

Peri-Urban farmers' perception of profitability of catfish production in Osogbo Metropolis, Osun State, Nigeria

Alao, O. T.

Department of Agricultural Economics and Extension, College of Agriculture, Ejigbo Campus, Osun State University, Oshogbo, Osun State.

E-mail: oluwagbenga.alao@uniosun.edu.ng; +2348035844257

ABSTRACT

This study analysed the peri-urban farmers' perception of profitability of catfish production in Osogbo metropolis, Osun State, Nigeria. The socio-economic characteristics of the respondents, the cost and returns on catfish production, gross margin and factors influencing gross margin of catfish production were identified. Simple random sampling technique was used to select 90 respondents. Data were obtained through a structured and validated interview schedule. Descriptive statistics, budgetary technique and multiple regression models were used to analyze the data. The results of the study show that majority (91.1%) of the catfish farmers were in their active age of less than 60 years, with the mean age of 45 years while the majority (75.56%) of the respondents were male. The farmers perceived that catfish farming was profitable ($\bar{x} = 4.08$). Catfish farmer perceived the venture profitable but with the high cost of feed and labour. It has an average gross margin of ₦897,843.6 per annum and the Rate of Return on investment of ₦1.35. The budgetary analysis shows that the cost of raising one fish from fingerlings to table size of 1.45kg, average weight was ₦312.21 with accrued profit of ₦412.79. The average gross profit margin per catfish farmer was ₦897,843.6 per annum. The Regression analysis showed that feed and labour costs were the factors influencing gross margin profit negatively, while fish price and fish stocked cost influenced gross margin profit positively. In conclusion, Ministry of Agriculture should educate the farmers on how to reduce the cost of feeding and labour to enhance production and maximise profit.

Keywords: Peri-Urban farming, Perception, Profitability, Catfish farmer, Catfish production.

INTRODUCTION

Nigeria is predominantly an agrarian country, where the greatest percentage of the population is engaged in farming. In spite of the dominance of the oil export sector in foreign exchange earnings, agriculture remains the backbone of the rural economy in Nigeria. It provides direct employment to about 30.57 per cent of the population (World Bank, 2010). The contribution of agriculture to Nigeria's gross domestic product (GDP) went from 64 percent in 1960 to 46 percent in 2010 and is about 21.1 per cent in 2016 (Global Finance Magazine, 2017). This is as a result of the decimal performance of its sub-sectors. With the exception of crop sub-sector, livestock share of agricultural GDP declined from 24 percent in 1980 to 6 percent in 2010; forestry from 4 percent to 1 percent and fishery from 11 percent to 3 percent, respectively (Udah *et al.*, 2015). The fishery sub-sector 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 activities related to fisheries (Food and Agriculture Organization, FAO, 1999). Fish farming generates employment directly and indirectly in terms of people employed in the production of fishing output and other allied businesses (Olagunju *et al.*, 2007). Fish is the most important animal protein food available in the

tropics (Ali *et al.*, 2008). It provides about 40% of the dietary intake of animal protein of the average Nigerian (Federal Department of Fisheries, FDF, 1997). Apart from human consumption and nutritional well-being, fish is important for animal feed and a source of raw materials in allied industries. It also contributes to rural and peri-urban development, increasing export opportunities, effective administration of natural resources and conservation of biological diversity (Esu *et al.*, 2009).

Fish farming is the sub-set of aquaculture that focuses on the rearing of fish under controlled or semi-controlled conditions for economic and social benefits (Anthonio and Akinwumi, 2002). Fishing, like any other hunting activities, has been a major source of food for the human race and has put an end to the unsavoury outbreak of anaemia, kwashiorkor and so on. According to Ayinla (2007), the most reliable source of protein for many people in the developing economies is and could continue to be fish. According to Food and Agriculture Organization (2002), fisheries products represented a major source of export revenue for developing countries, amounting to over US \$ 20 billion per annum in the late 1990s. This exceeded the values obtained from the exports of meat, dairy, cereals, vegetables, fruit, sugar, coffee, tobacco and

oilseeds in 1997 from developing countries (International Trade Centre, 2002).

It has been shown that Nigeria can substitute fish importation with domestic production to create jobs, reduce poverty in rural and peri-urban areas where 70% of the population lives and ease the balance of payments deficits (Areola, 2007). However, Food Agricultural Organisation (F.A.O.) (2007) indicated that Nigeria imports about 560,000 tons of fish estimated at about \$400 million annually while annual domestic fish supply in Nigeria stands at about 400,000 tons. This makes Nigeria one of the largest importers of fish in the developing world.

The story of aquaculture in Nigeria is essentially the story of catfish culture and the hope of fish supply in Nigeria hangs on its development and culture. The most commonly cultured species of fish in Nigeria include catfish, tilapia, and carp (Olagunju *et al.*, 2007). Catfish farming is a branch of agriculture that is grouped under aquaculture. It is the manipulation of the freshwater body to achieve the desired result in raising catfish species to a marketable size. Catfish farming began in Nigeria in the 20th century with the establishment of a catfish farm at the experimental station in Panyam Jos, a State in North Central Nigeria. The African Catfish is a species of catfish of the family Clariidae and its scientific name is *Clarias gariepinus* which was named by Burchell in 1822. In most countries, it fetches a higher price than tilapia as it can be sold live at the market as they have a market value two to three times that of tilapia (Emokaro, 2010). According to Olagunju, *et al.*, (2007), it requires less space, time, money and has a higher feed conversion rate. Consequently, many fish farmers in Nigeria focus on catfish because it adapts well to culture environment, can easily be reared live and it attracts the premium price. Catfish are suitable for stocking in ponds and they tolerate low dissolved oxygen better than other common species in the country.

The importance of catfish itself cannot be overemphasised. According to Anoop *et al.*, (2009), it provides food for the populace, it allows for improved protein nutrition because it has a high biological value in terms of high protein retention in the body, higher protein assimilation as compared to other protein sources, low cholesterol content and one of the safest sources of animal protein. Many species of fish are farm produced all over the world, but Catfish is taking the lead because of its uniqueness. Catfish has wide acceptability as food in Nigeria, the demand for Catfish in Nigeria is unprecedented so much so that no matter the quantity supplied into the market, it would be consumed by ready buyers. This is so because of its low caloric value, low carbohydrate

content, high in protein, low in fat, it is quick and easy to prepare and above all, it tastes great (Vanguard, 2009).

Fish is very important in the diet of many Nigerians, high in nutritional value with the complete array of amino acids, vitamins, and minerals. In addition, fish products are relatively cheaper compared to beef, pork and other animal protein sources in the country. Fish contribute more than 60% of the world supply of protein, especially in the developing countries. However, the African catfish species (*Clarias gariepinus* or *lazera*) are the most resistant and widely accepted and highly valued fish that are cultivated in Nigeria. It is a major species reared in Nigeria. According to Ozigbo *et al.*, (2013) *Clarias* spp. (*C. lazera* or *gariepinus*) popularly known as Catfish has the following characteristics: Its body has no scales, has omnivorous feeding habit, preys heavily on other species and even on its own fry and fingerlings, usually it is not stocked alone but along with tilapia which provides food for it and it has relatively slow growth rate when compared with common Carp and *Heterotis* spp.

Despite the increase in fish production in Nigeria, production level is still very low and this has been attributed to high cost of input, lack of credit to fish farmers at low-interest rate, lack of skilled manpower and an ineffective aquaculture extension service system (Oota, 2012). Adewumi and Olaleye, (2011); George *et al.*, (2010) and Nwiro, (2012) found out that a number of problems confronting the production of catfish; being a major species in Nigeria. Prominent among these are Poor management skills, inadequate supply of good quality seed, lack of capital, high cost of feed, inadequate information, faulty data collection, lack of environmental impact consideration and marketing of products. According to Oluwasola and Ige (2015), fish feed constituted 79.18% of the total operating cost and the amount of labour, and quantity of feed used were significant determinants of net income in catfish production. If the associated problems of production, especially the twin issue of feed production and fingerling supply are tackled, Nigeria will soon become a world exporter of catfish.

In Nigeria, aquaculture development has been driven by social and economic objectives, such as nutrition improvement in rural areas, generation of supplementary income, diversification of income activities, and the creation of employment (Chilaka *et al.*, 2014). Profitability is the financial reward that farmers get from its produce. It is the primary goal of all business outfits. The basis of farmer's decision for venturing into farming operation and allocating their scarce resources in the production depends on the relative profits gained (Carlo,

2001; Don 2009). Profit is a function of farm type, size, location and commodity produced as well as yield, output price and operational cost which include both fixed and variable cost (Blank, 2002; Jolejole *et al.*, 2009). Farm profitability is the key to fish production enterprise as fish farmers would only embrace new technologies if they are profitable (Ashley-Dejo *et al.*, 2016). Government policies and decisions affect farmers profit (Acquaah, 2005). Studies have been carried out on profitability of fish production using gross margin analysis in many part of Nigeria and it was confirmed that fish production is profitable; these include Ashaolu *et al.*, (2005); Olagunju *et al.*, (2007); Raufu *et al.*, (2007); Emokaro and Ekunwe (2009); Okwu and Acheneje (2011); Olaoye and Odebiyi (2011) and Tunde *et al.* (2015).

Despite perceived profitability of catfish farming with a projected return on investment of 70% to 80% catfish farmers in Lagos are grappling with myriad of challenges that leave a sour taste in their mouths. According to REJOPRAO's (2017) investigation into catfish farming in Lagos, Nigeria, the problems bedevilling catfish farming in Lagos State ranges from theft, under-pricing, inability to identify Runts from Shoots, high cost of fish feeds; high mortality rate of fingerlings, poor funding, and epileptic power supply to instability on market. While some Lagos catfish farmers struggle to remain in business; many others who lack the financial muscle and professional skills are quitting; at a time Nigeria's annual fish import bill, according to Audu Ogbe, minister of Agriculture, stands at a staggering \$700 million.

Hence, this study analyzed the peri-urban famers perception of profitability of catfish production in Osogbo metropolis, Osun State, Nigeria. The study specifically determined the socio-economic characteristics of the catfish farmers; estimated the cost and returns of catfish production; assessed the gross margin of catfish production; as well as investigated the factors influencing gross margin of catfish production in the study area.

METHODOLOGY

Oshogbo is the capital and the seat of power of Osun State government. Many farmers practiced fish farming on the available land close to the source of perennial water and their houses in the peripheral of the town as the source of employment and income generation. Primary data were obtained from respondents through well-structured and validated interview schedule. The information scope of the interview schedule was based on the socio-economic characteristics of the respondents (age, marital status, years of experience), other information such as the cost of fingerlings, feed, and labour, as well as, quantity harvested among

others. Simple random sampling technique was used to select 90 respondents which represent 75% of the total population, based on the list of Catfish Farmers Association of Nigeria (CAFAN) in Osogbo metropolis. Each farmer on the list was represented with a number on a card and the cards were shuffled and picked randomly one after the other. The data obtained were analyzed using the descriptive statistics, budgetary technique and multiple regression models. Farmers' perception was measured using Likert-scale of Strongly agreed (5), Agreed (4), Undecided (3), Disagreed (2) and Strongly Disagreed (1) for positive questions and vice versa for negative ones.

RESULTS AND DISCUSSION

Socioeconomic characteristics of catfish farmers

Age: Table 1 shows that 82.18 percent of the respondents were in age bracket between 30 and 60 years. The mean age of the farmers was 45 years. The age distribution showed that catfish farming is practiced among the middle-aged farmers. This indicates that most of the respondents can withstand the rigors associated with the trade.

Sex: Table 1 shows that 75.56 percent of the respondents were males while 24.44 percent of were female. This corroborates Fregene *et al.*, (2011) that farming is an occupation that is gender sensitive. This also corroborates Adewumi and Olaleye, (2011); George *et al.*, (2010) and Nwiro, (2012) that catfish farming business is faced with a lot of risks and uncertainties that could be bear by men. It could be associated with the drudgery of fish farming.

Marital status: Table 1 shows that 74.44 percent of the respondents were married. Twenty percent of them were single while 5.56 percent were widowed. This implies that the respondents would have access to family labour.

Household Size: Table 1 shows that 58.89 percent of the respondents had household sizes of between 1 and 5 while 40 percent had household sizes of between 6 and 10. The mean household size was 5. The result showed that majority of the farmers had the small household size between 1 and 5. This is an indication that there would be the reduction in household expenditure which would not affect the quantum of income realizable from the enterprise.

Educational status: As shown in Table 1, the majority (74.44%) had tertiary education and 16.67 percent had secondary education. This indicates that the respondents would not have difficulty in adopting any of innovation introduced by change agents in fish production. Education makes a person responsive to new ideas.

Source of capital: Table 1 shows that majority (71.11%) of the respondents invested personal savings on their fish farming while 10 percent borrowed money from relatives and friends, and from Cooperatives societies. This might be as a result of the bureaucracy in obtaining the loan from the financial institutions or as a result of high-interest rate. This finding corroborates Oota, (2012) that lack of credit to fish farmers at low-interest rate, lack of skilled manpower and an ineffective aquaculture extension service system are some of the impediments to catfish production.

Annual income: Table 1 shows that 33.31percent of the respondents earned less than ₦500,000

annually and 38.86percent of the respondents earned between ₦500,000 and ₦1,000,000 annually. The mean of respondents' annual income was ₦869,259.3. This indicates that catfish farming is a profitable venture.

Farming experience: Table 1 shows that 33.33 percent of the respondents had between 1 and 5 years experience. 35.56 percent of the respondents had between 6 and 10 years experience in catfish farming, while only 17.78percent had between 16 and 20 years experience in catfish production. The mean farming experience was 9 years. The result indicated that the enterprise is young but not new to the respondents.

Table 1: Distribution of respondents by their Socioeconomic characteristics n=90)

Variables	Frequency	Percentage	Mean
Age			
<30	8	8.88	45
30- 60	74	82.18	
>60	8	8.88	
Sex			
Female	22	24.44	
Male	68	75.56	
Marital Status			
Single	18	20.00	
Married	67	74.44	
Widowed	5	5.56	
Household size			
1-5	53	58.89	5
6-10	36	40.00	
11-15	1	1.11	
Education Status			
Tertiary education	67	74.44	
Secondary education	15	16.67	
Primary education	6	6.67	
No formal education	2	2.22	
Source of capital			
Personal savings	64	71.11	
Relatives and friends	9	10.00	
Cooperatives	9	10.00	
Commercial bank	4	4.44	
Agricultural Bank	4	4.44	
Farmers' income (₦)			
<500000	30	33.31	869,259.3
500000 - 1000000	35	38.86	
1000001- 1500000	10	11.1	
1500001-2000000	10	11.1	
Above 2000000	5	5.55	
Farming experience (years)			
1-5	30	33.33	9
6-10	32	35.56	
11-15	12	13.33	
16-20	16	17.78	

Source: Field survey, 2016

Perception of the peri-urban farmers' of the catfish profitability

Table 3 shows the perception of the catfish farmers' profitability. The result shows that Catfish production is a profitable venture in Osogbo

metropolis ($\bar{x} = 4.08$)^{*} This corroborate the findings of Ashley-Dejo *et al.*, (2016) that farm profitability is the key to fish production enterprise as fish farmers would only embrace fish farming if it is profitable. Furthermore, I believe that more than half of the cost of catfish production is spent on purchasing of feeds ($\bar{x} = 3.21$), the cost of hiring labour for catfish production in Oshogbo metropolis is on the high side ($\bar{x} = 2.77$) and high seed capital is needed to start catfish production ($\bar{x} = 2.95$). This show that costs of feed, labour and capital investment on fish farming is at high side. This finding confirms the finding of Oluwasola and Ige (2015), that fish feed constituted 79.18% of the total operating cost and the amount of labour, and quantity of feed used were significant determinants of net income in catfish production. Also, Climate change has great adverse effect on catfish production in Oshogbo metropolis ($\bar{x} = 2.86$). Adverse effect of climate change could result into harsh environment and shortage of water availability for the fish and high cost of production for the fish farmers. However, I don't have much

experience in catfish production when I started ($\bar{x} = 2.39$) were at very high level of their perception.

In contrary, I run my catfish farm at a loss ($\bar{x} = 1.35$), expenses on diseases and parasites control take a bulk chunk of cost of catfish production ($\bar{x} = 1.31$) and transportation cost is a major problem in catfish production ($\bar{x} = 1.26$) were at a very low side of their perception. This may be as a result of inexperience in fish farming, stocking runt breeds and poor management skill. This findings corroborate Oota, (2012) that low returns on fish farming could be attributed to high cost of input, lack of credit to fish farmers at low-interest rate, lack of skilled manpower and an ineffective aquaculture extension service system. This is also in agreement with Adewumi and Olaleye, (2011); George *et al.*, (2010) and Nwiro, (2012) findings that a number of problems confronting the production of catfish are Poor management skills, inadequate supply of good quality seed, lack of capital, high cost of feed, inadequate information, faulty data collection, lack of environmental impact consideration and marketing of products.

Table 3: Distribution of the respondents according to their perception of catfish profitability (n = 90)

Statements	Mean (\bar{x})	SD
Catfish production is a profitable venture in Osogbo metropolis	4.08	1.20
I believe that more than half of the cost of catfish production is spent on purchasing of feeds	3.21	1.16
The cost of hiring labour for catfish production in Osogbo metropolis is on the high side	2.77	1.25
I don't have much experience in catfish production when I started	2.39	1.24
High seed capital is needed to start catfish production	2.95	1.07
High cost of good fingerlings is challenge to catfish production	2.31	1.20
Scarcity of good source of fingerlings is a great challenge to catfish farming	2.06	1.05
Climate change has great adverse effect on catfish production in Osogbo metropolis	2.86	1.36
There is the available market for catfish produce in Osogbo metropolis	2.23	1.30
There is inadequate electricity supply which affects catfish production negatively	1.90	1.10
Expenses on diseases and parasite control take a bulk chunk of cost catfish production	1.31	1.20
Transportation cost is a major problem in catfish production	1.26	1.25
I run my catfish farm at a loss	1.35	1.22
I believe that much experience is necessary for catfish production	1.92	1.06

Source: Field survey, 2016

Annual cost and return of catfish farmers

As shown in Table 4, the average fish stocked per year was 2152. The average total variable cost of catfish enterprise was ₦662,676.4. The average total revenue was ₦1,560,520, and the total average gross margin was ₦897,843.6. The rate of return on investment was ₦1.35 which indicates that for every ₦1 the farmers invest on each fish would fetch ₦1.35 in return. This indicates that

catfish production is a profitable venture. Table 4 clearly shows that the cost of feed for fish constitute 90.71 percent of the total variable cost. This finding corroborates Oluwasola and Ige (2015) that fish feed constituted 79.18% of the total operating cost. Labour constituted only 1.70 percent of the total variable cost. The low cost could have resulted from the use of family labour by the majority of the catfish farmers who were married with moderate family sizes.

Table 4: Annual Cost and Return Analysis per fish farmer (Two production cycle) n=90

Item	Average Value	Scale
Total Revenue	₦1,560,520	
Average number of fish stocked per the year	2152	
Average fish stocked at 1 st production cycle	1102	
Average fish stocked at 2 nd production cycle	1150	
Variable Cost		% of TVC
Cost of feed	₦ 608,199.2	90.71
Cost of fingerlings	₦ 41,979.44	0.21
Cost of labour	₦11,238.89	1.70
Cost of lime	₦1,997.26	0.24
Cost of drug	₦1,825.41	0.12
Cost of electricity	₦4,005.88	0.11
Cost of transportation	₦2,639.88	0.01
Total Variable Cost	₦662,676.4	100
Gross margin (TR-TVC)	₦897,843.6	
Rate of Return (GM/TVC) on investment	₦1.35	

Source: Field survey, 2016

Cost and return per unit fish from fingerlings to table size

Table 5 shows the cost and returns of a unit fish from fingerlings to table size. The average total variable cost of one fish was ₦312.21. The average weight of the fish was 1.45kg. The average total

revenue was ₦725, and the total average gross margin was ₦412.79. This shows that the cost of raising one fish from fingerlings to table size was ₦312.21, and ₦412.79 was realized as the profit. The rate of return on investment was ₦1.35 which indicates that for every ₦1 the farmers invested would yield ₦1.35 in return.

Table 5: Cost and Return Analysis per unit fish (from fingerlings to table size)

Item	Average Value	Scale
Total Revenue (P ₀ .Q)	₦725	
Average weight of the fish	1.45kg	
Price of fish per kg	₦500	
Variable Cost		% of TVC
Cost of feed	₦282.62	90.52
Cost of Fingerlings	₦19.51	6.25
Cost of labour	₦5.22	1.67
Cost of lime	₦0.93	0.30
Cost of drug	₦0.84	0.27
Cost of electricity	₦1.86	0.60
Cost of transportation	₦1.23	0.39
Total Variable Cost	₦312.21	100
Gross margin (TR-TVC)	₦412.79	
Rate of Return (GM/TVC) on investment	₦1.35	

Source: Field survey, 2016

Factors influencing gross margin of catfish production in the study area

Table 6 shows normal regression analysis of the factors influencing gross margin of catfish production in the study area. There is a positive relationship between fish price, and gross margin, this implies that as fish price increases by 1 unit, the gross margin increases by 3.83 unit, and it's statistically significant at 1% level.

There was also a negative relationship between feed cost and gross margin, this implies that as fish cost increases by 1 unit, the gross margin decreases by 0.16 unit and the fish cost is statistically significant at 5% level.

In similar vein, there was a negative relationship between labour cost and gross margin, this implies that as labour cost increases by 1 unit, the gross margin decreases by 10.90 unit, and vice-versa, and labour cost is statistically significant at 10% level.

There was a positive relationship between fish stock cost, and the gross margin, this implies that as fish stock cost increases by 1 unit, the gross margin increases by 12.10unit, and it's statistically significant at 1% level.

The R-squared was 0.74; this implies that 74% of the explanatory variables had positive impacts on the response variables.

The result reveals that F was significant at 1% level which indicates a good fit of the regression line.

Table 6: Factors influencing gross margin of catfish production

Gross margin	Coefficient	Std. Err.	t	P>t
Fish price	3.83***	1.10	3.61	0.001
Feed cost	-0.16**	0.072	-2.20	0.030
Labour cost	-10.90*	6.294	-1.73	0.087
Electricity cost	-6.49 ^{NS}	13.167	-0.49	0.623
Fish stock cost	12.10***	1.053	11.50	0.000
Constant	-2001698	528673.7	-3.79	0.000
R ²	0.7408			
Adj	R ²	0.7254		
F	48.02			
Prob>F	0.000			

Source: Field survey, 2016

* significant at 10% (p<0.1)

** significant at 5% (p<0.05)

***significant at 1% (p<0.01)

NS- Not significant

CONCLUSION AND RECOMMENDATION

It was concluded that catfish production is a profitable venture in the study area. Nevertheless, there are some factors influencing gross margin of catfish production in the study area which are fish price, the cost of feed, and the cost of labour.

Based on the findings of this study, it is therefore suggested that:

- Effort should be made to bring down the cost of feeds by exploring alternative sources of feed for catfish through well-funded researches.
- Policies that will guarantee sale and price stability should be put in place, this will go a long way to further increase the economic return from catfish marketing in the study area in particular and in the nation as a whole.
- The government through the Ministry of Agriculture should encourage more people to invest in catfish farming by making inputs available to farmers at a subsidized price.

- More fishery specialists and extension officers should be encouraged through incentives, training, and financial support to carry out their duties through regular and constant seminars, workshops and conferences to motivate catfish farmers to adopt new technologies that would enhance catfish productivity in Osun state.

REFERENCES

Acquaah, S. (2005) Principles of Crop Production, Theory, Techniques and Technology, India, Prentice Hall of India Private Ltd, 495pp.

Adewumi, A. A. & Olaleye, V.F.(2011) Catfish culture in Nigeria: Progress, Prospects, and Problems. *African Journal of Agricultural Research*, 6(6): 1281-1285.

Ali, E. A., H. I. M. Gaya and T. N. Jampada (2008) Economic analysis of fresh fish marketing in Maiduguri Gaboru Market and Kachallari Alau Dam Landing Site of

- Northeastern Nigeria, *J. Agric. Soc. Sci.*, 4: 23-26.
- Amao, J. O., Awoyeni, T. T., Omonona, B. T. and Falusi, A. O. (2009) Determinants of poverty among fish farming households in Osun State, Nigeria, *International Journal of Agricultural Economics and Rural Development*, 2 (2): 14-25.
- Anoop, K. R., Sundar K.S.G., Khan B.A., Lal S., (2009) Common Moorhen *Gallinula chloropus* in the diet of the African catfish *Clarias gariepinus* in Keoladeo Ghana National Park, India. *Indian Birds* 5(2):22-23
- Anthonio O.R. and Akinwumi J.A. (2002) Supply and distribution of fish in Nigeria. *Geographical Journal*. 14: 16-16.
- Areola, F. O. (2007) Fish marketing and export potentials of fish and fisheries products of Nigeria. A lecture delivered at educative and informative aquaculture workshop and aqua-exhibitions tagged: sustainable fisheries livelihood, management and food security in Nigeria. 23pp.
- Ashaolu, F. O., Akinyemi, A. A. and Nzekwe, L. S. O. (2006) Economic viability of homestead fish production in Abeokuta Metropolis of Ogun State, Nigeria. *Asset Series A*, 6(2):209-220.
- Ashley-Dejo, S. S., Omoniyi I. T., Olaoye, O. J., Fakoya, E. O. and Adelaja, O. A. (2016) Adoption of improved fish hatchery production technologies by fish hatchery managers in Oyo State, Nigeria. *Nigerian J. Animal Production*, 43(2):399-411.
- Ayinla, O. A. (2007). Analysis of feeds and fertilizers for sustainable aquaculture development in Nigeria. In M.R. Hasan, T. Hecht, S.S. De Silva & A.G.J. Tacon, eds. *Study and analysis of feeds and fertilizers for sustainable aquaculture development*, pp. 453-470. FAO Fisheries Technical Paper No. 497, Rome, FAO. 510 pp.
- Blank, S. (2002) Farm household profit performance, Dava, University of California, United States of America. 115pp.
- Carlos, F. O. (2001) Financial profitability model for agricultural and agro-industry. Rural Agro Enterprise Development Project. CIAT, 151 pp.
- Chilaka, Q. M., Nwabeze, G. O. and Odili, O. E. (2014) Challenges of inland artisanal fish production in Nigeria: Economic perspective. *J. Fisheries and Aquatic Sci.* 9: 501-505.
- Emokaro, C. O and P. A Ekunwe. (2009) Efficiency of resource-use and elasticity of production among catfish farmers in Kaduna, Nigeria. *J. Applied Sci. Research*, (7): 776-779.
- Emokaro, CO., Ekunwe PA and Achille A (2010) Profitability and viability of catfish farming in Kogi State, Nigeria". *J. Agric. Biol. Sci.* 6 (3):215-219.
- Esu, B. B., Asa, U. A. and Iniedu, M. O. (2009). Costs and returns of fish production using earthen ponds in Akwa Ibom State, Nigeria, *Nigerian Journal of Agriculture, Food and Environment*, 5(2-4): 26-29.
- FAO (Food and Agriculture organization 1999) *The State of Food and Agriculture*, Rome: FAO. Pg 15-17.
- FAO (Food and Agriculture Organization 2002) *Fishstat Plus: Universal software for fishery statistical time series*. Rome: FAO Fisheries Department, Fishery Information, Data and Statistics Unit. 125Pp.
- FAO (Food and Agriculture Organization 2007) *State of World Fisheries & Aquaculture* <http://www.fao.org/fi/statist/fisoft/fishplu.asp>. Pg 1-3.
- Federal Department of Fisheries. 1997. *Fishery Statistics*, FDF, Abuja, Nigeria. 15Pp.
- Fregene, T., Inyang, I., and Awolumote, S. (2011). Operational Attributes of Urban Aquaculture Systems in Ibadan Municipal, Oyo State, Nigeria. In R. Adeyemo (ed.), *Urban Agriculture, Cities, and Climate Change*, (pp. 173-178). CuvillierVerlag, Gottingen.
- George, F.O.A., Olaoye, O. J., Akande, O. P. & Oghobase, R. R.(2010) Determinants of Aquaculture Fish Seed Production and Development in Ogun State, Nigeria. *Journal of Sustainable Development in Africa*, 12(8): 22 – 34.
- Global Finance (2017) Nigeria GDP and Economic Data. Country Report 2017 - Includes Nigeria real Gross Domestic Product growth rate, with latest forecasts and historical data, GDP per capita, GDP*

- composition and breakdown by sector. Retrieved from <https://www.gfmag.com/global-data/country-data/nigeria-gdp-country-report>
- International Trade Centre (2002). ITC Databases: Aggregated Trade Centre. URL <http://www.thewaveonline.com/article/?id=13781>. Accessed April 23, 2003. Pg 1-3.
- Jolejole, C. B., Swinton, S. M., Roberstson, G. P. and Sywerda, S. P. (2009) Profitability and environmental stewardship for crop production: Are there trade-off? International Association of Agricultural Economic Conference, Beijing, China, August 16–22, 2009.
- Nwiro, E.(2012) Fish Farming a Lucrative Business. Accessed online 20th October 2012 from <http://www.thisdaylive.com/articles/fish-farming-a-lucrative-business/119253/> . Pg 2-4
- Okwu, O. J. and S. Acheneje. (2011) Socio-economic analysis of fish farming in Makurdi local government area, Benue State, Nigeria. *European J. Social Sci.*23(4): 508 - 514.
- Olagunju, F. I., Adesiyani, I. O., and Ezekiel, A. A., (2007). Economic viability of cat fish production in Oyo State, Nigeria *J. Human Ecology* 21(2): 121 –124.
- Olagunju F.I., Adesiyani I.O. and Ezekiel A.A. (2007). Economic Viability of Cat Fish Production in Oyo State, Niger. *J.Human Ecol.*21 (2): 121-124.
- Olaoye, O. J. and Odebiyi, O. C., (2011) Economic viability for the use of microfinance bank loan on aquaculture development in Ogun State, Nigeria. *Inter.J. Fisheries and Aquaculture* 3(4): 70-77.
- Oota, L. (2012). Is Nigeria Committed to Fish Production? Accessed online 20th October 2012 from URL <http://blueprintng.com/2012/07/is-nigeria-committed-to-fish-production>
- Oluwasola O. and A. O. Ige (2015) Factors Determining the Profitability of Catfish Production in Ibadan, Oyo State, Nigeria. Published by Canadian Center of Science and Education. *Sustainable Agriculture Research*; Vol. 4, No. 4; 2015. ISSN 1927-050X E-ISSN 1927-0518. Pg 57-65.
- Ozigbo Emmanuel, Anyadike Chinenye, Forolunsho Gbadebo, Okechuckwu Richardson and Kolawole Peter (2013). Development of an Automatic Fish Feeder” International Institute of Tropical Agriculture Postharvest Unit, Ibadan – *African Journal of Root and Tuber Crop*;10 (1): 27-32.
- Raufu, M. O., Adepoju, A. S., Salau, A. S. and Adebisi, O. A. (2009) Determinants of yield performance in small scale fish farming in Alimosho Local Government Area of Lagos State. *Inter. J. Agricultural Economics and Rural Development*, 2(1): 9–14.
- REJOPRAO (2017) Nigeria: Pains, gains of Lagos Catfish farmers – Sipa. URL <http://sipanews.org/news/nigeria-pains-gains-of-lagos-catfish-farmers/> Apr 20, 2017. Pg 1
- Udah S. C., Nwachukwu I. N., Nwosu A. C., Mbanasor J. A. and Akpan S. B. (2015) Analysis of Contribution of Various Agricultural Subsectors to Growth in Nigeria Agricultural Sector *International Journal of Agriculture, Forestry, and Fisheries*. Published online April 30, 2015 <http://www.openscienceonline.com/journal/ijaff> 2015; 3(3): 80-86
- Tunde, A. B., Kuton, M. P., Oladipo, A. A. And Olasunkanmi, L. H. (2015) Economic analysis of costs and return of fish farming in Saki-East local government area of Oyo State, Nigeria. *J. Aquaculture Resources Development*, 6(2): 306-310.
- Vanguard (2009) “Nigeria: Catfish Farming – a Reliable Investment”. Lagos, Nigeria. Pg 5.
- World Bank (2010) Employment in agriculture (% of total employment) from The World Bank: Data. Nigeria. Northern Mariana Islands. Norway. 2. Oman. Pakistan. Palau, Panama. URL <http://data.worldbank.org/indicator>