Investigation of Sources of Micro-Credit, and Profitability of Fish Farming in Eriwe Fish Farm Estate, Ijebu-Ode, Ogun State, Nigeria

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Abstract

This study investigated the sources of credit used by fish farmers in their production activities vis-à-vis the profitability of fish farming in Eriwe fish farm estate, Ijebu-Ode, Ogun State, Nigeria. This was done through the random sampling of 80 out of 150 fish farmers and 10 out of 74 fish farmers' groups in Eriwe fish farm estate. Data were collected with pre-validated interview guide and analysed using inferential statistics, budgetary analysis and Chi-square analytical technique. The findings revealed that the fish farmers had mean age of 47.08±9.07 years, and a mean household size of 7 persons; 71.25% of the respondents were married, while 55.0% of them had secondary education. The fish farmers sourced production credit mainly from personal savings, asusu, ajo, loans from friends and IDIPR. The mean fish farming experience, number of ponds operated, culture periods, and distance to fish farms were 6.56±2.49 years, 3 ponds, 6.15±0.39 months, and 3.34±1.30km respectively. Also, majority operated on leased/rented lands (91.25%), sourced fish seeds from known hatcheries (90.0%), and used weighing scales for selling fishes (100.0%). The study also deduced that the gross margin and net farm incomes were ₦605,287.50 and ₦503,611.58 respectively. The benefit-cost ratio and return on investment were 1.32 and 0.32 respectively. Significant associations were found between the profitability level of fish farming and credit sources such as personal savings (χ^2= 18.05, p = 0.011), esusu (χ^2= 11.63, p = 0.020), ajo (χ^2 = 29.92, p = 0.004), and IDIPR (χ^2 = 68.76, p = 0.001). It was therefore concluded that fish farming is a profitable business in Eriwe fish farm estate and recommended among other things that unemployed youths should venture into fish farming as a means of wealth creation and employment generation.

Keywords: Micro-credit, Loan, *Esusu*, Fish farming, Eriwe, Fish farm estate

Introduction

Nigeria is still generally considered as an agrarian economy despite the country's reliance on the oil sector for her revenue, as agriculture remains the mainstay of the nation's economy. It provides about 70 percent of the nation's population, especially those in the rural areas, with employment opportunities, and acts as a source of food for the nation's teeming population (Ogen, 2007; CBN, 2010). The fishery subsector plays a notable role in the Nigerian economy as it continuously ranks third after the crop and livestock subsectors which ranked first and second respectively in terms of contribution to the gross domestic product – GDP (Bassey *et al.,* 2014). Aquaculture, which is the rearing of aquatic organisms including fish under controlled environment for the benefit of mankind, is the fastest growing livestock industry in the world (FAO, 2009; Ozigbo *et al.,* 2014). Fish farming is therefore a subset of aquaculture.

In Nigeria, the demand for fish is being met through two main sources which are domestic production and importation from foreign countries. The domestic production is from artisanal, industrial and culture fisheries with artisanal fisheries accounting for as much as 85% of total fish production, while industrial and culture fisheries accounted for 1% and 14% respectively. Due to the insufficiency of domestic production of fish, importation of fish and fish products accounts for more than half of fish supply in the country. With 23,031 tonnes of fish imports, Nigeria remains the highest importer, accounting for 46% of Third World Countries' exports (49,000 tonnes) from Ireland in 2015 (Sea-Fisheries Protection Authority – SFPA, 2016). Nnabugwu (2016) reported that the Minister of Transport, Mr Rotimi Amaechi, has said that the country spends a total of $2 billion annually to import agricultural products into the country. According to Nnabugwu (2016), fish is one of the large imports of food products in Nigeria. This does not position Nigeria as a great nation that it ought to be in Africa as well as globally in terms of agricultural development, rural development and sustainable national development.

As the fastest growing sector of the livestock industry, aquaculture has the potential to make Nigeria a fish exporting country after meeting the protein needs of Nigerians through increased fish production. This is because Nigeria is favoured with climatic and environmental endowments that support culture fisheries. As at July 23, 2017, Nigeria was the most populous country in Africa and seventh in the world with a population of over 192 million persons (Countrymeters, 2017). In terms of age structure, more than half (55.9%) of the population were persons aged 15 to 64 years which constitute the working population of the nation (Countrymeters, 2017). With this population, the unemployment and underemployment rates (especially of youths – 15 to 34 years) are increasing. For instance, the Nigerian unemployment and underemployment rates were 25.2% and 15.4% for persons aged 15-24 and 25-34 years respectively as against the world's rates of 12.4% and 8.0% respectively (NBS, 2017). This ugly scenario will not seize to persist if the human and non-human endowments of the nation are not harnessed. Ogunbiyi (2012) also recommended that young population can be an asset if investment in Nigerian youths is prioritized through provision of education, jobs, infrastructure and health care. Aquaculture is therefore an enterprise where the energy of the youths' population could be harnessed with improved technologies as well as the enabling environmental factors that could lead to a Nigeria that will export a great deal of her fish aquatic products after meeting the domestic need. If this is done, then the nation's high population will cease to be a burden on the country and, instead, be a blessing through improved productivity for self-sufficiency. It is disheartening however those nations where Nigeria's imports come

from are not as divinely blessed as the country in terms of total land area, suitable agricultural land area, water resources, rurality, and active work force population.

Eriwe fish farm estate in Ijebu-Ode is one of the new locations in Ogun State, Nigeria where the youths and people of other age categories have been involved in fish production through the formation of groups. In fact, fish farming and other fish-related activities serve as major means of livelihood to the residents in Eriwe fish farm estate. Annual reports of the farm also indicated that fish production output has increased tremendously over the years (Adeniyi, 2016).

Despite the increased productivity of fish farmers in the estate, the fish needs of the people of Ijebu-Ode are yet to be met. This implies that more still needs to be done by the fish farmers but they are constrained by sustainable sources of financing their fish farming business. Traditionally, fish farmers do source production finances through personal savings, loans from money lenders, friends, relatives, and neighbours (Alabi *et al.*, 2015; Oladele *et al.*, 2014; Isaac and Alfred, 2014; Leon, 2009) which are mainly the informal means of financing businesses, due to the absence of bureaucratic procedures as compared with the formal financial sources such as loans from commercial, merchant, development and even microfinance banks.

In the study area, the Ijebu Development Initiative for Poverty Reduction (IDIPR) and other groups have been a major source of support to fish farmers through the provision of micro-credit with a view to developing Eriwe Fish farm estate, Ijebu-Ode. However, there have been few empirical findings on the profitability of the fish farm estate especially in the light of micro-credit provision. It is therefore important to conduct a survey that will examine the profitability of fish farming among the fish farmers in Eriwe fish farm estate with a view to finding out if the different financial sources that the fish farmers used for credit demands have any significant effect on the profitability of fish farming.

The specific objectives were to determine the production characteristics of the fish farmers; identify the different sources of credit used by the fish farmers; determine the gross margin ratio of fish farming; and identify the constraints facing credit demands among the fish farmers in the study area. It also tested the hypothesis that there was no significant association between the different sources of credit to fish farmers and their profitability levels.

Materials and Methods

The Study Area

This study was conducted at Eriwe fish farm estate which is located in Ijebu-Ode, Ogun State. In Ijebu, Eriwe means "Eri Iwe" "bathing water or stream" (Nigerian Best Forum - NBF, 2013). It was a village formed between 1300 and 1400 AD. Oral tradition says that in 1492 some Brazilians who came to trade at Ejinrin market bathed at Eriwe before proceeding to Ijebu-Ode (NBF, 2013). The bank of the stream later became the venue for celebration of Easter. In 1962, the western Regional Government acquired it for a farm settlement, but because of its large water reserve, it was kept as a water reservoir, with plans to convert it into a man-made lake. By 2002, Ijebu Development Initiative for Poverty Reduction (IDIPR) obtained government's permission to convert 50 of the 156 hectares of the land to fish ponds, through co-operative schemes. Later, another 50 hectares was released, until the balance of 56 hectares was released.

Agape and Bethel were the pioneers of the current 74 co-operatives (Adeniyi, 2016). Between 2002 and 2012, the scheme had sold fish worth about ₦750 milion (NBF, 2013). As at today, Eriwe fish farm village has grown tremendously in assets, buildings, and productivity. The assets include: 67 concrete fish tanks, 2,432 earthen (dugout) fish ponds, 346 boreholes, a smoking kiln, and several pumping machines.

The fish farm village started with 6 cooperative groups and 105 stakeholders but now has 74 groups and 1338 stakeholders with yield growing from 285 metric tonnes in 2006 to 2100 metric tonnes of fish in 2015 (Adeniyi, 2016). In addition, there is a modern feed mill, six modern poultry pens, a fish hatchery, three piggery pens and a hundred bee-hives. To access credit from Ijebu Development Initiative for Poverty Reduction (IDIPR), a prospective fish farmer must have at least one third of the resources needed to properly set up a pond (NBF, 2013).

Study Population

The targeted population of this study included all the farmers (male and female) that are involved in fish farming activities in Eriwe, Ijebu–Ode ~~ode~~ Agricultural extension zone of Ogun state.

Sampling Procedure

This study involved a two-stage sampling procedure with stage one entailing the random sampling of 10 out of the 74 groups of fish farmers within the fish farm estate. The second stage involved the random selection of 50% of the fish farmers who owned fish farms from the sampled groups. This yielded a total of 80 fish farmers which was the sample size for this study. The sampling frame of 158 fish farmers was obtained from the list supplied by Ogun State Agricultural Development Programme (OGADEP) and Ijebu Ode Development Board on Poverty Reduction (IJDBPR).

Data Collection Instrument and Procedure

The research instrument used in eliciting information from the selected fish farmers was the interview guide which was pre-validated and also tested for its reliability via the test-re-test approach. The validated interview guide was then administered on the selected fish farmers by the researcher and a trained research assistant. The reliability coefficient of the scales which made up the interview guide ranged from 0.78 to 0.92 which implies the research instrument was reliable and then suitable for the collection of data. The interview guide consisted of four sections on the fish farmers' socio-economic characteristics, sources of micro credit, production characteristics, and profitability of fish farming.

Measurement of Key Variables

i. Socio-economic Characteristics

Age was measured at interval level by obtaining the specific age of the respondents and categorizing it into equal ranges of 21 – 30 years, 31 – 40 years, 41 – 50 years, 51 – 60 years and >60 years during data entry. Marital status was measured at nominal level in the following categories: single = 1, married = 2, widowed = 3 and divorced = 4. Educational background was measured at ordinal level as the highest level of education attained by the fish farmers

categorized as: no formal education = 1, adult education = 2, primary education = 3, secondary education = 4, and tertiary education = 5. Household size was measured at interval level as the actual number of persons living and feeding under the same roof, and the responses were categorized as 1 – 5 = 1, 6 – 10 = 2, and > 10 = 3.

ii. Sources of Micro Credit

A scale was developed for the purpose of this study on the sources of micro credit used by the fish farmers in their fish farming enterprise. The scale consisted of 7 items which were personal savings, loans from friends, loans from money lenders, traditional cooperation, *esusu, ajo*, and IDBPR measured nominally as Yes or No.

iii. Production Characteristics

Fish farming experience was measured at interval level as the actual number of years that the fish farmers had been in fish farming and this was categorized into 1-5 years = 1, 6-10 years = 2, and >10 years = 3 for data analysis purposes. Mode of land acquisition was measured nominally as the means through which the fish farmers acquired their fish farms with options as inheritance, gift, lease or rent, and purchase. Sources of fish seeds were measured at nominal level as from the wild = 1, own farm = 2, and known hatcheries = 3. Number of fish ponds was measured at interval level and the response categorized with their corresponding values as follows: 1 – 3 ponds = 1, 4 – 6 ponds = 2, 7 – 9 ponds = 3, 10 – 12 ponds = 4 and 13 – 15 ponds = 5. Culture period was measured at interval level as the period between fish stocking and fish harvesting in months. Farm distance was measured at interval level as the distance from the fish farmers' residence to their farms in the nearest kilometre.

iv. Profitability of Fish Farming

This was measured through the cost and return analysis of the budgetary analytical technique. Profitability ratios such as Net farm income - NFI, Gross margin - GM (Olukosi and Erhabor, 1988; Adebayo and Daramola, 2013) and Benefit-Cost Ratio – BCR (Andem *et al.*, 2011) were calculated from the cost and return structure.

The mathematical expressions are stated as follows:

Net farm income (NFI) =Profit (π) =TR-TC……..i
Gross margin (GM) = TR - TVC ……..…… ii
Benefit cost ratio (BCR) = TR/TC ……..……..iii
Return on investment (ROI) = NFI/TC…….……iv
Where TC = Total cost = TFC + TVC; TR = Total Revenue (₦) = Output (Y) X Price (Px), TVC = Total Variable Cost (₦), TFC = Total Fixed Cost (₦), and BCR = Benefit cost ratio.

Fish farming is profitable on conditions that TR>TC, BCR>1, ROI>0.00, Net farm income = positive and Gross margin = positive.

Method of Data Analysis

Data obtained from field in 2013 fish culture period were checked for omission, outliers, and inconsistencies before being entered into the Statistical Package for Social Sciences (SPSS) version 17.0 for data analysis. The probability was set *a priori* at 5% level. Data were analysed

with descriptive and inferential statistics. The descriptive statistics used were frequency, percentage, mean and standard deviation. The budgetary analysis was used in determining the profitability of fish farming through the cost and return structure. Chi-square analytical technique was the inferential statistics used in testing the hypothesis of the study.

Results and Discussion

Socio-economic Characteristics

Table 1 shows that close to half (46.25%) of the fish farmers were within the age group of 41-50 years while 22.5% and 20.0% were in the age brackets of 31-40 and 51-60 years respectively. This shows that more than 90 percent of the fish farmers in Eriwe fish farm estate were between the ages of 21 and 60 years. The mean age (47.08±9.07 years) also indicated that the fish farmers were within the active work force of the population which implied that fish production could be sustainably produced at the estate. Omobepade *et al.* (2015) also reported that fish farmers in Ekiti State had a mean age of 50.69 years. This is because people within the age group are usually innovative, motivated, and adaptive with the expectation that they would be good managers of limited available resources and can perform effectively without problems that come with old age. The group is also energetic, which could lead to their adoption of improved technologies that can lead to increased productivity in fish farming (Oyediran *et al*., 2013; Oyediran *et al*., 2017; Olasunkanmi *et al*., 2012).

It was further shown in Table 1 that majority (71.25%) of the fish farmers were married while the remaining were either single (10.0%), divorced (8.75%), or widowed (10.0%). This is indicative of the fact that marriage is highly cherished among the people of Ijebu-Ode especially the fish farmers in Eriwe fish farm estate. This is also expected to place additional responsibilities especially those that come with marriage. Married fish farmers could also have access to a cheaper source of labour as family members (spouses, children, and in-laws) could be used in fish farming at little or no cost for labour. With marriage, relocation of fish farmers could be limited and hence, fish production in the study area could be said to be highly sustainable as married persons, especially, the females are less likely to leave their families than the unmarried female persons.

More than half (55.0%) of the fish farmers had their highest attainment in terms of education to be the secondary education while 42.5% had primary education. This indicates that although none of the fish farmers was educated to the tertiary level, most of the fish farmers could be said to have the basic education that is the fundamental human right of any Nigerian. With their level of education, the fish farmers were in a position to make use of improved technologies and better means of production (Osondu *et al*., 2014). This agrees with the position of Adebayo and Adeyemi (2000) that education is important in shaping perception of farmers. Education could also enhance the fish farmers' access to productive resources such as credit facilities.

About 45.0% and 42.5% of the fish farmers were also found to have household sizes of 1-5 and 6-10 persons respectively while only 12.5% had above 10 persons in their households. The mean household size was approximately 7 persons indicating that the fish farmers had relatively moderate household sizes. This agrees with previous studies (Omobepade *et al*., 2015; Osondu and Ijioma, 2014) that reported average household sizes of 6 and 5 persons among the fish farmers in Ekiti and Abia States respectively but disagrees with that of Olaoye

et al. (2011) which reported a mean household size of as high as 13 persons among fish farmers in Ogun State. Hence, the sampled fish farmers could only be supported by few family members in their fish production activities. This could be as a result of the intensive nature of pond fish farming which does not require lots of farm labour unlike the artisanal fishing (Irokwe, 1999).

Table 1: Socio-economic characteristics of fish farmers in Eriwe Fish Farm Estate, Ijebu- Ode

Socio-economic variables	Frequency	Percentage	Mean	SD
Age (years)				
21 – 30	4	5.00		
31 – 40	18	22.50		9.07 years
41 - 50	37	46.25	47.08 years	
51 – 60	16	20.00		
>60	5	6.25		
Marital status				
Single	8	10.00		
Married	57	71.25		
Divorced	7	8.75		
Widowed	8	10.00		
Educational attainment				
No formal education	1	1.25		
Adult education	1	1.25		
Primary education	34	42.50		
Secondary education	44	55.00		
Tertiary education	0	0.00		
Household size (persons)				
1 – 5	36	45.00		
6 – 10	34	42.50	7 persons	3 persons
>10	10	12.50		
Other occupations				
Arable farming	16	20.00		
Trading	42	52.50		
Civil service	24	30.00		
None	13	16.25		
Artisans	5	6.25		

Source: Field survey, 2013.

Finally, Table 1 reveals that more than half (52.5%) of the fish farmers also engaged in trading while 30.0% and 20.0% were civil servants and arable crop farmers respectively. However, some (16.25%) of the fish farmers did not have any other occupation aside from fish farming. This indicated that fish farming could be combined with any kind of occupation and hence could be done either on part-time or full-time basis. The implication is that the fish farmers could still earn some income in case of risks associated with fish farming. This is in line with earlier reports that farmers now engage in multiple income generating activities as a means of adaptation to risks associated with agriculture.

Sources of Micro Credit to Fish Farming

Figure 1 shows that all (100.00%) of the fish farmers sourced finances for their fish farming activities through their personal savings and friends.

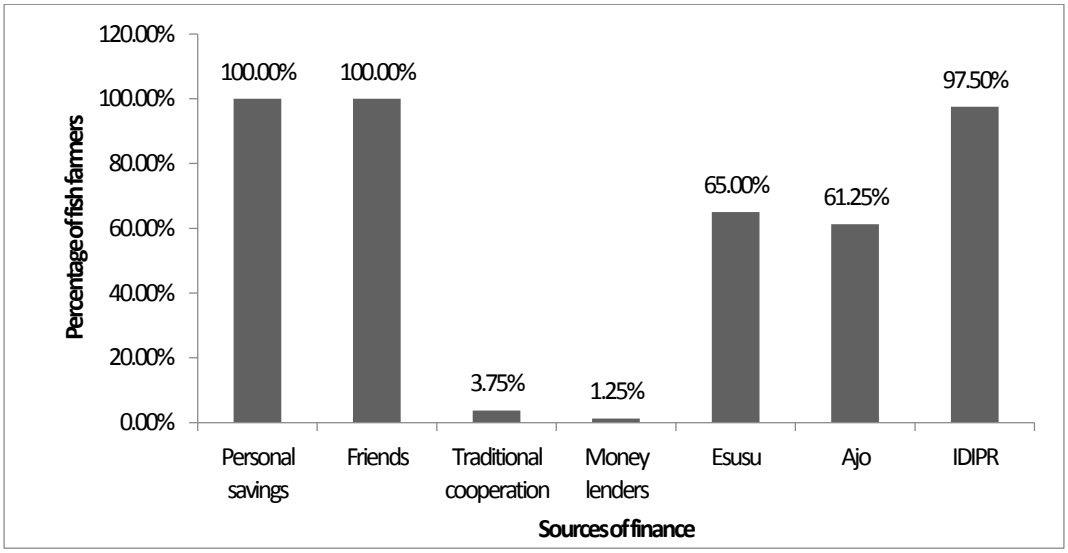

Figure 1: Distribution of fish farmers by their sources of finance

Also, almost all (97.50%) of the fish farmers financed their fish farming business through IDIPR while *esusu* and *ajo* were the sources of finance to 65.00% and 61.25% of the fish farmers respectively. Only a few (3.75% and 1.25%) of the fish farmers sourced credit from traditional cooperation and money lenders respectively. Earlier findings (Omobepade *et al.*, 2015; Olasunkanmi, 2012; Awoyemi and Ajiboye, 2011; Ekanem *et al.*, 2012; Adewuyi *et al.*, 2010)) also emphasized the importance of personal savings to the fish farmers.

Production Characteristics of the Fish Farmers

The production characteristics of the fish farmers are as shown in Table 2. It reveals that more than three-fifths (61.25%) of the fish farmers had 6-10 years of experience in fish farming, 35.0% had 1-5 years of fish farming experience, while some 3.75% had more than 10 years of fish farming experience. The mean fish farming experience was 6.56±2.49 years which implied that the fish farmers had substantial fish farming experience, and this could enhance their access to micro-credits as most financial institutions would prefer to give loans to enterprises with good record of production over the years. This could also serve as a factor in determining the credit worthiness of the fish farmers. This finding was confirmed by the findings of Olaoye *et al.* (2011) that the mean farming experience of the fish farmers in Ogun State was 5.87 years.

Majority (91.25%) of the fish farmers were also reported to acquire lands through lease or rent, and this could be attributed to their membership of cluster groups through which lands could be directly allocated to group members for production activities. Also, some could afford to rent or lease lands from the loans obtained from their cluster groups. It is a good development for fish farming in the study area that the fish farmers do not have to depend on inherited lands as lands acquired through inheritance could be too small and may not allow for business

expansion. Also, such lands may be associated with further fragmentation and other problems arising from family members.

Table 2: Distribution of fish farmers by their production variables

Production variables	Frequency	Percentage	Mean±SD[1]
Fish farming experience (years)			
1-5	28	35.00	6.56±2.49 years
6-10	49	61.25	
>10	3	3.75	
Mode of land acquisition			
Inheritance	4	5.00	
Gift	3	3.75	
Lease/rent	73	91.25	
Number of ponds in operation			
1-5	79	98.75	3 ponds
6-10	1	1.25	
Culture period (months)			
6	69	86.25	6.15±0.39 months
7	10	12.50	
8	1	1.25	
Farm distance from residence (km)			
1-5	77	96.25	3.34±1.30 km
>5	3	3.75	
Sources of fish seeds			
Own farm	8	10.00	
Known hatcheries	72	90.00	
Measures of sale*			
Weighing scale	80	100.00	
Subjective means	12	15.00	

[1]SD = standard deviation; * indicates multiple responses

Almost all (98.75%) of the fish farmers operated 1-5 ponds. This could be as a result of small farm sizes operated by the fish farmers. The mean number of ponds operated by the fish farmers was 3 and this aligns with Osondu and Ijioma (2014) who also reported that majority of the fish farmers in Abia State operated from 1 to 3 ponds. This could then imply that majority of the aquaculturists operated at subsistence level. Majority (86.25%) of the fish farmers cultured and harvested their produce within six months while 12.50% and 1.25% cultured and harvested theirs within seven (7) and eight (8) months respectively. The mean culture period to harvest was 6.15±0.39 months which indicated that almost two production cycles could take place by the fish farmers within a year. This could be attributed to fish farmers' membership of cluster groups which exposed them to improved methods of production that enhance the growth of the fishes.

Almost all (96.25%) of the fish farmers had their fish farms located between 1 and 5 kilometres from their residence which indicated that the fish farmers did not need to travel long distances to reach their fish farms. Olaoye *et al.* (2011) also made a similar report and stated that for the

smooth running of fish farms, the farms should not be too far from their homes and from extension service centres. This is likely to translate to higher efficiency in management with consequent positive effects on fish production. Nine out of every ten (90.0%) of the fish farmers sourced fish seeds from other farms, while only 10.0% got their fish seeds from their fish farms. This is in line with the findings of Adelakun *et al.* (2015) that catfish farmers in Osun State sourced fish seeds from known hatcheries.

All the fish farmers also used weighing scales graduated in kilogrammes for selling their produce while 15.0% of them sometimes used subjective means of measure for selling their fishes in addition to the use of weighing scales. This is contradictory to Olaoye *et al.* (2016)'s findings that weighing scale was used by only a small proportion of the fish farmers in Lagos State. The discrepancy in these two findings could be attributed to either location difference or fish farmers' membership of cluster groups.

Profitability of Fish Farming

The costs and returns structure which was used in calculating the profitability ratios of fish farming is as presented in Table 3. It shows the annual costs and revenues associated with fish farming at Eriwe fish farm estate. Table 3 reveals that the average total cost of production was ₦1,586,913.42 out of which 93.59% (₦1,485,237.50) accounted for the variable cost elements. It was also glaring that the cost of fish seeds accounted for 84.88% of the total cost of production in fish farming which is more than 90 percent of the total variable cost. This agrees with earlier findings (Okwu and Acheneje, 2011; Omobepade *et al*., 2015; Olawumi *et al.*, 2010) that cost of fish seeds and feed constitute the largest proportion of the fish farmers' cost of production. This could imply that fish farmers' cost of production would drastically be reduced if they could be provided with fish seeds.

The total revenue from fish farming was found to be ₦2,090,525.00 which is higher than the total cost of production. The gross marginal income as a result of the difference between the total revenue and total variable cost was ₦605,287.50 while the net farm income obtained by subtracting total cost from the total revenue was ₦503,611.58. This implied that the fish farmers were left with an excess balance of ₦605,287.50 after offsetting expenses associated with variable inputs, and ₦503,611.58 after paying for all inputs including depreciation values of fixed inputs of production. This is an indication of profitability of fish farming among the fish farmers at Eriwe fish farm estate. The benefit-cost ratio (BCR) of 1.32 was also found from the study, with return on investment of 0.32. The BCR value indicated that on every ₦1 invested in fish farming, ₦1.32 was earned as revenue while the return on investment indicated that 32% of the capital investment was realized. That is, on every 1₦ invested, 32 kobo was returned. All these ratios indicate that fish farming is a profitable enterprise in the study area. Previous studies also indicated that fish farming in Ogun State was profitable, especially when micro credits were utilized by the fish farmers (Olaoye and Odebiyi, 2011; Olaoye *et al*., 2011; Adeniyi, 2016; Ashaolu e*t al.*, 2005). Adeniyi (2016) attributed the profitability of fish farming in Ijebu-Ode to the fish farmers' membership of farmers groups and or associations under the IDIPR scheme.

Table 3: Annual cost and return structure

Items	Cost/return per annum (₦)	Percentage
Land purchase/rent	1,442.92	0.09
Water pump	6,015.00	0.38
Earthen pond	53,137.50	3.35
Plumbing	1,365.50	0.09
Deep well	715.00	0.05
Water container	37.50	0.00
Building/shed	4,133.33	0.26
Drag net	7,725.00	0.49
Cutlass and file	1,311.67	0.08
Weighing scale	2,202.25	0.14
Generator	18,575.87	1.17
Net fencing	5,014.38	0.32
Total Fixed Cost (TFC)	**101,675.92**	**6.41**
Fish seeds	49,637.50	3.13
Fish feeds	1,346,975.00	84.88
Liming	6,425.00	0.40
Fertilization/Manure	4,423.75	0.28
Bowls/buckets	3,715.00	0.23
Labour	32,512.50	2.05
Land/pond/tank preparation	1,700.00	0.11
Transportation/handling charges	3,587.50	0.23
Fuel	15,886.25	1.00
Security	20,375.00	1.28
Total Variable Cost (TVC)	**1,485,237.50**	**93.59**
Total cost	**1,586,913.42**	
Total Revenue	**2,090,525.00**	
Gross Marginal Income	**605,287.50**	
Net Farm Income	**503,611.58**	
Benefit Cost ratio	**1.32**	
Return on investment	**0.317**	

`Source: Field survey, 2013

Association between Fish Farmers' Sources of Micro Credit and Profitability

Table 4 shows that there were significant associations between the profitability level of fish farming and personal savings (χ^2= 18.05, p = 0.011), *esusu* (χ^2= 11.63, p = 0.020), *ajo* (χ^2 = 29.92, p = 0.004), and IDIPR (χ^2 = 68.76, p = 0.001), while the associations between the profitability level of fish farming and credits sourced from friends (χ^2 = 2.15, p = 0.089), and with traditional cooperation (χ^2 = 3.47, p = 0.431) were not significant. This means that personal savings, *esusu*, *ajo* and IDBPR were important sources that contributed to the profitability of fish farming among the fish farmers in Eriwe fish farm estate.

Table 4: Association between the different sources of credit and profitability of fish farming

Sources of credit versus profitability	**χ^2-value**	**df**	**p-value**
Personal savings	18.05	2	0.011*
Friends	2.15	2	0.089ns
Traditional cooperation	3.47	2	0.431ns
Esusu	11.63	2	0.020*
Ajo	29.92	2	0.004**
IDIPR	68.76	2	0.001**

χ^2 = Chi-square value, df = degree of freedom,
* and ** = significant association at 0.05 and 0.01 levels of significance, and ns = no significant association

Conclusion and Recommendations

The findings of this study indicated that fish farming is being practiced at subsistence level with fish farmers operating small number of fish ponds. It can be concluded from the findings of this study that although the fish farmers sourced production credits from IDIPR, the fish farmers still relied heavily on the informal financial sources such as personal savings and loans from friends, *esusu*, and *ajo*. It could also be concluded from the budgetary analysis that fish farming was a profitable enterprise ~~that~~ worth venturing into in the study area.

Based on these, the study recommends that other fish farmers that have not joined any farmers' group or association should endeavour to do so as this is likely to be responsible for the profitability of fish farming in the fish farm estate. Unemployed persons are also encouraged to venture into fish farming as it has proven to be highly profitable. Other non-governmental organizations are encouraged to form rural fish farmers into cluster groups that could be used in the promotion of aquaculture and other agricultural enterprises. Ijebu Development Initiative for Poverty Reduction (IDIPR) is however advised to scale up its support for farmers especially in the area of credit provision as this has the tendency to increase fish farmers' productivity and ultimately their profits.

References

Adebayo, K. and Adeyemi, E. T. (2000). Key issues in the sustainability of farmers' groups in Ogun State. Paper presented at the 6th Annual conference of the Agricultural Extension Society of Nigeria held at the University of Ibadan, Ibadan, Nigeria. 15p.

Adebayo, O. O. and Daramola, O. A. (2013). Economic analysis of catfish (*Clarias gariepinus*) production in Ibadan metropolis. *Discourse Journal of Agriculture and Food sciences,* 1(7): 128-134.

Adelakun, K. M., Amali, R. P., Ogundiwin, D. I. and Bakare, K. (2015). Assessment of catfish farming in Osogbo and its environs. *Peer J PrePrints* 3: e1108v1https://doi.org/10.7287/peerj.preprints.1108v1

Adeniyi, M. A. (2016). Using fish farming cluster to create wealth: Ijebu pattern (operations). Being Text of Address Presented to the Minister of Niger Delta, Abuja on Monday11th January, 2016. 18 slides.

Adewuyi, S. A., Phillip, B. B., Ayinde, I. A. and Akerele, D. (2010). Analysis of profitability of fish farming in Ogun State, Nigeria. *Journal of Human Ecology, 31*(3): 179-184.

Alabi, Y., Awe, O. J. and Musa, l. Y. (2015). Managing small and medium scale enterprises in Nigeria: Challenges and prospect. *Review of Public Administration and Management,* 3(7): 92-97.

Andem, A. U., Bassey, E. B. and Okon, I. M. (2011). Costs and returns of fish production using concrete ponds in Akwa Ibom State, Nigeria. *Journal of Agriculture and Social Sciences*, 7: 38-40.

Ashaolu O.F., Akinyemi, A.A. and Nzekwe, K. (2005). Economic Viability of homestead Fish Production in Abeokuta Metropolis of Ogun State, Nigeria. *Asset Series* A, 6(2): 209-220.

Awoyemi, T. T. and Ajiboye, A. J. (2011). Analysis of profitability of fish farming among women in Osun State, Nigeria. *Journal of Economics and Sustainable Development,* 2(4): 1-8.

Bassey, N. E., Nyong, E. E., Umoh, I. U. and Okon, U. E. (2014). Determinants of credit access and default among crayfish traders in four selected markets in Akwa-Ibom State, Nigeria. *Research Journal of Finance and Accounting,* 5(18): 30-38.

Central Bank of Nigeria (CBN) (2010). Central Bank of Nigeria Annual Report and Statement of Accounts for year ended 31st December, 2010.

Countrymeters (2017). Nigerian population clock (live). Retrieved online on July 23, 2017 from http://countrymeters.info/en/Nigeria.

Ekanem E., Damian A., and Etim, G. (2012). Socio-economic analysis of fish farming in Cross River State, Nigeria: Implication for Food Security *Tropentag*, G¨ottingen Resilience of agricultural systems against crisis. 25p.

Food and Agriculture Organization – FAO. (2009). The State of World Fisheries and Aquaculture. FAO Fisheries and Aquaculture Department. Rome.196p.

Irokwe, I. (1999). Socio-economic and sales of fish production. A case study of Abia State. Unpublished project work B. Agric. Department of Agricultural Economics, Abia State University Uturu, Nigeria. 156p.

Isaac, Q. and Alfred, S. (2014). Assessing alternative sources of financing for small and medium scale enterprises in Ghana: Case study of savings and loans companies (s*and*ls) in the Greater Accra region of Ghana. *International Journal of Advancements in Research and Technology,* 3(7): 123-136.

Leon, I. (2009.). Entrepreneurial development and small business management. National Open University of Nigeria Study Guide, Assessed www.nou.ng.

National Bureau of Statistics – NBS (2017). Unemployment/Under-employment report: Q4 2016. *Proshare*. 26pp.

Nigerian Best Forum (NBF) (2013). Making Fishers of Men. A general discussion. Available on http://www.nigerianbestforum.com/index.php?PHPSESSID=df81138796918607cefa537d76b64866&topic=250028.0;nowap.

Nnabugwu, F. (2016). Nigeria spends $2bn importing agric products annually - *Amaechi*. *Vanguard NG News.* FEBRUARY 23, 2016 Retrieved from http://www.vanguardngr.com/2016/02/nigeria-spends-2bn-importing-agric-products-annually-amaechi/ on July 23, 2017.

Ogen, O. (2007). The Agricultural sector and Nigeria's development: Comparative perspectives from the Brazilan agro-industrial economy, 1960-1995. *Nebula*, 4(1), 184-194.

Ogunbiyi, B. (2012). Nigeria: Population and Demographic trends. A conference themed "Nigeria Beyond the Headlines: Population Health, Natural Resources, and Governance" by Population Action International held at The Woodrow Wilson International Centre for Scholars, Washington DC, April 25 2012. 15pp.

Okwu, O. J. and Acheneje, S. (2011). Socio-Economic Analysis of Fish Farming in Makurdi Local Government Area, Benue State, Nigeria *European Journal of Social Sciences – 23 (4): 508-519.*

Oladele, P. O., Olowookere, B. A. and Akinruwa, T. E. (2014). Sources of finance and small and medium scale enterprises' performance in Ado-Ekiti metropolis. *European Journal of Business and Management,* 6(28): 88-98.

Olaoye, O. J. and Odebiyi, O. C. (2011). Economic viability for the use of microfinance bank loan on aquaculture development in Ogun State, Nigeria. *International Journal of Fisheries and Aquaculture*, 3 (4): 71-78.

Olaoye, O. J., Ashaolu, O. F., Idowu, A. A., Akintayo, I. A. and Talabi, J. O. (2011). Determinants of demand for Ogun State Agricultural 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., Ezeri, G. N. O., Akegbejo-Samsons, Y., Awotunde, J. M., Ojebiyi, W. G. (2016). Dynamics of the adoption of improved aquaculture technologies among fish farmers in Lagos State, Nigeria. *Croatian Journal of Fisheries*, 74: 56-70.

Olasunkanmi, J. B.**,** Omitoyin, B. O. and Ipinmoroti, M. O. (2012). Social structure of fish farmers Osun State, South-Western Nigeria. *Biological and Environmental Sciences Journal for the Tropics*, 9(1): 23-35.

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

Olukosi, J. O. and Erhabor, P. O. (1988). *Introduction to Farm Management Economics: Principles and Applications.* Agtab Publishers Limited, Zaria, Nigeria. 77-88.

Omobepade, B. P., Adebayo, O. T., Amos, T. T. and Adedokun, B. C. (2015). Profitability analysis of aquaculture in Ekiti State, Nigeria. *Nigerian Journal of Agriculture, Food and Environment.* 11(1): 114-119.

Osondu C. K. and Ijioma, J. C. (2014). Analysis of profitability and production determinants of fish farming in Umuahia Capital Territory of Abia State, Nigeria. *World Journal of Agricultural Sciences,* 2 (7): 168-176.

Osondu, C. K., Ezeh, C. I., Emerole, C. O. and Anyiro, C. O. (2014). Comparative Analysis of Technical Efficiency of Small Holder Fadama II and Fadama III Cassava Farmers in Imo State, Nigeria. *Nigerian Journal of Rural Extension Development*, 8: 26-37.

Oyediran, W. O., Omoare, A. M., Sodiya, C. I. and Fakoya, E. O. (2013). Capacity building for rural youths: Priorities for Sustainable Catfish Production in Ogun State, Nigeria. IOSR *Journal of Agriculture and Veterinary Science (IOSR-JAVS),* 4(2): 38-42.

Oyediran, W. O., Sodiya, C. I., Omoare, A. M. and Ogbonna, C. C. (2017). Effects of occupational health hazards on artisanal fish production in Ogun State, Nigeria. *Oceanography and Fisheries Open Access Journal*, 3(2): 001-006.

Ozigbo, E., Anyadike, C., Adegbite, O. and Kolawole, P. (2014). Review of aquaculture production and management in Nigeria. *American Journal of Experimental Agriculture*, 4(10): 1137-1151.

Sea-Fisheries Protection Authority – SFPA. (2016). 2015 exports to non-EU countries: Nigeria top importer of Irish seafood. SFPA News published on Wednesday June 1, 2016. Retrieved on July 23, 2017 from http://www.sfpa.ie/News/TabId/167/ArtMID/538/ArticleID/31/Nigeria-top-importer-of-Irish-seafood.aspx.