FACTORS AFFECTING PRODUCTIVITY OF POND FISH FARMING IN IBADAN/ IBARAPA AGRICULTURAL ZONE, OYO STATE, NIGERIA

Oyebanjo, Olumayowa; Ologbon, Olugbenga A. C.; Akerele, Ezekiel O.; Awotide, Diran O. and Ogundipe, Samuel O.

Department of Agricultural Economics and Farm Management,
College of Agricultural Sciences, Olabisi Onabanjo University, Ago-Iwoye, Ogun State, Nigeria
Corresponding Author's email: oyebanjoolumayowa@gmail.com

ABSTRACT

Fish is an important source of animal protein but production level is insufficient to meet the consumption requirement of Nigerian population. The study examined the determinants of pond fish productivity in Ibadan/ Ibarapa Agricultural Zone, Oyo State. Primary data were collected using structured questionnaire. The data were analysed using descriptive statistics, budgetary techniques and Cobb-Douglas production function. The findings show that a fish farmer was relatively 40 years old with 4 years of experience. Majority (54.7%) had higher education, 80.2% used earthen pond, 95.3% cultured only catfish while 18.6% were primarily engaged in fish farming. Budgetary estimates show that the respondents earned an average net income of N 294,714. 31. Fish productivity was significantly increased by marital status ($p<0.10$), household size ($p<0.10$),previous farm income ($p<0.01$), pond water ($p < 0.01$) and feed ($p < 0.01$) while primary occupation ($p<0.10$), fish farming experience ($p<0.10$),fertilizer ($p<0.05$) and lime ($p<0.10$) negatively affected fish productivity. The major constraints were high cost of feed (80.2%), inadequate fund (67.4%) and poor medication/ feed materials (60.5%). The study concluded that fish farming is lucrative. Therefore, government should promote the provision of credits, quality feeds and medication materials at affordable prices for increased fish production.

Key words: Catfish, Earthen pond, Productivity, Net Income, Constraints.

Accepted Date: *29 June, 2020*

Introduction

Nigeria is blessed with fisheries resources which can be classified into artisanal fisheries (85%), industrial fisheries (14%), and culture fisheries (1%) (FDF, 2005). Nigerians are high fish consumers and offer the largest market for fish and fisheries products in Africa. Domestic fish production is put at 551,700 metric tons against the national demand of about 1.5 million metric tons estimated for 2007 (Osawe, 2007). The shortfall is said to be abridged by the annual importation of 680,000 metric tons gulping about N 50 billion (Odukwe, 2007). The need to meet the much needed fish for domestic consumption and export has continued to increase the awareness of the potential of aquaculture to contribute to domestic fish production in the country. The Central Bank of Nigeria (CBN, 2005) pointed out that fisheries occupy an important position in the agricultural sector of the Nigeria economy. FAO (2007) also pointed out that fish production through aquaculture has risen steadily in Nigeria from a few hundred kilograms to over 45,000 metric tonnes in 2004. Thus, aquaculture will play an increasingly important role in meeting the demand for fish being the fastest growing animal food-producing sector in Nigeria.

Fish farming involves raising fish commercially in tanks, ponds or enclosures. The major fish species

which are commonly cultured in Nigeria include catfish (*Clarias gariepinus) and Tilapia spp.* The role of fish farming in achieving household and national food security and poverty alleviation cannot be over emphasized in Nigeria. It is an artificial method of raising fish for human consumption and it provides profitable means of livelihood for both rural and urban dwellers. Fish is a good source of high-quality protein and other essential nutrient. It provides white meat which is important especially for women and growing children. It is low in calories and cholesterol levels (FAO, 2005). In recent years, increased knowledge and awareness of human nutritional requirements for healthy growth have focused increasing attention on the unique roles of fish farming in human development (CBN, 2004). According to Adeniyi *et al.,* (2012), plant proteins are deficient in certain amino acids notably methionine, tryptophan and lysine which are essential for healthy growth while, animal proteins are rich in these amino acids and are therefore described as first class or good quality protein

Fish had been recognized to contribute 55% of animal protein intake of an average Nigerian while the aquaculture sub-sector contributes between 0.5% and 1% to the domestic fish production (Dalhatu and Ala, 2010).Apart from utilization of fish in preparation of household meals, it is used in medicine (fish oils), fashion industry, recreation (fishing sport), fish meals, ornamental and decorations (Bolorunduro, 2004). As a result, considerable attention is being shifted towards fish farming as a means of increasing fish availability at affordable prices. Fish yields and the area under fish farming are increasing and fish farming is being generally accepted as a branch of agriculture and efforts are being made to substitute fish imports with domestic production in order to create jobs and reduce poverty in the rural areas.

In Nigeria, the contribution of fisheries sub-sectors to GDP rose from ₦76.76 billion in 2001 to ₦162.61 billion in 2005. The world aquaculture has also grown dramatically from a production of less than 1 million tonnes in the early 1950s to 51.7 million tonnes in 2006 with a value of US$78.8 billion. China contributed the highest world's supply (67.0%) of cultured aquatic animals during the period. This has continued to show strong growth, increasing at an average annual growth rate of 6.2 % i.e. from 38.9 million tonnes in 2003 to 52.5 million tonnes in 2008 at an estimated value of USD 98.4 billion (FAO, 2008).

Increasing fish production requires embarking on pond fish farming. This has prompted the Federal Government of Nigeria to package the Presidential Initiative on fisheries and aquaculture development in 2003 to provide financial and technical assistance to government programmes and projects to encourage fish production. In the same direction, Oyo State Agricultural Development Programme (OYSADP introduced some modern technologies to fish farmers to compliment the efforts of the Federal Government. Despite these efforts, fish production has remained low in Nigeria (Ugwumba and Chukwuji, 2010).

OBJECTIVES OF THE STUDY

The specific objectives are to;

i. Describe the socioeconomic characteristics of the fish farmers and the farming system,
ii. Assess the financial performance of the farmers in fish production, and
iii. Examine the factors affecting the productivity of fish farming in the study area.

REVIEW OF PREVIOUS EMPIRICAL STUDIES

A number of studies has been conducted on the economics of fish farming in Nigeria. Ajao (2006) revealed that fish enterprise was profitable but 80% of the fish farmers operated less than two (2) ha which could not capture economies of size. About 90% of the respondents distributed their fish at the site while 60% of them had little or no access to extension agents.

Sanni *et al.* (2009) observed that fisheries occupy a very significant position in the primary sector providing employment for over five hundred thousand people and contributing to over 40% of the animal protein intake of the people particularly the resource poor.

The study of Kudi *et al* (2008) showed that fingerlings/juveniles was the most expensive variable input at 42.8% of total cost of production followed by feed (34.7%) and hired labour (16.91%). The estimated total cost of production was N571, 231.79 while total revenue was N5, 853, 625.64 showing a net income of N5, 282, 393.85.

Dauda (2010) pointed out that fish demand in

Nigeria was 1.85 million metric tonnes while domestic production was as low as 0.51 million metric tonnes. Therefore, about 0.7 million metric tonnes of frozen fish was imported annually at an annual foreign exchange cost of N35 billion thereby making Nigeria the highest importer of frozen fish in the World. Ejiola and Yinka (2012) observed that fish farming is the least exploited fishery sub-sector in Nigeria with the vast brackish water fishing grounds almost unexploited. The average yield of fish being produced as estimated at 20,500 tonnes per annum. This represents only 3.12% of the estimated fish culture potential of 656,815 tonnes per annum. They concluded that the contribution of fisheries sub-sector to the GDP was small, about 3-4% but significant ranging from employment creation to the provision of raw materials for the animal feed industry.

Adetunji (2011) concluded that Nigeria has high potentials for aquaculture development which can be realized substantially through extension services. This is necessary to promote fish production technologies, substitute fish importation with domestic production, create jobs, reduce poverty in rural and peri-urban areas,

Ugwumba and Chukwuji (2010) reported that the supply of fish in Nigeria has been on the decline. In the same vein, Madubuike (2012) observed that the gap between supply and demand for fish in Nigeria is widening. According to Adinya *et al. (*2011), the decline was attributed to the use of poor quality fish seeds, inadequate information, inadequate entrepreneurship skills, high cost of feeds, traditional techniques, small size of holdings, inefficiency in resource use, poor infrastructural facilities, lack of credit, high cost of industrial feed, lack of extension agents, lack of veterinary doctors, lack of fish production equipment and low capital investment as well as the problem of predators.

Ofuoku *et al.* (2008) opined that access to accurate and adequate information on fish production technologies by farmer is essential to increase fish production in Nigeria. Such information should cover wide range of areas including pond construction and management, breed selection, stocking, feeding, water management, harvesting, processing, storage, marketing and record keeping

MATERIALS AND METHODS

The Study Area

The study was carried out in Ibadan/Ibarapa Agricultural Zone, Oyo state, Nigeria. Ibadan is the capitalof Oyo State in southwestern Nigeria. It has the third largest population of over 3 million (NPC, 2007). Ibadan is reputed to be the largest indigenous city in Africa in term of geographical area. It is 128 km northeast of Lagos and 530 km southwest of the federal capital, Abuja. It is about 120 km east of the border with the Republic of Benin. The city is naturally drained by four rivers namely: Ona River in the North and West; Ogbere River towards the East; Ogunpa River flowing through the city and Kudeti River in the Central part of the metropolis.

The city is inhabited mainly by the Yorubas who are primarily agrarian. Other people from within and outside the country trade and settle in Ibadan. The climate corresponds with dry and wet seasons and relative high humidity and is favourable for agricultural activities. The Ibadan/Ibarapa Agricultural Zone is blessed with state, federal and international agencies that provide advisory services and technical support to farmers. Such agencies include: Oyo State Agricultural Development Programme (OYSADEP), Institute of Agricultural Research and Training (IAR&T), and International Institute for Tropical Agriculture (IITA), among others.

Method of Data Collection and Sampling Techniques

The study was based mainly on primary data which were collected in the study area from the respondents using a well-structured questionnaire in a personal interview. The study was carried out in Ibadan/ Ibarapa Agricultural zone being the predominant area for fish farming in Oyo state. The study data include the socio-economic profile of the farmers, quantity of inputs and costs, fish output, sales and revenue, and production constraints, among others.

A multi-stage sampling procedure was employed in the selection of the sample. The first stage involved purposive selection of three (3) Local Government Areas (LGAs) in the zone based on the concentration of the fish farmers in the area. Each local government represents an agricultural extension block of the OYSADEP. Therefore, three

(3) communities were randomly selected from each of the blocks namely Akinbule, Alabata and Moniya from Akinyele LGA; Ologun-Eru, Camp and Ido Farm Settlement from Ido LGA and Olorunda, Akobo-Ojurin and Adeyipo Estate from Lagelu LGA. Subsequently, one hundred and two (102) fish farmers were interviewed in the nine (9) communities through a snowball approach. However, data analysis was based on eighty six (86) complete questionnaires after data screening.

Method of Data Analysis

The socio-economic characteristics of the fish farmers and their production constraints were described by descriptive statistics such as frequency, percentages, means etc. The financial performance of the fish farmers was estimated by budgetary techniques while the factors affecting fish productivity were examined by regression model of the Cobb-Douglas production function. The financial performance was estimated as follows;

$GM = \Sigma p_i Q_i - \Sigma r_i X_i \quad (i = 1, 2... n)$ (1)

$NI = GM - TFC$ (2)

Where;

P_i = the farm gate unit price of output i.

Q_i = total output of ith crop enterprise.

r_i = unit market price of variable input i.

X_i = quantity of variable input i.

n_i = number of fish farm in the sample

Total revenue (TR) = $\Sigma p_i Q_i$

Total variable cost (TVC) = $\Sigma r_i X_i$

NI = Net Income

TFC = Total fixed cost

Depreciation oftools/ equipment, ponds, machines etc. was estimated by the straight-line method as specified below;

$$\text{Depreciation} = \frac{\text{Initial Cost (₦)} - \text{Salvage Value (₦)}}{\text{Number of useful year(s)}} \quad (3)$$

Indices of Financial Performance

The financial indices that were used to determine the performance of the fish farming enterprise include profitability index, rate of return on investment and benefit-cost ratio which were estimated as follows;

i. Profitability Index (PI) = $\frac{NI}{TR}$ (4)

PI determines the performance of the farm in profit making.

ii. Rate of Return on Variable cost

(RRVC = $\frac{TR - TFC}{TVC} x\ 100$ (5)

RRVC measures the rate of returns on total variable cost of production

iii. Benefit-cost ratio (BCR) = $\frac{TR}{TC}$ (6)

BCR determines the amount of financial benefits accruing to the owners' equity/investment.

The Estimating Model

Farm productivity has been investigated using the Cobb-Douglas production function e.g. Okoye *et al*. (2008). Evidence from the studies depicts that the Double log of the Cobb-Douglas production function gives the best results than other functional forms. Therefore, the Double-log model was fitted in this study to examine the variables affecting pond fish productivity among the farmers. The estimating equation of the model is specified as follows:

$$\text{Log } Y = \beta_0 + \beta_1 \text{Log} X_1 + \beta_2 \text{Log} X_2 + \beta_3 \text{Log} X_3 + \ldots + \beta_{16} \text{Log} X_{16} + u_i \quad \text{(Double-log)} \quad (7)$$

Where;

Y = Yield (output of fish in kg per square meter M^2)

X_1 = Age (years)

X_2 = Marital status (married = 1, otherwise = 0)

X_3 = Educational status (years)

X_4= Household size (number)

X_5= Major occupation (fish farming = 1, others = 0)

X_6= Previous annual farm income ₦

X_7= Labour employed/ attendants (number)

X_8= Family/ hired labour (manday)

X_9= Quantity of Fertilizer (kg)

X_{10}= Quantity of Lime (kg)

X_{11}= Frequency of water supply per month (number)

X_{12}= Fish farming experience (years)

X_{13}= Source of water (borehole=1, otherwise = 0)

X_{14}= Quantity of feed (kg)

X_{15}= Stock size (number of fingerlings/juvenile/brood stock)

X_{16}= Types of pond (Concrete=1, otherwise = 0)

RESULTS AND DISCUSSIONS

The descriptions of the socio-economic characteristics of the respondents and the farm settings are presented in Table 1for possible inference deduction on their relationship with productivity. The results show that majority (76.7%) of the fish farmers were less than 50 years and an average farmer was 40 years old. This implies that the respondents were within the active age class and should have the ability to drive higher productivity in fish farming. Fish farming activity was dominated by male (80.2%) maybe because male have the courage to secure fish farm against pilferage, theft and predators while child bearing and home care may hinder the women.

A proportion of 57.0% of the respondents was single while those that were either married, divorced, widowed or separated constituted 43.0%. About 86.0% of them had, at most, 6 members in their family while the average household size was 4 persons. Marital status and household size are important household variables that affect the level of household income, supply of family labour and farm productivity. Assessment of the respondents' educational status indicates that 45.3% had a maximum of secondary school education while 54.7% were educated beyond secondary school. This implies that fish farming requires high level of literacy. Thus, the education level of the fish farmers should be complemented with extension services and new innovations. This result corroborates the finding of Yahaya *et al.* (2011) who reported that yield performance improved among farmers with higher level of education.

The results revealed that only 18.6%of the respondents were engaged in fish farming as their main occupation while 81.4% of them include civil servants, crop farmers, artisans, traders and postgraduate students who ventured into fish farming as their secondary occupation or for research purpose. Majority (59.3%) of the respondents started to culture fish less than 5 years ago. An average farmer had 4 years of fish farming experience. This shows that the level of fish farming experience in the area is considerably low. Hence, they require a lot of technical support from extension agents for improved farm productivity.

Description of the farm-related characteristics shows that 80.2% of the respondents cultured their fish in earthen pond while 19.8% used concrete pond for fish production. The earthen pond probably attracted the farmers because it is close to natural environment of the catfish. Although, earthen pond may be affected by climatic and weather conditions such as rain failure and flood unlike concrete pond. This result is in line with Ideba *et al.* (2013)who found that majority (87.2%) of the fish farmers in Calabar used earthen pond.

Majority (95.3%) of the farmers were involved in monoculture of catfish while 4.7% cultured both catfish and tilapia. The high level of catfish production could be attributed to a relatively high level of market demand in the area. This finding agreed with the result of Igoche *et al*. (2019) which revealed that majority 62.66% of the fish farmers in Plateau State practiced monoculture of the African catfish (*Clarias gariepinus*) as compared to 37.34% for Tilapia species.

The results further revealed that the average stock size/ fingerling/ fish density was 1,850. About 44.2% of the respondents had a stock size of, at most, 1,500 fingerlings/ fishes, 43.1% cultured less than 2,500 fishes while 12.7% had above 2.500 fishes. This indicate that fish production in the area was dominated by small-scale farmers. This implies that quantity of cultured fish may be insufficient to meet local market demand in the area. In addition, majority (53.5%) of the fish farmers either rented or borrowed the fish ponds while those that acquired their ponds by purchase and inheritance were 31.4% and 15.1% respectively. This means that some fish farmers had withdrawn from the fish farming activities thereby making their facilities available for the new entrants/farmers. Hence, majority were not the rightful owners of the fish ponds/ farms. This result is in line with the findings of Adewuyi *et al*. (2010) who observed that the mode of fish pond/ farm acquisition could have implications on long term fish production and farm development plan.

Table 1: Characteristics of the Farmers and the Farms (n = 86)

Characteristics		Frequency	Percentage	Mean
Age (years)	Less than 30	15	17.4	
	30-<40	22	25.6	
	40-<50	29	33.7	40.16
	50 and above	20	23.3	
Sex	Male	69	80.2	
	Female	17	19.8	
Marital status	Single	49	57.0	
	Married	34	39.5	
	Divorced	2	2.3	
	Separated	1	1.2	
Household size	1 – 3	27	31.4	
	4 – 6	47	54.7	4.02
	> 6	12	14.0	
Education (years)	No formal education	4	4.7	
	Primary	10	11.5	
	Secondary	25	29.1	
	Tertiary	47	54.7	13.10
Primary occupation	Fish farming	16	18.6	
	Crop/ livestock farming	14	16.3	
	Trading	6	6.9	
	Artisans	10	11.7	
	Civil servants	23	26.7	
	Students /postgraduate	17	19.8	
Experience (years)	Less than 5	51	59.3	
	5 - < 10	27	31.4	4.26
	10 and above	8	9.3	
Type of pond	Earthen	69	80.2	
	Concrete	17	19.8	
Type of stocked fish	Catfish (clarias) only	82	95.3	
	Clarias and tilapia	4	4.7	
Stock size / density of fingerlings	< 1500	38	44.2	
	1500 -<2000	21	24.5	1,850
	2000-<2500	16	18.6	
	2500 and above	11	12.7	
Method of pond acquisition	Inherited	15	17.4	
	Purchased	27	31.4	
	Rented	39	45.3	
	Borrowed	5	5.8	

Source: Field Survey, 2015

Financial Performance of the Fish Farms

The estimates of the budgetary analysis and the financial ratios are presented in Table 2. The result shows that an average fish farmer incurred a total cost of N 702,102. 43 in fish production while the total revenue is N 996,816. 74. The estimated gross margin is N 306,471. 21 while the net income is N 294,714. 31 showing that the fish farmers earned appreciable amount of profit. The estimate shows that feed is the most expensive input of fish farming at 90.98% of total production cost. However, Kudi *et al.* (2008) also found that cost of feed constituted the largest 94.7% of the total cost of fish production in Kaduna State.

The estimate of the financial ratios shows that profitability index (PI), return on variable cost estimated (RRVC) and benefit-cost ratio (BCR) are 0.2956, 142.69 and 1.4197 respectively. PI is positive indicating that net profit is greater than total revenue by 29.6%. The value of RRVC shows that net profit is N 42. 69 in fish production on every N 100 expended on aggregate variable inputs while BCR also confirmed that there is a return of 42 kobo on every N 1 invested in fish production in the area.

Table 2: Estimates of Cost and Returns of the Fish farms

Item	Amount (₦)	% of Total Cost
TOTAL REVENUE	**996,816.74**	
Cost of Variable Inputs		
Fertilizer	1,029.21	0.15
Lime	4,023.07	0.57
Pumping/ Water supply	31,100.33	4.43
Feeds	638,769.50	90.98
Farm labour	15,423.42	2.20
TOTAL VARIABLE COST	**690,345. 53**	
Cost of Fixed Inputs		
Depreciation value	6,837.19	0.97
Rent	4,919.71	0.70
TOTAL FIXED COST (TFC)	**11756. 90**	
TOTAL COST (TC)	**702,102. 43**	**100.00**
Gross Margin (GM)	306,471. 21	
Net Income (NI)	294,714. 31	
Profitability Index (PI)	0.2956	
Rate of Return on Variable Cost (RRVC)	142.69	
Benefit-Cost Ratio (BCR)	1.4197	

Source: Field Survey, 2015

Factors Affecting the Productivity of the Fish Farms

The factors determining the productivity of the fish farms were examined by fitting the Double-log functional form of the Cobb Douglas production function. The estimates of the factors affecting fish productivity in the area is presented in Table 3. The model parameters of the Double-log shows that Adjusted R^2 value is 0.647 and F-value is 6.325 which is significant at ($p<0.01$). These indicate that the model has a significant explanatory power of the fish production data and 64.7% of the variation in fish productivity among the respondents is explained by the factors of production that were defined in the regression model while the remaining 35.3% could be attributed to the nature or uncontrollable factors such as climate, weather and market price.

The regression analysis revealed that the coefficient of marital status (0.041) contributed positive and significant ($p<0.10$) to the productivity of fish farming in the study area. Since the coefficient is significantly not different from zero, it

implies that the status of being single, divorced or separated contributed to increased productivity. This could be attributed to a small household size and low dependency of the family on the farm output. The coefficient of household size (0.225) is significant ($p<0.10$) and had a positive relationship with fish productivity. Perhaps, the household supplied family labour at cheap or free cost which reduced production cost in favour of increased output.

Primary occupation has a negative and significant coefficient (-0.062) at ($p<0.10$) showing a declining effect on fish productivity probably because, majority of the farmers were engaged in fish production as a secondary job. Hence, they were not fully committed to the fish enterprise. More so, previous farm Income has a positive coefficient (0.422) which is significant at $p< 0.01$. This indicates increasing effect of the farm income on fish productivity among the respondents. Perhaps, it provided the basic fund to increase the stock size/fingerlings beyond previous level of production.

The estimates of the physical factors revealed that the coefficient of fertilizer (-0.056) and lime (-0.039) had significant negative effects on fish productivity at ($p<0.05$) and ($p<0.10$) respectively. This indicates inefficient utilization i.e. overutilization or underutilization of fertilizer and lime which was counterproductive. Thus, there is need for extension education/ training on how to use fertilizer and lime in pond fish farming. Years of experience in fish farming also has a negative and significant coefficient (-0.039) at ($p<0.10$) implying that it had a reducing effect on fish productivity. This may be attributed to the fact that an average farmer had only 4 years of experience or there was no effective extension services to complement the knowledge of the fish farmers. The finding of Oyebanjo (2017) also affirmed that farming experience affected labour productivity among arable crop farmers. Thus, it is important in understanding the farm setting and promotes effective farm management.

Furthermore, the coefficient of major source of water (0.305) positively and significantly contributed to the level of fish productivity at ($p<0.01$). Since the coefficient value is significantly not different form zero, it means that the use of stream/ river water or earthen pond contributed to increased fish productivity. Perhaps, it is more productive to use earthen pond for catfish production provided that there is no adverse climate or bad weather. The coefficient of feed (0.625) is positive and significantly (at $p<0.01$) contributed to increase in productivity of the fish farms.

Table 4: Estimates of the Factors Affecting Fish Productivity in the Area (n = 86)

Variable	Double-log		
	Coefficient	t-value	Standard Error
(Constant)	-3.106	-1.554	1.999
Age	0.012	0.242	0.298
Marital status	0.041*	1.855	0.022
Education	0.023	0.562	0.042
Household size	0.225*	1.637	0.138
Main occupation	-0.062*	-1.582	0.039
Annual Farm Income	0.422***	4.019	0.105
Permanent labour	0.032	1.078	0.029
Hired/ Family labour	-0.008	-0.231	0.036
Fertilizer	-0.056**	-2.071	0.027
Lime	-0.039*	-1.950	0.020
Frequency of water supply	0.099	1.528	0.065
Farming Experience	-0.039*	-1.714	0.023
Major source of pond water	0.305***	4.697	0.065
Quantity of feed	0.625***	3.427	0.182
Stock size/ density of fingerlings	0.016	0.362	0.044
Type of Pond	0.057	1.442	0.040
R-squared	0.755		
Adjusted R-squared	0.647		
F-value	6.325***		

Source: Field Survey, 2015, *** = significant at 1%, ** = Significant at 5%, * Significant at 10%, the values in parenthesis are t-values.

The Constraints Confronted by the Fish Farmers

The basis for identifying the constraints is to be able to address them through formulation of appropriate policies. The results in Table 4 show that the three major problems confronting the fish farmers are high cost of feed (80.2%), inadequate fund (67.4%) and poor quality of medication materials/ feeds (60.5%). Other challenges faced by the farmers include adverse weather conditions (53.5%), pilferage on farm (47.7%), attack of predators e.g. snakes and birds on the pond fishes (41.9%) and high mortality of fingerlings (31.4%). These problems suggest that appropriate policies should be formulated to resolve them so as to achieve the expected level of fish productivity in the area.

Table 4: The Constraints Militating against Fish Production among the Farmers

CONSTRAINT	Frequency	Percentage	Rank
Inadequate finance	58	67.4	2nd
High mortality of fingerlings	27	31.4	7th
High cost of feed/ input	69	80.2	1st
Bad weather/ climatic conditions	46	53.5	4th
Attack of pests/ snakes and birds	36	41.9	6th
Pilferage/theft	41	47.7	5th
Poor medication materials and feed quality	52	60.5	3rd

Source: Field Survey, 2015

Conclusion and Recommendations

The findings of the study show that fish farming is a lucrative enterprise. A return of 42 kobo was realized from every N 1 invested. Secondary occupational status and low average experience i.e. 4 years negatively affected productivity of fish farming among the respondents. Meanwhile, previous farm income and feeds contributed significantly to increase in productivity. Feed as the most expensive input of fish farming constituted 90.9% of total cost of production in the area. Therefore, government should formulate and implement proper policies that would make credits available to the fish farmers through their respective Fish Farmers' Associations. The little experience of the fish farmers should be complemented with effective extension training and new innovations.

More so, government and private organizations should make efforts to ensure production of quality feeds and medical materials as well as adequate distribution to the farmers at affordable prices. The above recommendations, if implemented, would enhance increased productivity in fish farming for the growing population in the area.

REFERENCES

Adeniyi, O. R.; Omitoyin, S. A. and Ojo, O. O. (2012). Socio-Economic Determinants of Consumption Pattern of Fish among Households in Ibadan North Local Government Area of Oyo State, Nigeria. *African. J. Food, Agric., Nutrition. Dev*., 5(2) 6537-6552.

Adetunji, A. A. (2011). Fish Production, Poverty Alleviation and Cooperative Success of Eriwe Cooperative Fish Farm at Ijebu-Ode, Ogun State, Nigeria. Unpublished Bachelor of Aquaculture and Fisheries Management Project, University of Agriculture, Abeokuta, Ogun State, Nigeria.

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

Adinya, I.B; Offem, B.O. and Ikpi G.U. (2011). Application of a Stochastic Frontier Production Function for Measurement and Comparison of Technical Efficiency of Mandarin Fish and Clown Fish Production in Lowlands Reservoirs, Ponds and Dams of Cross River State, Nigeria. *The J. Animal and Plant Sci.,* 21(3): 595-600.

Ajao, A.O. (2006): Economic of Fish Farming in Oyo State, Nigeria. Ph.D. Thesis, Department of Agricultural Economics. Obafemi Awolowo University, Ile-Ife, Nigeria.

Bolorunduro, P. I. (2004). "Post-Harvest Loss Assessment and Adoption of Disseminated Technologies in the Artisanal Fisheries of Northern Nigeria". Unpublished Ph.D. Thesis. University of Ibadan. Nigeria.

Central Bank of Nigeria (2004). Statistical Bulletin, 264 - 267.

Central Bank of Nigeria (2005).Annual report and statement of Accounts, .CBN Abuja.

Dalhatu, M and Ala A. L. (2010). Analysis of Fish Demand in Sokoto Metropolis, Sokoto, Nigeria. *Nig. J. Basic Applied Sci.,* 18 (2) 154-159.

Dauda, T. O. (2010). Indigenous and Emerging technologies and Innovations for climate change Adaptation in Forestry. *Journal of sustainable Development,* 7:2-9.

Ejiola, M. T, and Yinka, O. F. (2012). Comparative Cost Structure and Yield Performance Analysis of Upland and Mangrove Fish Farms in Southwest, Nigeria. *International Journal of Agricultural Management & Development*, 2(3): 187-198.

Federal Department of Fisheries (FDF) **(**2005). Report of Presidential Committee on Fisheries and Aquaculture Development, Agriculture Focus. An Agricultural News Magazine Published by Foundation Consultants Limited, Abuja. (1) 5: pp. 10.

Food and Agricultural Organization of the United Nations*(FAO) (2005). Review of the state or world fishery resource in 2003: marine fisheries resources in 2003: marine fisheries, by S.M Garcia, I. DELEIRA Moremo & R J R Granjer. FAO. Fisheries Technical paper No. 457 Rome*

Food and Agricultural Organization of the United Nations (FAO) (2007). FAO Fishery Department Country Profile. Nigeria FID/CP/NIR.Rev. 4. March 2007. pp. 11.

FAO, (2008). Fisheries-The State of World Fisheries and Aquaculture. Part 1: World review of fisheries and aquaculture, Aquaculture production: 16-23.

Ideba, E.E; Otu, W.I; Essien, A.A; Iniobong, E.O. and Ekaette, S.U. (2013). Economic Analysis of Fish Farming in Calabar, Cross River State, Nigeria. *Greener Journal of Agricultural Sciences*, 3 (7): 542-549.

Igoche, L.E.; Makwin, F.; Akpenseun, T.T.; Kaye, J. and Oyedapo, F.A. (2019). Assessment of Fish Farming in Plateau State, North Central Nigeria. *Asian Journal of Fisheries and Aquatic Research*, 4 (1): 1-10.

Kudi, T. M., Bako, P. F. and Atala, T. K. (2008). Economics of fish production in Kaduna State Nigeria. ARPN *Journal of Agricultural and Biological Science* 3(5 & 6):17-21

Madubuike, F.N. (2012). Bridging the Animal Protein Supply and Demand Gap in Nigeria. An *Inaugural Lecture Series No. 7, Imo State University, Owerri, Nigeria.*

National Population Commission (NPC), 2007, Results of the 2006 Population Census, Abuja, Nigeria

Odukwe, A. (2007). *Fish Farming in the Tropics: A Functional Approach, Maxiprints*, Awka, Nigeria.

Ofuoku, A.N; Emah, G.N and Itedjere, B.E. (2008). Information utilization among rural fish farmers in Central Agricultural Zone of Delta State, Nigeria. *World J. Agric. Sci*. 4(5):558-564.

Okoye, B.C.; Okoye, A.C.; Asumugha, G.N.; Dimalu, M.U; Agwu, A.E. and Agbaeze, C.C. (2008). Determinants of Gender Productivity among Small-Holder Cocoyam Farmers in Nsukka Agricultural Zone of Enugu State, Nigeria. University of Nigeria, Nsukka, National Root Crops Research Institute, Umudike, Umuahia, Abia State, Nigeria: pp. 1-8.

Osawe, M. (2007). Technical know-how of Catfish Grow-out for Table Size in 4-6 Months. Proceedings of a Seminar on Modern Fish Farming by Dynamo Catfish Production, pp: 1–14. Lagos, Nigeria.

Oyebanjo, O. (2017). Labour Utilisation, Production Efficiency and Poverty Status of Rural Farm Households in Southwest Nigeria. Ph.D. Thesis, Department of Agricultural Economics and Farm Management, Federal University of Agriculture, Abeokuta, Nigeria.

Sanni, A. O.; Olowosegun, T.; Sule, A. M., Muhammed, A.; Yem, I.Y. and Onimisi, H. U. (2009). Capacity Building and Training Requirement for Effective Fisheries and Aquaculture Extension in Nigeria - A Review. Nature & Science, 7(4): 66 – 71.

Ugwumba, C. O. A. and Chukwuji, C. O. (2010). The Economics of Catfish Production in Anambra state, Nigeria: A Profit Function Approach. *J. Agric. and Soc. Sci.* 6 (4): 105–109.

Yahaya, K. A, Osemene, O. F. and Abdulraheem, A. (2011). Effectiveness of Microfinance Banks in Alleviating Poverty in Kwara State Nigeria. *Global Journal of Management and Business Research, 11* (4), 49-53.