those who do not belong to a society.

## CONCLUSION AND RECOMMENDATION

This study was carried out to examine the socioeconomic determinants of catfish production in Oyo State, Nigeria. The study revealed that majority of the sampled farmers were male, married, educated and within the economically active age group. Our findings are suggestive of economic prosperity of fish production in the study area and show that output level can considerably increase provided the policies are channeled towards promoting access to education and participation of fish farmers in a cooperative society, thereby confirming the alternative hypothesis and rejecting the null hypothesis. Besides, efforts from the government, NGOs, and other developmental stakeholders are key to achieving these goals. It should be understood that findings and policy suggestions are *ceteris paribus*, other incentives and interventions to boost fish production are crucial for sustained success.

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