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Economic assessment of backyard catfish (*Clarias gariepinus*) production in Abia State, Nigeria

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ABSTRACT

This study investigated economics of backyard catfish (*Clarias gariepinus*) production in Abia State. Multi-stage random sampling was used to select 60 catfish farmers across the three agricultural zones of the state. Primary data were collected using structured questionnaire. The data collected were analysed using frequency counts, percentage, mean, gross margin analysis and multiple regression analysis. The result of the study showed that 70% of the catfish farmers used concrete pond system, while 83.3% of them practice monoculture production system of fishery. Catfish farmers that rely solely on imported feeds constituted 23.3%, 43.3% mix imported with local feeds while 33.3% use local feeds only for feeding their catfish to market weight. The total revenue of the catfish farmers per production cycle was ₦185,870.00, gross margin of ₦65,170.00, net return of ₦62,185.00 and profitable index of 0.33. The result of the regression analysis had R^2 value of 0.92. Eight out of the 12 variables specified in the model significantly influence output at 0.01 and 0.05 level of significance. Some of the constraints faced by catfish farmers in the area include high cost of input, high cost of transportation, unstable prices, poor road network, poor technical know-how for technology adoption, lack of access to credit among others. The study therefore recommended proper funding of catfish production through provision of soft loans to catfish farmers and intending farmers to venture into catfish production to close the demand supply gap of catfish in the area.

Keywords: Economics, Backyard, Catfish, Protein, Abia State

INTRODUCTION

The greatest percentage of Nigeria's population is engaged in production of crops, livestock, agro-processing and marketing of agricultural products for livelihood. Fishery is an important sub-sector of the Nigerian agricultural sector providing employment directly and indirectly in terms of people employed in raising fishes to market weight, producing fingerlings, formulating feeds, processing

and marketing of fishes. Asa and Obinaju (2014) stated that the fishery provides full-time employment to over 12 million people, which constitutes about 3% of the active population of the nation; another 11 million people indirectly earn their livelihoods from fishery related farming activities. Fishery sub-sector has recorded the fastest growth rate in terms of gross domestic product (GDP) contributing about 5% out of the total estimated 40% being contributed by entire

agricultural sector to GDP (Federal Department of Fishery, 2013). The contributions of the fishery sub-sector to Nigeria's economy is very significant through improved national food security, employment creation, income generation, poverty alleviation, foreign exchange earnings and protein sufficiency.

Regrettably, the total aggregate of domestic fish supply from all sources both captured from natural water bodies and cultured fishes is less than 0.7 million metric tonnes per annum. Consequently, Nigerian has to result to importation of fish valued at about \$500 million annually to augment the shortfall making Nigerian the largest importer of frozen fish in Africa (FMARD, 2011). Due to the obvious wide demand and supply gap, there has been several efforts at promoting fish production among small scale famers who practice backyard fish farming.

Backyard production of fish otherwise called *aquaculture* is widely gaining recognition in Nigeria through domestication of fishes raise in concrete, earthen and plank or wooden pond to market weight. The most commonly cultured fish species in Nigeria include tilapia, carp and catfish (Olagunju et al, 2007). According to Asa and Obinaju (2014), there is preference among Nigerian fish farmers for catfish production because it adapts well to culture environment and can easily be retailed live and it attracts premium price. Catfish (*Clarias gariepinus*) is suitable for stocking in ponds and they tolerate low dissolved oxygen better than other common species in the country. Catfish has wide acceptability as food across Nigeria because it's not full of bones and scales like some species of fish. Despite these considerably high potentials, local fish production has failed to meet the country's domestic demand. The growth of a country's population is usually accompanied by increase in the demand for

the basic necessities of life including water, food, shelter and protein of both plant and animal origin. This is the case with the unrestricted increase in the demand for protein rich fishes especially catfish. Out of the 35 grams of animal protein per person per day recommended by FAO, less than 7grams is consumed per day by average Nigerian (Food and Agriculture Organization, 2006). As a result of this, many Nigerians suffer malnutrition due to protein deficiency. Nigeria is therefore faced with the task of providing enough protein enriched food for its population due to the vital role it plays in health and general well being of the citizen.

The importance of the fishing industry to the sustainability of animal protein supply in the Nigeria cannot be overemphasized (Ugwumba and Chukwuji, 2010). Greater improvement in catfish production can be achieved with a proper analysis that will lead to knowledge of the level of profitability of catfish farming and constraints to its production. In Abia State, there is gross inadequacy of catfish supply couple with the increasing population and less natural water bodies. In order to stimulate farm business interest in cultured catfish production in the area therefore, information on the profitability and other factors that affect the returns of the farmers must be provided taking into cognisance the peculiarity of the ecological and business environment of Abia State different from other areas where related studies had been conducted. It is against this background that this study was carried out to assess economics of backyard catfish (*Clarias gariepinus*) production in Abi State. The specific objectives of the study focused on assessment of: (i) catfish production system practiced by catfish farmers in the study area, (ii) cost and return of backyard catfish production, (iii) determinants of backyard catfish farmers' output and (iv) challenges

faced by backyard catfish farmers in Abia State.

MATERIALS AND METHODS

Area of the Study

The study was carried out in Abia State, Nigeria. The state is located within the tropical rainforest zone and lies between longitudes 7° 10' and 8° East of the Greenwich Meridian and latitudes 4° 40' and 6° 14' North of the Equator (National Bureau of Statistics, 2005). Abia State is made up of seventeen (17) administrative Local Government Areas broadly divided into three agricultural zones which include: Aba, Ohafia and Umuahia agricultural zones. The state lies south of Enugu and Ebonyi States as well as east of Anambra and Imo States. It is bounded in the east by Cross River and Akwa Ibom States and in the south by Rivers State. Abia State has a climate marked by two major seasons; the raining season which lasts between April to October and dry season lasting from November to March like other states in the rainforest zone. Abia State occupies a land area of about 5,243.775sq.km which is approximately 5.85% of the total land area of Nigeria (National Bureau of Statistics, 2005). The population of Abia State as projected by National Bureau of Statistics (2012) is 3,256,642 persons. Agriculture is one of the main occupations of the people of Abia State, providing income and employment for more than 65% of the population. Catfish farming is a common farm enterprise across the three agricultural zones of the state. Other livestock commonly reared by farmers in the state include poultry, goat, pigs, cattle and micro livestock such as bees, snail farming, grasscutter among others. Food crops grown in the Abia State include yam, cassava, maize, cocoyam and different types of

Gross Margin

$$GM = TR - TVC \dots \dots \dots (1)$$

vegetables while the main agricultural cash crops in the state are cashew, mango, citrus and oil palm among others.

Sampling and Data Collection

Multi-stage random sampling was adopted for the selection of respondents for this study. The three (3) agricultural zones of the state, namely: Aba, Ohafia and Umuahia were selected because of the spread of catfish production across the state. Secondly, two Local Government Areas (LGAs) from each of the zone were selected using random sampling making six LGAs for the study. The third stage involved random sampling of two communities in each of the six LGAs making 12 communities for the study. At the fourth stage, five catfish farmers were selected using simple random sampling from each of the 12 communities giving a total of 60 catfish farmers for the study.

Primary data for the study were collected between April and May, 2017 using structured questionnaire. With the help of two research assistants, the entire 60 copies of the questionnaire administered to the respondents were retrieved representing 100% return rate. Information sourced from the respondents includes their socio-economic characteristics, catfish production system adopted, cost and returns of catfish farmers and constraints militating against catfish farmers. Data collected were analysed using descriptive statistics, cost and return analysis and ordinary least square (OLS) multiple regression analysis.

Model specification

Gross Margin Analysis

The economics of backyard catfish production in Abia State was estimated using gross margin analysis. The model is expressed as:

Where: GM = Gross Margin
 TR = Total Revenue
 TVC = Total Variable Cost

Rate of Return on Investment (RRI)

$$RRI = \frac{NR}{TC} \times \frac{100}{1} \dots \dots \dots (2)$$

Where: RRI = Rate of Return on Investment
 NR = Net Return
 TC = Total Cost

Profitability Index (PI)

$$PI = \frac{NR}{TR} \dots \dots \dots (3)$$

Where: PI = Profitability Index
 NR = Net Return
 TR = Total Revenue

Operating Expense Ratio (OR)

$$OR = \frac{TVC}{TR} \dots \dots \dots (4)$$

Where: OR = Operating Expense Ratio
 TVC - Total Variable Cost
 TR = Total Revenue

Regression Analysis

Ordinary Least Square (OLS) multiple regression analysis was employed to estimate determinants of output of backyard catfish farmers in the area. The following is the implicit form of the model:

$$Y = f(X1, X2, X3, X4, X5, X6, X7, X8, X9, X10, X11, X12 + e) \dots \dots \dots (5)$$

Where:

- Y = output of the catfish farmers (in kg).
- X1 = Gender (1 = male, 0 = female)
- X2 = Age (years);
- X3 = Household size (number);
- X4 = Educational Attainment (years);
- X5 = Farming Experience (years);
- X6 = Extension contact (number);
- X7 = Cost of feed used (Naira);
- X8 = Cost of medication (Naira);
- X9 = Unit price (Naira);
- X10 = Stock size (number);
- X11 = Location (Urban 1, Rural 0;
- X12 = Labour (man days);
- e = Radom error term.

Three functional forms (linear, semi-log and double-log) were estimated using the Ordinary Least Square (OLS). The explicit forms of the functional forms are:

Linear Function

$$Y = b_0 + b_1X1 + b_2X2 + b_3X3 + b_4X4 + b_5X5 + e \dots \dots \dots (6)$$

Semi-Log Function

$$Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + e \dots \dots \dots (7)$$

Double-Log Function

$$\log Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + e \dots \dots \dots (8)$$

This was considered necessary in order to select the functional form with the best fit. In the semi-log and double log forms, 0 values in the dummies were replaced with 0.0001. This is because, the number 0 is undefined for log.

Mean Using Rating Scale Technique

To identify the challenges faced by catfish farmers in the study area, mean and standard deviation were employed using a 4-point rating scale. The four response options to describe the degree of the challenges are as follows:

<i>Response options</i>	<i>ordinal values</i>
Very Serious (VS)	= 4
Serious (S)	= 3
Less Serious (LS)	= 2
Not Serious (NS)	= 1

The cut-off point for the response option was obtained thus:

$$\frac{4 + 3 + 2 + 1}{4} = \frac{10}{4} = 2.50 \text{ (cut-off point)} \dots \dots \dots (9)$$

Based on the obtained cut-off point value, any item with mean value of 2.50 and above was treated as “Serious Challenge” while items with mean values less than 2.50 were regarded as “Not Serious Challenges”.

RESULTS

Pond Systems Practiced by Catfish Farmers in Abia State

The result in Table 1 on pond systems mostly used by catfish farmers revealed that, majority (70%) of the farmers practiced

concrete fish pond farming while the remaining 30% practice the use of earthen pond for catfish production. None of the catfish farmers in the Abia State practice the use of planks/wooden pond for catfish production.

Table 1. Frequency and Percentage Distribution of Catfish Farmers by Pond System Practiced in the Study Area

SN	Pond Systems	Frequency	Percentage
1	Concrete pond	42	70.0
2	Earthen pond	18	30.0
3	Plank / wooden pond	0	0
	Total	60	100

Source: Field Survey, 2017

Culture Methods Practiced by Catfish Farmers in Abia State

Majority (83%) of the farmers practiced monoculture of rearing mostly catfish in

their ponds while only about 17% of the farmers practice polyculture in which some few species of fishes are reared with the main catfish stock in the ponds.

Table 2. Frequency and Percentage Distribution of Catfish Farmers by Culture Method Practiced in the Study Area

SN	Culture Methods	Frequency	Percentage
1	Monoculture	50	83.30
2	Polyculture	10	16.70
	Total	60	100

Source: Field Survey, 2017

Types of Feeds Used by Catfish Farmers in Abia State

The result on types of feeds used for feeding catfish by farmers in Abia State showed that about 23% of the farmers indicated the use

of purely imported feeds, 33.3% of the catfish farmers practice the combination of both imported and local feeds while majority (43.3%) used local feed only for feeding catfish.

Table 3. Frequency and Percentage Distribution of Catfish Farmers by Types of Feeds for Feeding Fish in the Study Area

SN	Feed Types for Fish Feeding	Frequency	Percentage
1	Using purely imported feeds	14	23.3
2	Mixing imported with local feeds	20	33.3
3	Using local feeds only	26	43.3
	Total	60	100

Source: Field Survey, 2017

Costs and Return of Backyard Catfish Production in Abia State

The result in Table 4 presents the costs and return on backyard catfish fish farming per production cycle in Abia State. From the computation, the estimated total revenue (TR) of catfish per production cycle was ₦185,870.00 and gross margin (GM) of ₦65,170.00. The net return (NR) of catfish farmers in the area was ₦62,185.00. The profitable index (PI) of catfish farmers in Abia State was 0.33, indicating that about 33% of the total revenue (TR) generated from catfish farming constitute the net income. This suggests an appreciable level of profit from catfish farming as a lucrative farming enterprise in the study area. The

rate of return on investment (RRI) of about 50% implies that an average catfish farmer in the area earns 50% profit on every naira invested in the enterprise. The operating expense ratio (OR) of 0.65 indicates that the variable cost consumed 65% of sales.

Determinants of Backyard Catfish Farmers' Output

The result in Table 4 presents the regression analysis of the determinants of output of the catfish farmers in kg. Three functional forms (linear, semi-log and double-log) were tried with the double-log functional form had the best fit, based on the values of R^2 (0.92), number and levels of significance of explanatory variables and

their signs. For instance, the R^2 value of 0.92 indicates that the significant variables are responsible for about 92% variation in the output (kg) of the catfish farmers. The F-value of (78.717) indicated that the overall equation was significant at ($p < 0.01$) while Durbin-Watson (DW) of 2.194, showed the absence of autocorrelation. Out of the twelve explanatory variables specified, eight were statistically significant; these were gender, age, household size, years of education, farming experience, cost of medication, unit price and stock size

The coefficient of gender was significant and positive affected output of catfish farmers at ($p < 0.01$). This suggests that male catfish farmers perhaps make higher output from their catfish farming than their female counterparts. The coefficient of age of the farmers was highly significant ($p < 0.01$) but negatively related with catfish output. This indicates that as the age of the farmers increases, the lower the output. Household size of the farmers was significant ($p < 0.01$) and positively related with catfish output. This shows that as

households increase in number, there is likelihood for increased in catfish output.

The coefficient of years of education was positive and significantly ($p < 0.01$) influence the output of catfish farmers. This conform to *a priori* expectation as years of education increase, the output of the farmers too is expected to increase. Years of farming experience of the farmers is significant and positively influence catfish output of the farmers at $p < 0.05$ level. The significant and positive relationship indicates that as years of farming experience of the farmers increase, there is also increase in the output (income) of the farmers. Cost of medication had a positive and significant ($p < 0.01$) relationship with output of catfish farmers. The coefficient of unit price of catfish at market weight was significant and positively related to output at $p < 0.05$. The coefficient of stock size was highly significant ($p < 0.01$) and positively related to output of catfish farmers. This also conforms to *a priori* expectation because as stock size of the catfish increases, there should be corresponding increase in the output (income) of the farmers, all things being equal.

Table 4. Costs and Return of Backyard Catfish Production per Production Cycle

Items	Amount (₦)	% in Cost Category
Variable Cost (VC)		
Fingerlings	21,270.00	17.6
Cost of medication	4,880.00	4.0
Labour	17,300.00	14.3
Feed	25,800.00	21.4
Manure	3,950.00	3.3
Water	15,000.00	12.4
Energy (power generation)	13,000.00	10.8
Transportation	12,500.00	10.4
Miscellaneous cost	7,000.00	5.8
Total Variable Cost (TVC)	120,700.00	
Fixed Cost (FC)		
Depreciation on pond	900.00	30.2
Depreciation on refrigerators	1,400.00	46.9
Depreciation on other equipment (such as bowls, weighing balance, hooks, nets,	685.00	22.9
Total Fixed Cost (TFC)	2,985.00	
Total Cost (TC)	123,685.00	
Total Revenue	185,870.00	
Gross Margin	65,170.00	
Net Return	62,185.00	
Profitability Index	0.33	
Rate of Return on Investment	50.28%	
Operating Expenses Ratio	0.65	

Source: Field Survey data, 2017

Table 4. Parameter Estimates of Determinants of Backyard Catfish Farmers' Output (kg) in Abia State, Nigeria

Variables	Linear	Semi-Log	Double-Log+
Intercept	6.442 (1.449)***	3.560 (0.824)***	18.870 (1.091)***
Gender	0.588 (0.096)***	0.242 (0.095)**	3.946 (0.352)***
Age	-2.374 (0.336)***	-20.950 (3.356)***	-0.109 (0.006)***
Household Size	3.898 (1.229)**	4.175 (1.192)***	0.181 (0.024)***
Yrs of Education	32.002 (4.844)***	2.792 (0.404)***	0.198 (0.011)***
Experience	-8.530 (8.379)	0.572 (0.569)	0.016 (0.005)**
Ext Contact	6.832 (2.061)***	0.434 (0.098)***	0.266 (0.358)
Cost of Feed	-0.335 (0.138)**	17.109 (17.134)	0.187 (0.214)
Cost of Med	-34.292 (17.892)*	-27.017 (15.378)	-0.965 (0.156)***
Unit Price	27.499 (3.969)***	4.089 (0.570)***	0.364 (0.108)**
Stock Size	32.066 (31.512)	-5.751 (4.849)	0.252 (0.047)***
Location	-0.206 (1.261)	-1.112 (0.367)**	-0.083 (0.122)
Labour	0.292 (2.448)	-2.563 (2.507)	0.149 (0.152)
No of Observation	60	60	60
R ²	0.701	0.738	0.920
Durbin-Watson	1.940	2.019	2.194
F-value	44.726	49.967	78.717

Note: *** denotes $p \leq 0.01$; ** denotes $0.01 < P \leq 0.05$; *denotes $0.05 < p \leq 0.10$.

+ = Lead equation, (Figures in parenthesis are standard errors)

Source: Field Survey, 2017

Challenges faced by Backyard Catfish Farmers in Abia State

The result presented in Table 5 showed that the mean ratings of the responses of the respondents on 15 out of the 20 items ranged from 2.61 to 3.90 which are all greater than the cut-off point value of 2.50 on 4 point rating scale. Some of the items and their

respective mean values include: high cost of farm input (3.48), high cost of transportation (3.15), fluctuation of prices of product in the market (3.10), poor road network to facilitate movement of product (3.15), lack of Technical know-how for farmers to adopt technology (3.32), lack of access to extension and other supporting facilities and

services (3.32), lack of access to credit to expand producing enterprise (3.90), insufficient knowledge on sources of credit (2.78), lack of collateral security to secure formal loans (3.36) and lack of adequate

capital to support farm operations (3.43). These results showed that the identified 15 items are serious challenges facing catfish farmers in their farming operations in the study area.

Table 5. Mean Ratings of the Challenges Faced by Backyard Catfish Farmers in Abia State

SN	Challenges facing farmers in catfish production include:	\bar{X}	SD	Rmks	Ranking Order
1	Lack of access to credit to expand producing enterprise	3.90	0.30	S	1 st
2	High cost of farm input	3.48	0.74	S	2 nd
3	Lack of adequate capital to support farm operations	3.43	1.09	S	3 rd
4	Lack of collateral security to secure formal loans	3.36	0.84	S	4 th
5	Lack of access to extension and other supporting services	3.33	1.08	S	5 th
6	Lack of technical know-how to adopt technology	3.32	0.67	S	6 th
7	High cost of transportation	3.17	0.51	S	7 th
8	Poor road network to facilitate movement of product	3.15	0.84	S	8 th
9	Fluctuation of prices of product in the market	3.10	0.79	S	9 th
10	Labour intensive nature of catfish production	2.80	1.27	S	10 th
11	Insufficient knowledge on sources of credit	2.78	1.10	S	11 th
12	Inadequacy of labour supplies for palm fruit processing	2.72	1.22	S	12 th
13	Theft and security of fishes in the farm	2.67	1.12	S	13 th
14	Unwillingness of farmers to adopt modern technologies	2.63	1.24	S	14 th
15	Poor attitude of most people towards catfish production	2.61	0.82	S	15 th
16	Poor quality of catfish in the market	2.45	0.76	NS	16 th
17	Disease outbreak in fish farming	2.40	1.36	NS	17 th
18	Lack of steady land for pond construction	2.25	1.11	NS	18 th
19	Low demand of catfish in the market	2.20	0.87	NS	19 th
20	High cost of labour in the area	1.95	0.76	NS	20 th

Note: \bar{X} = Mean; SD = Standard Deviation; S = Serious Challenge; NS = Not Serious Challenge

Source: Field Survey, 2017

DISCUSSION

The total revenue (TR) of catfish per production cycle was ₦185,870.00, gross margin (GM) of ₦ 65,170.00 and net return (NR) of ₦62,185.00. This indicates that catfish farming is a viable farm enterprise where youth can be gainfully engaged for sustainable livelihood in the study area. The profitable index (PI) of the catfish farmers per production cycle was 0.33. This suggests that about 33% of the total revenue (TR) generated from catfish farming constitute the net income. This indicates that

catfish farming is a highly profitable enterprise that can guarantee higher returns to the farmers. For instance, the rate of return on investment (RRI) of about 50% implies that an average catfish farmer in the area earns 50% profit on every naira invested in the enterprise. Asa and Obinaju (2014) equally carried out a study on economics of catfish production in Akwa Ibom State and found that the total revenue of catfish farmer per production cycle was ₦56,385,000.00 and net income of ₦18,539,760.00. The study of Issa, *et al.*

(2014) also confirmed the profitability of small-scale catfish farming in Kaduna State. This shows that catfish production is a profitable farm enterprise in Nigeria irrespective of the location.

The coefficient of gender was significant and positively affected output of catfish farmers at ($p < 0.01$). This suggests that male catfish farmers perhaps make higher output from their catfish farming than their female counterparts. The steady access to land for increased farming and possible better technical know-how of men than women could be responsible for the trend. Adebayo and Daramola (2013) investigated economics analysis of catfish production in Ibadan metropolis and found that sex in favour of male farmers significantly influenced total revenue of catfish production. The coefficient of age of the farmers was highly significant ($p < 0.01$) but negatively related with catfish output. This indicates that as the age of the farmers increases, the lower the output. The attention-demanding and tedious nature of catfish production could possibly be responsible for low output of aged farmers. Sikiru, et al, (2009) reported that younger age bracket is a productive age, which predicts better future for catfish production. Similarly, Adebayo and Daramola (2013) on economics analysis of catfish production in Ibadan metropolis showed that as the age of farmer increases productivity decreases. Hence, teaming unemployed youth should be encouraged to venture in catfish farming for earning a living.

Household size of the farmers was significant ($p < 0.01$) and positively related with catfish output. This shows that as households increase in number, there is likelihood for increased in catfish output. The observed higher catfish output in relation to household size suggests readily labour availability for increased catfish

production. Labour is one of the most important inputs in smallholder farm business enterprises. Oluwasola and Ige (2015) in a study found that amount of labour used positively and significantly influenced net income in catfish production. The coefficient of years of education was positive and significantly ($p < 0.01$) influence the output of catfish farmers. This conform to *a priori* expectation as years of education increase, the output of the farmers too is expected to increase. Knight, Weir, Woldehanna (2003) noted that education encourages farmers to adopt innovations for increased production. Years of farming experience of the farmers is significant and positively influence catfish output of the farmers at $p < 0.05$ level. The significant and positive relationship indicates that as years of farming experience of the farmers increase, there is also increase in the output. This is expected as experience of the farmers exposes them to better methods and technologies of catfish farming that will result in higher output. Effiong, et al. (2014) equally established a positive relationship between farming experience and farm output. Although, the result of this study on influence of experience contradicts the findings of Oluwasola and Ige (2015) where farming experience was found to negatively influenced net income of catfish farmers. Possible reasons for the negative relationship between experience and net income of catfish farmers in the case of Oluwasola and Ige could be extremely old age of the farmers, old and small size of fish ponds as output could decrease as pond sizes also decrease.

Cost of medication had a positive and significant ($p < 0.01$) relationship with output of catfish farmers. The coefficient of unit price of catfish at market weight was significant and positively related to output at $p < 0.05$. The coefficient of stock size was

highly significant ($p < 0.01$) and positively related to output of catfish farmers. This also conforms to *a priori* expectation because as stock size of the catfish increases, there should be corresponding increase in the output of the farmers, all things being equal. Adebayo and Daramola (2013) found that cost of drug and number of pond unit positively and significantly influenced total revenue of catfish farmers. The result of the study of Yusuf, et al, (2016) also confirm that operating cost which may include cost of feed, medication and stock capacity significantly influence farm income.

The challenges of catfish farmers in the study area include: high cost of farm input, high cost of transportation, fluctuation of prices of product in the market, poor road network to facilitate movement of product, lack of technical know-how for farmers to adopt technology, lack of access to extension and other supporting facilities and services, lack of access to credit to expand producing enterprise, insufficient knowledge on sources of credit and lack of collateral security to secure formal loans. The high of input, lack of technical know-how and lack of access to credit to expand producing enterprise among other are likely to be the cause of the observed shortage and wide demand and supply gap for catfish in Abita State. Asa and Obinaju (2014) in a study also identified high cost of feeds, high cost of pond construction and lack of capital/finance as severe constraints to catfish farming in Akwa Ibom State. Ohen and Abang (2009) reported that catfish farming requires a huge capital outlay. The findings of Kudi, et al (2008) confirmed that lack of capital is a major problem encountered in fish production in Nigeria.

Hence, based on the results of this study, it is recommended that there should be provision of soft loans to catfish farmers for improved investment in catfish farming in the state, the state government through its

ministry of Agriculture should embark of aggressive provision of farm inputs and subsidies to catfish farmers in the state, appropriate policies for good business environment for catfish farming should be formulated by the state government.

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