

## **PROFITABILITY ANALYSIS OF FISH FARMING AMONG SMALL SCALE FISH FARMERS IN IKORODU FISH FARM ESTATE, LAGOS STATE, NIGERIA**

**\*Olaoye, O. J., \*Oluwalana, E. O., \*Ojebiyi, W. G and \*Ayantunji, T.**

---

### ***Abstract***

*The Ikorodu fish farm estate was one of the programs initiated by the Lagos State Government in order to boost local fish production in rural communities of the State. This study examined the profitability of fish farming among small scale fish farmers in Ikorodu fish farm estate. Ninety participant fish farmers were sampled through the random sampling technique of 45% of the total fish farmers that were part of the programme in the 2017 production season. Data were collected with the aid of interview guide and analyzed using frequency, percentage, mean, standard deviation, profitability ratios and Chi-square analytical techniques. Results revealed that the total cost and revenue were ₦3,134,962.15 and ₦4,834,500.00 respectively. The gross margin and net*

---

**\*Olaoye, O. J.,**

**\*Oluwalana, E. O.,**

*Dept. of Agricultural Media Resources and Extension Centre, FUNAAB, Abeokuta*

**\*Ojebiyi, W. G**

*Dept of Agricultural Extension and Rural Development, FUNAAB, Abeokuta*

**\*Ayantunji, T.**

*Dept of Aquaculture and Fisheries Management, FUNAAB, Abeokuta*

*farm incomes were ₦1,858,647.00 and ₦1,699,537.85 respectively. The benefit cost ratio (BCR) was 1.54 while the profitability index was 0.35. More than half (52.2%) of the fish farmers had high profitability level. The most severe constraints militating against fish farming as identified by most of the fish farmers were high cost of feeds, inadequate number of extension visits, high acquisition costs of fish farming equipment, high rate of inflation and poaching of cultured fish. It was further revealed that significant associations exist at  $p < 0.05$  between marital status ( $\chi^2 = 12.235$ ,  $df = 4$ ), other occupations ( $\chi^2 = 19.038$ ,  $df = 6$ ), mode of land acquisition ( $\chi^2 = 11.583$ ,  $df = 6$ ) and profitability of small scale fish farming among the participant fish farmers in the Ikorodu fish farm estate. It is concluded that fish farming was a profitable enterprise among the participant fish farmers. The study recommended that participant fish farmers should be trained by the programme management on means of producing local fish feeds using alternative feed inputs which are readily available within the communities.*

**Keywords:** Aquaculture, Fixed cost, Gross margin income, Net farm income, Profitability index

## INTRODUCTION

Nigeria is a maritime nation with a vast population of over 190 million people and a coastline measuring approximately 853 kilometres, fish production as an enterprise possesses the capacity to contribute significantly to the agricultural sector of Nigeria (Osagie, 2012). In Nigeria, fish supply is not distributed equally across the country and sometimes within the household. Rural population is especially prone to malnutrition and malnourishment as the majority of them are more likely

to be poor (NBS, 2018; Kalu and Etim, 2018). A large proportion of the populace including children, do not receive enough calories to ensure physical health and development. This is because, less than 7 of the 35 grams recommended by FAO are being consumed by Nigerians on the average (Britton, 2003; Oloyode, 2005). As a result of this, many Nigerians suffer from protein deficiency due to low protein intake. In order to meet up with domestic fish needs, Nigeria has become one of the largest importers of fish in the developing world, importing about 600,000 MT of fish annually (Tunde, Kuton, Oladipo and Olasukanmi, 2015).

According to Chilaka, Nwabeze and Odili (2014), the fishery industry is significant to the Nigerian economy in view of its roles in providing cheap source of food/nutrition, income generation, employment and serves as source of foreign exchange. Nigerians are high consumers and offer the largest market for fish and fisheries products in Africa. Fish farming has thus become an important venture in the quest for food security and eradication of malnutrition especially among infants (Awotide, 2012). However, despite the popularity of farming in Nigeria, the fish farming industry can best be described as being at the infant stage when compared to the large market potential for its production and marketing (Nwiro, 2012). Although aquaculture in Nigeria has the potential for satisfying the increased demand for protein and has been experiencing unprecedented growth during the last decade, questions regarding the sustainable development of the industry remain (Adeogun and Chukwuka, 2012).

According to Akinyemi (1998), fish is one of the best animal proteins because it is cheap and easily digestible. Fish provides a cheaper source of first class protein for human consumption when compared to other sources of animal protein such as cattle, pig, poultry which are more expensive (Moses, 1992). Proteins are the major structural components of all cells of the body and amino acids are the building blocks of protein. As far as the human body is concerned, there are two different types of amino acids: essential and non-essential amino acids. Non-essential amino

acids are amino acids that the body can create out of the chemicals found in the body. Essential amino acids cannot be created therefore, the only way to get them is through food. Protein contains approximately 22 amino acids, eight of which are essential because the body cannot produce them, but must be obtained from our food.

Fish farming activity in Nigeria started over 50 years ago with the establishment of a small experimental station at Onikan, Lagos State and an industrial farm of about 20 hectares at Panyam in Plateau state by the Federal Government of Nigeria (Olagunju, Adesiyani and Ezekiel, 2007).

This generated a lot of interest in fish farming leading to the involvement of other levels of government and some private establishments. In recent times, Nigeria has witnessed an unprecedented interest by entrepreneurs in fish farming. This is largely due to the scarcity of fish in the local markets in addition to the high export potentials of our local shell fish species in international markets.

Fish farming has great potentials for the production of high quality food suitable for domestic use and export. In view of the rising human population and demand for scarce and costly animal protein foods in the Lagos area, fish farming is considered an appropriate means of bridging the gap between demand and supply. Nigerian fish production by the artisanal sector as at 2015 was about 694,867 metric tonnes while aquaculture (fish farms) produced 316,727 metric tonnes and industrial, 15,464 metric tonnes (National Bureau of Statistics - NBS, 2017). Considering the increasing human population in the Lagos area, which in turn affects the demand for fish, fish farming is therefore a good tool for equilibrating the level of demand and supply.

The increasing gap between the demand and supply of fish within Lagos State led to the establishment of fish farm estates. The Ikorodu fish farm estate was one of the programs initiated by the Lagos State Depart-

ment of Fisheries when it realized the importance of rural communities in the development of the State's fisheries potentials and other rural based industries. The Ikorodu fish farm estate was one of such established in 2004 and as such there is a need to determine the profitability of fish farming in the estate in order to verify its necessity. The Lagos State government has boasted about the potentials and contribution of the farm estate to the state and national fish production in several of their publications (Okeowo, 2015). Since the establishment of the farm estate, little empirical studies made attempt at determining the profitability of fish farming among the participants of the programme. Most of the empirical studies on the Ikorodu Fish Farm Estate were not on how profitable the initiative has been to the participants. For instance, Olaoye, Odebiyi, Omoyinmi, Akintayo, Udolisa, Ezeri and Hundeyin-Agoro (2011) conducted their study on the socio-economic analysis of fish farming in the farm estate. It therefore becomes imperative to examine the profitability of fish farming among the participants in the fish farm estate. The specific objectives are to ascertain the socio-economic and production characteristics of the fish farmers; determine the profitability of fish farming among the fish farmers; and identify the constraints to profitable fish farming in Ikorodu fish farm estate. A hypothesis was tested on the association between socio-economic and production factors to profitability of the fish farming enterprise in the estate.

## **MATERIALS AND METHODS**

The study was conducted among fish farmers in the Ikorodu fish farm estate, Odogunyan, Ikorodu local government area, Lagos State, Nigeria. It is the first concrete Fish Farm Estate established on 34 hectares parcel of land in 2004. A total of 750 concrete tanks of 6m×4m×1m each were constructed on 262 plots. A random sampling technique was used to select a total number of 90 fish farmers which represented 45% of the total population of 199 participants in Ikorodu fish farm estate. Data were collected with questionnaire and analyzed using descriptive (frequency,

percentage, mean, standard deviation, mode), profitability ratios and Chi-square analytical techniques.

### Measurement of Key Variables

**Constraints to fish farming:** This was measured with a 19-item Likert type scale on a 3 point rating of Very severe, moderately severe and not severe constraints with scores of 2, 1 and 0 respectively. The mean score of 1.00 served as the decision point for determining which of the items were considered as either severe or not severe constraints by majority of the fish farmers. Items with scores greater than 1.00 were considered as severe constraints militating against small scale fish farming while those with scores lesser than 1.00 were considered otherwise.

**Profitability ratios:** Profitability ratios such as net farm income, benefit-cost ratio, and profitability index were used in determining the profitability of fish farming using cost-return analysis as discussed by authors (Olaoye and Odebiyi, 2011; Olaoye, Ashley-Dejo, Fakoya, Ikenweiwe, Alegbeleye, Ashaolu and Adelaja, 2013). The ratios are as presented below:

$$\text{NFI} = \text{GM} - \text{TFC} \dots \dots \dots \text{(i)}$$

$$\text{TC} = \text{TVC} + \text{TFC} \dots \dots \dots \text{(ii)}$$

$$\text{BCR} = \text{TR}/\text{TC} \dots \dots \dots \text{(iii)}$$

$$\text{TVC} = \text{P}_{xi} * \text{X} \dots \dots \dots \text{(iv)}$$

$$\text{TR} = \text{P}_y * \text{Y}_i \dots \dots \dots \text{(v)}$$

$$\text{PI} = \text{NFI}/\text{TR} \dots \dots \dots \text{(vi)}$$

$$\text{GMI} = \text{TR} - \text{TVC} \dots \dots \dots \text{(vii)}$$

Where:

NFI = Net farm income (₦)

TC = Total cost (₦)

BCR = Benefit cost ratio

TVC = Total variable cost (₦)

TFC = Total fixed cost (₦)

TR = Total revenue (₦)

PI = Profitability index (Net profit margin)

GMI = Gross margin index

$P_y$  = unit price of output produced (₦)

Y = Quantity of output produced (kg)

$P_{xi}$  = Unit price of variable inputs used (₦)

X = Quantity of variable inputs used (kg)

## **RESULTS AND DISCUSSION**

### **Socio-economic characteristics of fish farmers in Ikorodu farm estate**

The socio-economic characteristics of the fish farmers in the Ikorodu fish farm estate are presented in Table 1. It reveals that 28.9% of the fish farmers were not older than 30 years while 37.8% and 23.3% were in the 31-40 and 41-50 years age brackets respectively. The mean age was

found as  $40.27 \text{ years} \pm 12.83$  indicating that most of the participating fish farmers in the estate were within the economically active population and therefore constitute a good labour force for the fish farming industry (Olawumi, Dipeolu and Bamiro, 2010). Majority (93.3%) of the fish farmers were male implying that fish farming was dominated by males thus justifying Brummett, Youaleu, Tiyani and Kenmegle (2010) who asserted that fishery activities are mostly dominated by men. More than half (55.6%) were married while 36.7% were single. This could mean that fish farming has been a reliable means of livelihood that fish farmers could use in meeting their family needs as marriage confers some level of responsibility and commitment on married persons (Oladoja, Adedoyin and Adeokun, 2008).

Data on level of education presented in Table 1 show that more than half (54.4%) of the fish farmers had tertiary education while 6.7% had no formal education. This is an indication that most of the fish farmers had a high level of education. The possession of higher level of educational qualifications could make the fish farmers better equipped to understand improved farming practices for fish production towards enhancing their productivity. Furthermore, 56.7% of the fish farmers had household sizes ranging from 1 to 5 while 43.3% had household sizes of 6-10 with the mean household size being  $6 \text{ persons} \pm 2$ . The implication of this is that the fish farmers had relatively small household size with a low probability level of accessing labour through the household members. This may increase the number of hired labour used in the fish farming business (Adegbite and Oluwalana, 2004; Adegbite, Oloruntoba and Olaoye, 2008).

The results also revealed that more than half (55.6%) of the fish farmers had no other occupations aside from fish farming. This could imply that fish farming had been a profitable enterprise among fish farmers in the Ikorodu fish farm estate. This is however contrary to earlier assertions that it is almost impossible to see a farmer engaged in a single enterprise. According to Olaoye (2010), cooperative society is a social participation that helps farmers to pool their resources in order to have access to fish-



eries inputs and have insights in their fishing issues. A higher proportion (63.3%) of the fish farmers were non-members of cooperative societies implying that fish farming is likely to be constrained by credit facilities. This is because most cooperative societies offer credit services to her members. Also, fish farmers in a group such as cooperative societies could have better access to training programmes on improved fish farming techniques than those who were non-members.

**Table 1: Socio-economic characteristics of fish farmers in Ikorodu fish farm estate**

<b>Socio-economic variables</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Mean</b>	<b>Standard deviation</b>
<b>Age (years)</b>				
d”30	26	28.9	40.27	12.83
31-40	34	37.8	year	
41-50	21	23.3		
51-60	7	7.8		
e”60	2	2.2		
<b>Sex</b>				
Female	6	6.7		
Male	84	93.3		
<b>Marital status</b>				
Married	50	55.6		
Single	33	36.7		
Divorced	4	4.4		
Widowed	3	3.3		

<b>Socio-economic variables</b>	<b>Frequency</b>	<b>Percentage</b>	<b>Mean</b>	<b>Standard deviation</b>
<b>Age (years)</b>				
<b>Level of education</b>				
No formal education	6	6.7		
Primary education	4	4.4		
Secondary education	31	34.4		
Tertiary education	49	54.4		
<b>Household size</b>				
1-5	51	56.7	6 persons	2 persons
6-10	49	43.3		
<b>Other occupations</b>				
Civil servant	23	25.6		
Artisans	8	8.9		
Trading	9	10.0		
None	50	55.6		
<b>Membership of cooperative societies</b>				
Non-member	57	63.3		
Member	33	36.7		

### **Production characteristics of the fish farmers in Ikorodu fish farm estate**

Table 2 shows that most (63.3%) of the fish farmers were new entrants into the fish farming business spending at most 5 years while additional 26.7%

had 6-10 years of fish farming experience. The means that fish farming experience was 5.16 years $\pm$ 2.94. This could be associated with the fact that the programme had made youths irrespective of their educational background to be engaged in fish farming. The findings were in agreement with the report of Tihamiyu, Fakoya, Olaoye, Ashimolowo and Ojebiyi (2015) which noted that most of the fish farmers were new entrants. The study also attributed the prevalence of the new entrants in aquaculture to new government programmes such as Fadama projects. There is therefore the likelihood that the fish farmers may have little practical experience to combat the challenges involved in fish production and this could influence their farm management decisions as well as productivity.

Majority (86.7%) of the fish farmers operated on a full time basis and this may explain why most of the fish farmers had no other occupation. This implies also that the farmers would most likely be interested in acquiring knowledge and skills that could improve their productivity. The findings also indicated that fish farming could be considered as both a part time and full time business by different categories of people. All (100.0%) of the fish farmers cultured the *Clarias* species while only 6.7% also cultured *Tilapia* species. Other studies within South-western states of Nigeria (Adewuyi, Phillip, Ayinde and Akerele, 2010; Olaoye, Ashaolu, Idowu, Akintayo and Talabi, 2011; Olaoye, Ashley-Dejo, Fakoya, Ikeweinwe, Alegbeleye, Ashaolu and Adelaja, 2013; Tihamiyu *et al.*, 2015; Olaoye, Mathew, Ojebiyi and Nwekoyo, 2017) also reported the culture of *Clarias sp.* among fish farmers. This could imply that *Clarias* species are the most preferred fish species within the study area as a result of several factors such as early maturity, efficient feed conversion ratio, high market value and preference by consumers which are advantages the species have others. All (100.0%) of the fish farmers made use of the concrete tank culture system. In addition to the use of concrete tanks, 22.2% and 20.0% used wooden vat and tarpaulin respectively. The provision of concrete tanks in the farm estate explains why all the fish farmers used the concrete tank culture system.

Land is a vital resource for fish production especially for fish farmers with concrete, earthen, embankment and diversion pond types. Results revealed that lease/rent was the dominant mode of land acquisition among 60.0% of the fish farmers, 30.0% claimed to have purchased their production lands while the remaining acquired land either through inheritance (3.3%) or gifts (6.7%). Also, majority (86.7%) of the fish farmers were residing within the farm estate. This group are likely to be those who had no other occupation aside from the fish farming business while those who had other occupations or took fish farming as a part time job are not likely to reside within the estate. Residing within the farm estate is a good development as it facilitates better monitoring opportunities for the fish farmers and enhances the effective management of fish production.

**Table 2: Production characteristics of the fish farmers in Ikorodu fish farm estate (n = 90)**

Production variables	Frequency	Percentage	Mean	Standard deviation
<b>Fish farming experience (years)</b>				
d'5	57	63.3	5.16	2.94 years
6-10	24	26.7		years
e'10	9	10.0		
<b>Mode of operation</b>				
Full time	78	86.7		
Part time	12	13.3		
<b>Fish species cultured</b>				
Clarias sp.	90	100.0		
Tilapia sp.	6	6.7		
<b>Culture systems</b>				
Plastic tankConcrete tank	3	3.3		
Wooden vat Tarpaulin	90	100.0		

**Mode of land acquisition**

Inheritance	3	3.3
Gift	6	6.7
Lease/rent	54	60.0
Purchase	27	30.0

**Fish farmers' residence****to fish farm**

On farm	78	86.7
Very close by	9	10.0
Far from the farm	3	3.33

**Profitability analysis of small scale fish farming**

The cost and return structure of small scale fish farming among the fish farmers in the Ikorodu fish farm estate is presented in Table 3. It reveals that only 5.08% of the total cost of production per annum was expended on fixed items while the variable items accounted for 94.92% of the total cost of production. It was further observed from Table 3 that more than half (57.04%) of the total cost of production was expended on fish feeds while fish seeds accounted for 18.66% of the total cost.

From Table 3, results revealed that the total cost and revenue were ₦3,134,962.15 and ₦4,834,500.00 respectively. The gross margin and net farm incomes were ₦1,858,647.00 and ₦1,699,537.85 respectively. The benefit cost ratio (BCR) was 1.54 while the profitability index was 0.35. All these are indicators that small scale fish farming in Ikorodu fish farm estate was a profitable enterprise. Awoyemi and Ajiboye (2011) also reported a positive gross margin among women fish farmers in Osun State, Nigeria.

**Table 3: Cost and return structure**

<b>Items</b>	<b>Cost</b>	<b>% of Total Cost</b>
<b>Fixed items</b>		
Land purchase/rent	34,500.00	1.10
Water pump	17,290.00	0.55
Pond/tank construction	37,000.00	1.18
Plumbing	2,960.00	0.09
Borehole/deep well	10,000.00	0.32
Water container	6,110.00	0.19
Building/shed	1,980.00	0.06
Generator	8,090.00	0.26
Net fencing	2,800.00	0.09
Harvesting net	2,232.65	0.07
Permanent labour	32,500.00	1.04
Wheel barrow	1,207.72	0.04
Spade/shovel	1,563.81	0.05
Steel cutlass	599.30	0.02
Steel knife/file	275.67	0.01
<b>Total fixed cost (TFC)</b>	<b>159,109.15</b>	<b>5.08</b>

---

<b>Items</b>	<b>Cost</b>	<b>% of Total Cost</b>
<b>Variable items</b>		
Fish seeds	584,950.00	18.66
Lime	535.00	0.02
Fertilizer/manure	650.00	0.02
Bowls/bucket	23,540.00	0.75
Land/pond/tank preparation	10,680.00	0.34
Fish feed	1,788,198.00	57.04
Migrant labour	12,680.00	0.40
Drug and medication	13,270.00	0.42
<b>Items</b>	<b>Cost</b>	<b>% of Total Cost</b>
Transportation and handling charges	7,350.00	0.23
Fuel	534,000.00	17.03
<b>Total variable cost (TVC)</b>	<b>2,975,853.00</b>	<b>94.92</b>
<b>Total cost (TC)</b>	<b>3,134,962.15</b>	<b>100.00</b>
<b>TR</b>	<b>4,834,500.00</b>	
<b>Gross margin income</b>	<b>1,858,647.00</b>	
<b>Net farm income</b>	<b>1,699,537.85</b>	
<b>Benefit cost ratio (BCR)</b>	<b>1.54</b>	
<b>Profitability index (PI)</b>	<b>0.35</b>	

### Profitability levels of small scale fish farming

Entries in Table 4 reveal that more than half (52.2%) of the fish farmers had high profit level higher than ₦1,000,000, 41.1% had low profit level while 6.7% recorded some losses. This means that majority of the participant fish farmers were able to break-even and had some profits at different levels. Hence, fish farming could be said to be a profitable enterprise among participant fish farmers in the Ikorodu fish farm estate.

**Table 4: Profitability levels of fish farming in Ikorodu fish farm estate**

Profitability levels	Frequency	Percentage
No profit (loss) (TR<TC)	6	6.7
Low profitability level (d"₦1,000,000)	37	41.1
High profitability level (>₦1,000,000)	47	52.2

### Constraints to small scale fish farming

Various factors which affect fish farming in the study area were rated according to the degree of severity. The results in Table 5 show that most of the fish farmers identified poaching of cultured fish (56.7%), high inflation rate (50.0%), high acquisition cost/lack of fish farming equipment (53.3%), high cost of fish feed (85.6%), and inadequate number of extension visits (50.0%) as very severe constraints militating against fish production in Ikorodu fish farm estate.



**Table 5: Constraints militating against fish production**

Constraints to fish farming	Level of severity			Mean
	Very severe	Moderately		
		severe	Not severe	
Lack of suitable land	6 (6.7)	0 (0.0)	84 (93.3)	0.13
Inefficiency of labour	18 (20.0)	12 (13.3)	60 (66.7)	0.53
Poaching of cultured fish	51 (56.7)	12 (13.3)	27 (56.7)	1.27
Disease and predators	9 (10.0)	24 (26.7)	57 (63.3)	0.58
High rate of inflation	45 (50.0)	27 (30.0)	18 (20.0)	1.30
High acquisition cost of fish farming equipment	48 (53.3)	24 (26.7)	18 (20.0)	1.33
Marketing of fish and fish products	6 (6.7)	15 (16.7)	69 (76.7)	0.30
Poor quality fish seed sourced	0 (0.0)	21 (23.3)	69 (76.7)	0.23
Poor genetic broodstock fish	9 (10.0)	0 (0.0)	81 (90.0)	0.20
High cost of fish feed	77 (85.6)	12 (13.3)	1 (1.1)	1.8
Unfavourable government policies	12 (13.3)	27 (30.0)	51 (56.7)	0.57
Unfavourable climatic problems	0 (0.0)	0 (0.0)	90 (100.0)	0.00
High mortality rate	9 (10.0)	48 (53.3)	33 (36.7)	0.73
High repair and maintenance costs of fish farming equipment	15 (16.7)	51 (56.7)	24 (26.7)	0.90
Inadequate fish storage facilities	0 (0.0)	35 (38.9)	55 (61.1)	0.39
Inadequate finance (capital and credit)	30 (33.3)	12 (13.3)	48 (53.3)	0.80
Lack of training on fish farming	9 (10.0)	18 (20.0)	63 (70.0)	0.40
Inadequate number of extension agents visits	45 (50.0)	33 (36.7)	12 (13.3)	1.37
Technical skill and knowledge	9 (10.0)	6 (6.7)	75 (83.3)	0.27

Additionally, high mortality rate and high repair and maintenance costs of fish farming equipment were considered as moderately severe constraints militating against fish production by 53.3% and 56.7% of the participant fish farmers respectively. These findings were in tandem with those of Adebayo and Daramola (2013) and Adewumi *et al.* (2012) which reported poaching as one of the major constraints in the Ibadan metropolis, Oyo and Kwara States respectively. Sadiq and Kolo (2015) also reported that scarcity of quality brooding stocks, paucity of capital and high costs of feeds were the major constraints encountered by fish farmers. Akpabio and Inyang (2007) also identified inadequate supply of fish fingerlings, and the high cost of fish pond establishment as the major constraints affecting aquaculture development in Akwa Ibom State, Nigeria.

#### **Socio-economic/production characteristics and profitability level of fish farmers**

Table 6 reveals that, significant associations exist at  $p < 0.05$  between marital status ( $\chi^2 = 12.235$ ,  $df = 4$ ), other occupations ( $\chi^2 = 19.038$ ,  $df = 6$ ), mode of land acquisition ( $\chi^2 = 11.583$ ,  $df = 6$ ) and profitability of small scale fish farming among the participant fish farmers in the Ikorodu fish farm estate. The implication of these findings is that married fish farmers who had no other occupation and acquired lands through lease and/or purchase had higher profits than their counterparts.

**Table 6: Association between fish farmers' socio-economic/production characteristics and profitability of fish farming**

<b>Socio-economic characteristics</b>	<b>÷<sup>2</sup>-Value</b>	<b>df</b>	<b>p-value</b>
Sex	1.607	2	0.448
Marital status	12.235	4	0.016
Education	8.682	12	0.730
Mode of fish farming operation	3.462	2	0.177
Other occupations	19.038	6	0.004
Mode of land acquisition	11.583	6	0.043
Member of cooperative society	0.646	2	0.724

## **CONCLUSION AND RECOMMENDATIONS**

The findings from this study indicated that fish farming within the Ikorodu fish farm estate was a profitable enterprise with varied profitability levels which are associated with the fish farmers' marital status, other occupations, and mode of land acquisition. The enterprise was constrained with high costs of fish feeds and acquisition of fish farming equipment, high inflation rate as well as poaching. It is therefore recommended that participant fish farmers should be trained on means of producing local fish feeds using alternative feed stuffs, such as the brewers' waste and leftover food from restaurants, which are readily available all year round. In the same vein, the state government is encouraged to provide the farmers with subsidized inputs such as fish feeds and seeds. The fish farm estate should be provided with better security from the poaching activities of humans. Training programmes and seminars should be organized by the management of the fish farm estate for the fish farmers on best practices associated with modern fish production techniques that could lead to optimally profitable and sustainable aquaculture development within the study area.

**REFERENCES**

- Adebayo O. O. and O. A. Daramola, 2013. Economic Analysis of Catfish (*Clarias gariepinus*) Production in Ibadan Metropolis. *Discourse Journal of Agriculture and Food Sciences*, 1(7): 128-134.
- Adegbite D. A. and E. O. Oluwalana, 2004. Involving Loan Scheme as a Poverty Allegation Strategy: A Case Study of Women Groups in UNAAB Extension Villages. *Faman Journal*, 7(2): 18-32.
- Adegbite D. A., Oloruntoba, A. O. and O. J. Olaoye, 2008. Performance Assessment of Ogun State Agricultural and Multi-purpose Credit Agency (OSAMCA) in Credit Delivery and Operation (2004-2006). *Journal of Sustainable Development in Africa*, 10(3): 127-153.
- Adeogun A. O. And A. V. Chukwuka, 2012. Altered Reproduction in *Clarias Gariepinus* Exposed to Industrial Effluents. *American Journal of Agricultural and Biological Sciences*, 7(1): 61-70.
- Adewumi M. O., Ayinde O. E., Adenuga A. H. and S. T. Zacchaeus, 2012. The Profitability Analysis of Artisanal Fishing in Asa River of Kwara state, Nigeria. *International Journal of Development and Sustainability*, 1(3): 932-938.
- Adewuyi S. A., Phillip B. B., Ayinde I. A. and D. Akerele, 2010. Analysis of Profitability of Fish Farming in Ogun State, Nigeria. *Journal of Human Ecology*, 31(3): 179-184.
- Akinyemi O., 1998. Sustainable Management of Nigeria's Fisheries in the 21<sup>st</sup> Century. *Series No. 7*: 12-17.

- Akpabio I. A. and E. B. Inyang, 2007. Major Constraints Affecting Aquaculture Development in Akwa Ibom State, Nigeria. *African Journal of Aquatic Science*, 32(1): 45-50.
- Awotide B. A., 2012. Poverty and Inequality among Fish Farming Households in Oyo State. *Nigeria Agricultural Journal*, 7(3): 111-121.
- Awoyemi T. T. and A. J. Ajiboye 2011. Analysis of Profitability of Fish Farming among Women in Osun State, Nigeria. *Journal of Economics and Sustainable Development*, 2(4): 1-8.
- Brummett R. E., Youaleu J. L. N., Tijani A. M. and A. O. Kenmegle, 2010. Women's Traditional Fishery and Alternative Aquatic Resource Livelihood Strategies in the Southern Cameroonian Rain Forest. *Fisheries Management and Ecology*, 17: 221-230.
- Chikala Q. M., Nwabeze G. O. and O. E. Odili, 2014. Challenges of Inland Artisanal Fish Production in Nigeria: Economic Perspective. *Journal of Fisheries and Aquatic Science*, 9(6): 501-505.
- Kalu R. E. and K. D. Etim, 2018. Factors Associated with Malnutrition among Under-five Children in Developing Countries: A review. *Global Journal of Pure and Applied Sciences*, 24: 69-74.
- Moses B. S., 1992. *Introduction to Tropical Fisheries/UP/UNESCO-ICSU*. University Press, Paris. 117pp.
- National Bureau of Statistics – NBS, 2007. NBS Official Gazette (FGP 71/52007/2,500(OL24). Legal notice on Publication of the Details of the Breakdown of the National and State Provisional totals, 2006 census. [www.nigerianstat.gov.ng](http://www.nigerianstat.gov.ng) accessed on 28th October, 2011.

- National Bureau of Statistics – NBS, 2018. Report on the Nutrition and Health Situation of Nigeria 2018. 153p.
- Nwiro E., 2012. *Fish Farming: A Lucrative Business*. Accessed online on 20<sup>th</sup> October, 2012 from <http://www.thisdaylive.com/articles/fish-farming-a-lucrative-business/119253/>
- Okeowo T. A. 2015. Economics of Fish Farming among Estate and Non-estate Fish Farmers in Ikorodu area of Lagos State. Available on [researchgate.net](http://researchgate.net)
- Oladoja M. A., Adedoyin S. E. and O. A. Adeokun, 2008. Training Needs of Fisher Folks on Fishing Technology. *Journal of Food Agriculture and Environment Science and Technology*, 6(1): 195-198.
- Olagunju F. I., Adesiyun I. O. and A. A. Ezekiel, 2007. Economic Viability of Catfish Production in Oyo State Nigeria. *Journal of Human Ecology*, 21(2): 121-124.
- Olaoye O. J. and O. C. Odebiyi, 2011. Economic Viability for the Use of Micro-Finance Bank Loan on Aquaculture Development in Ogun State, Nigeria. *International Journal of Fisheries and Aquaculture*, 3(4): 70-77.
- Olaoye O. J., 2010. Dynamics of the Adoption Process of Improved Fisheries Technologies in Lagos and Ogun States, Nigeria. A Ph.D Thesis Submitted to the Department of Aquaculture and Fisheries Management, University of Agriculture, Abeokuta, Ogun State, Nigeria. 337pp.
- Olaoye O. J., Ashaolu O. F., Idowu A. A., Akintayo I. A. and J. O. Talabi, 2011. Determinants of Demand for Ogun State Agricul-

tural and Multipurpose Credit Agency (OSAMCA) Loans among Fish Farmers in Ogun State, Nigeria. *Journal of Sustainable Development in Africa*, 13(4): 1-16.

Olaoye O. J., Ashley-Dejo S. S., Fakoya E. O., Ikenweibe N. B., Alegbeleye W. O., Ashaolu F. O. and O. A. Adelaja, 2013. Assessment of Socio-economic Analysis of Fish Farming in Oyo State, Nigeria. *Global Journal of Science Frontier Research*, 13(9): 41-45.

Olaoye O. J., Mathew C. T., Ojebiyi W. G. and V. E. Nwekoyo, 2017. Assessment of Benefits Derived from Students' Industrial Work Experience Scheme (SIWES) among Fish Farmers in Ogun State, Nigeria. *Nigerian Journal of Fisheries and Aquaculture*, 5(2): 96-103.

Olaoye O. J., Odebisi, O. C., Omoyinmi, G. A. K., Akintayo, I. A., Udolisa, R. E. K., Ezeri, G. N. O. and O. C. Hundeyin-Agoro, (2011). The Socio-economic Analysis of Small Scale Fish Farmers in Lagos State Fish Farm Estate, Ikorodu, Nigeria: An Appraisal. Proceedings of the 26<sup>th</sup> Annual Conference and Fair of the Fisheries Society of Nigeria (FISON). Pp. 214-222.

Olawumi A. T., Dipeolu A. O. and O. M. Bamiro, 2010. Economic Analysis of Homestead Fish Production in Ogun State, Nigeria. *Journal of Human Ecology*, 31(1): 13-17.

Oloyode O. I., 2005. Chemical Profile of Unripe Pulp of *Carica Papaya*. *Pak Journal of Nutritional*, 4(6): 379-381.

Osagie C., 2012. Aquaculture as Path to Thriving Agriculture. Accessed online 5<sup>th</sup> October 2012 from <http://www.thisdaylive.com/articles/aquaculture-as-path-to-thriving-agriculture/124614/>

- Sadiq M. S. and M. D. Kolo, 2015. Problems' and Prospects of Small-Scale Fish Farming in Minna Agricultural Zone of Niger State, Nigeria, and its Implications on Increased Fish Food Security. *International Journal of Agricultural Research and Review*, 3(2): 157-160.
- Tiamiyu S. A., Fakoya E. O., Olaoye O. J., Ashimolowo O. R. and W. G. Ojebiyi, 2015. Assessment of the Effect of National Fadama Development Project (Fadama II) on Fish Farming in Lagos State, Nigeria. *Ibadan Journal of Agricultural Research*, 11(2): 56-65.
- Tunde A. B., Kuton M. P., Oladipo A. A. and L. H. Olasukanmi, 2015. Economic Analysis of Cost and Return of Fish Farming in Saki-East Local Government Area of Oyo State, Nigeria. *Journal of Aquaculture Resources Development*, 6(2): 306-310.