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RESEARCH ARTICLE ARAŞTIRMA MAKALESİ

Backyard fish farm features and farmers personal characteristics as correlates of profitability of aquaculture in Nigeria

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Abstract: The purpose of this investigation was to deepen understanding of how farmer personal features and farm characteristics affect the profitability of backyard fish farms in south- south Nigeria. In order to achieve the aim of the study, primary data were collected on farmer and farm-based variables, using questionnaire from randomly selected fish farmers in 2018. Nested regression models were estimated to evaluate the separate and combined effects of farmer and farm characteristics of profitability. The results indicates that the mean age was 41 years, 84.4% of them were male and majority (90.0%) had secondary education and above. The mean farming experience was 8 years with mean household size of 9 persons. The findings revealed that backyard fish farming was profitable with a total revenue of ₦2, 233,800 (6111.63 USD), a total cost of ₦1, 404,280 (3842.08 USD) with a net income of ₦829520 (2269.55 USD) and BCR of 1.59. The benefit-cost ratio (BCR) of 1.59 implies that every ₦1.00 invested in backyard fish farming will yield additional income of ₦0.59k. The result shows that backyard fish farms profitability responds positively to farmers personal characteristics (age, years of experience, gender, education and family size). Farmer personal characteristics significantly and jointly explained 37% variation in profitability. Farm characteristics (stocking density and fertilizer) significantly and positively ($p<0.05$) influenced profitability of backyard fish farms. The most important cost factors that negatively affected profitability are unit cost of feeds, fingerlings and water supply. It was recommended that backyard fish farmers should increase stock size, acquire more education as human capital development and form cooperative societies to address the constraint of inadequate access to credit facilities.

Keywords: Backyard, fish farmer, personal, farm characteristics, profit

INTRODUCTION

Backyard fish farming is the practice of rearing, growing or producing fish in managed water systems in the home of the farmers in a small scale basis. Fish farming is the world's fastest growing food production sub-sector, growing at an increasing rate. Fish is seen as the prime source of animal protein for over one billion people globally and provides many important nutritional and health benefits. Fish contained high level of proteins, fats, vitamins, calcium, iron and essential amino acids. In Nigeria, backyard fish farming is a land based system mostly practiced at subsistence level in fresh waters (Anyawu-Akeredolu, 2005). Commercial farming is yet to be well-known (Fagbenro, 2005). At present, most backyard fish farmers operate small-scale farms ranging from homestead concrete ponds (25 – 40 meters) to small earthen ponds (0.02 - 0.2 hectares).The industry produced over 85,000 tons of fish in 2007 (FDF, 2008). Fish farming if properly managed, will be profitable to alleviate poverty of farmers.

High proportion of households in in Sub-Saharan Africa are confronted with serious nutrition uncertainty particularly the poor. The issue of food insecurity day by day turn out to be severe because of population growth, snowballing incidence of HIV/AIDS epidemic, climate change and policy problem. Furthermore, the upsurge in food prices sabotage food security and impends the means of support of the most susceptible by corroding their buying ability (Nawrotzki et al., 2013). Mitigation of food dearth can be achieved through the use of backyard fish farming to attain income.

A supply deficit of 2.04 million metric tons is therefore required to meet the ever increasing demand for fish in Nigeria. This demand and supply gap result to importation of frozen fish. Family unit continue to depend on backyard fish farming as an avenue to calm down food and nutrition security challenges and generate income against the risks and uncertainties of artisanal fishing output which has been declined by oil spillage from oil exploitation activities (Maroyi, 2009). Backyard fish farming has distinctiveness that make it a potential source of income among the rural folks.

Institutional reforms were undertaken by government at various levels to increase farmers productivity to encourage backyard fish farming. Some of these measures provided were subsidy for inputs and exemption from tax for fishermen. Despite the efforts of government, there is still a deficit in the supply and demand for fish by the people (Dada, 2004). There

is a paucity of literatures on the prominence of the fisheries industry through backyard fish farming and its income generating ability. Backyard fish farming is an indispensable sources of food availability and also significant for their socio-economic and cultural use tenets (Sunwar et al., 2006).

It is therefore necessary to look into the impediments in backyard fish farming to generate income for their sustainability and expansion. A veritable way of achieving this is to carry out economic study of backyard fish farmers personal and farm characteristics on their profitability which was lacking before now.

MATERIALS AND METHODS

Study Area

The study was conducted in South-South Nigeria. There are 6 states in the zone namely, Akwa Ibom, Cross River, Bayelsa, Rivers, Delta and Edo. It has a land area of 70,000 square kilometers and a population of 5,663,362 (NBS, 2017). It is located at latitude 4° and 7° North and longitude 3° and 9° East bordering the Atlantic Ocean on the southern end of Nigeria. The climate is characterized by a long rainy season from March /April through October. The vegetation of the area comprises of saline water swamp, mangrove swamp and rain forest and fresh water. There is therefore a tremendous potential for backyard fish farming in this area. Farming is the predominant economic activity of the people with fishing and arable crop farming. The crops grown are cassava, water yam, sweet potato, plantain, okra, pepper and vegetables

Sampling Technique

Multistage sampling technique was used to draw samples for the study. In the first stage, three states (Delta, Edo and Bayelsa) were purposively selected for their predominant in backyard fish farming and proximity. The second stage involved random selection of three Local Government Areas from the States to give a total of 9 Local Government Areas. The Local Government Areas are Bomadi, Burutu, Patani for Delta State, Brass, Southern Ijaw and Yenagoa for Bayelsa State and Esan central, Oredo and Owan East for Edo State. In the third stage, four communities were randomly selected from each of the Nine Local Government Areas to give a total of 36 communities. Finally, ten (10) backyard fish farmers were randomly selected from each of the 36 communities to give a total 360 farmers. The study used primary data which was generated through structured questionnaire and interview schedule administered with the help of trained enumerators.

Analytical Technique

Data were analyzed with the use of frequency counts, percentages, means, budgetary analysis and multiple regression model.

Model Specification

Budgetary Analysis

Cost and return analysis was used to determine the profitability of backyard fish farming. The net farm income was computed using the following equation.

NFI = GR-TC---------- equation (1)
Where:
NFI = Net farm income (₦ means Nigeria naira)
GR= Gross revenue
GR= TR-TVC
TR= Total revenue
TC= Total cost
TC= TVC +TFC
TVC =Variable cost
TFC= Total fixed cost

The performance and economic worth of the backyard fish farmers can be determined by the use of various profitability indices computed. It is specified as:

Profitability index (PI) = $\frac{NI}{TR}$ ----------equation (2)

Rate of Return on investment (RRI)= $\frac{NI}{TC} X100$ ----equation (3)

Where;

NI = Net income, TR = total revenue, TC = total cost.

PI was used to determine the extent to which investment in aquaculture farming is profitable, If PI > 1. RRI was used to measure the percentage of profit derived from aquaculture engagement. RRI is expected to be greater than the cost of capital for the investment to be worthwhile.

Regression Analysis

In order to ascertain the factors affecting profitability of backyard fish farming in the study area, a nested multiple regression model was employed. The nested regression model encapsulated farmers characteristics and farm variables. It is implicitly specified as:

Π=ΣΣxy + ei
Π=f(ΣxiΣyi) +ei
Where:
Π= Profit of aquaculture (₦)
Σxi=Aquaculture farmers related variable (characteristics)
Σyi=Aquaculture farm related characteristics
ei=stochastic error term
Π = f (X1, X2, X3, X4, X5, X6, X7…….Xn e) --------equation (4)
It is explicitly stated as follow:
Π= bo +b1X1 +b2 X2+b3 X3 +b4 X4 +b5 X5 +b6 X6 +b7 X7+b8X8 +Xn +e) ----------equation (5)

Four functional forms of the nested multiple regression models, (linear, semi-log, exponential and double log) was fitted to the data and the one with the best fit was chosen as the lead equation based on the economic, statistical and econometric criteria.

Where;

Π= profit of backyard fish farmers (₦)
X1= gender (dummy, male=1, otherwise =0)
X2= age (years)
X3= educational level (years)
X4= household size (number of persons)
X5= marital status (dummy, married=1, otherwise=0)
X6= pond size (m^2)
X7= fishing experience (years)
X8= fixed inputs (depreciated value of implement ₦)
X9= cost of fish feeds (₦)
X10= fertilizer cost (₦)
X11= cost of fingerlings (₦)
b0= constant
b1 –bn = regression coefficients
e= error term

RESULTS AND DISCUSSION

Socioeconomic characteristics of backyard fish farmers

Age: The percentage distributions of the respondents according to age showed that majority (52.2%) of the respondents fall between the age brackets of 30–39 years (Table 1). This was closely followed by 27.8% between the age categories of 40-49 years. About 17.8% were between 50-59 years and the least was 2.2% of the respondents between 20-29 years. The mean age was 41 years. This implies that those involved in backyard fish farming are still in their vibrant age to carry out tedious labour associated with fish farming venture. The result is in line with Olaoye et al (2015) that 76.7% of the respondents were within the active age group bracket of less than 50 years old.

Gender: The result in Table 1 shows that 58.9% of the backyard fish farmers were males and 41.1% were females. This implies that male backyard fish farmers dominated the study area. This result corroborates with Biummett et al (2010) that fishery activities are mostly dominated by males.

Educational level: The result indicated that respondents who had primary education were (10%), secondary education (53.3%) and post-secondary education was (36.7%) (Table 1). This suggests that all the respondents can read and write which could contribute to effective backyard fish farming in applying the needed technology. This result favourable supports Osondu et al (2014) that all the pond fish farmers in Abia State had some form of formal education.

Farming experience: The result showed that 7.8% of the respondents had farming experience between 1–3 years, 17.8% had 4–6 years, 32.2% had 7–9 years and 42.2% had 10–12 years backyard fish farming experience (Table 1). The average backyard fish farming experience of was 8 years in the study area. The results showed that the backyard fish farmers are relatively young in the business venture considering the number of years involved.

Household size: The household sizes were 0–4 persons (6.7%), 5–8 persons (58.9%) and 9–12 persons (34.4%) (Table 1). This revealed that majority (58.9%) of the respondents had household size of 5-8 persons. The average household size of backyard fish farmer was 9 persons in the study area. The implication is that backyard fish farmers have large family size that could possibly assist in farming activities.

Table 1. Socioeconomic characteristics of respondents

Age (Years)	Frequency	Percentage (%)	Mean/Mode
Age (Years)			
20–29	8	2.2	
30–39	188	52.2	
40–49	100	27.8	41years
50–59	64	17.8	
Total	360	100.0	
Gender			
Male	304	84.4	Male
Female	56	15.6	
Total	360	100.0	
Educational level			
No formal education	0	0.0	
Primary education	36	10.0	
Secondary education	192	53.3	Secondary
Post-secondary	132	36.7	education
education	360	100.0	
Total			
Farming			
experience(years)	28	7.8	
1–3	64	17.8	
4–6	116	32.2	8 years
7–9	152	42.2	
10–12	360	100.0	
Total			
Household size			
(Persons)	24	6.7	
0-4	124	34.4	9 persons
5-8	212	58.9	
9-12	360	100.0	
Total			

(Source: Survey data, 2018)

Cost and Returns Analysis of Backyard Fish Farmers

Cost Analysis of Backyard Fish Farmers

The total cost of production in backyard fish farming was ₦1,404,280 (3842.08 USD). Feed cost represents 63.9% of the production cost, labour accounted for 23.5% while fingerling cost accounted for 4.8% (Table 2). Other cost such as cost of transportation, fertilizer cost, drugs represent 7.8% of the cost of production. The study showed that the cost of feed, labour and fingerlings accounted for the highest proportion (92.2%) of the variable cost of production while tools/equipment accounted for 15.2%, land accounted for 84.8% of the total fixed cost of production in the area of study.

Analysis of Return on Investment

The result of returns analysis in Table 2 shows that the income from backyard fish farming in the study area was ₦2233800 (6111.63 USD) with a gross margin of ₦874780 (2393.38 USD) giving a net income of ₦829520 (2269.55 USD) and Benefit cost ratio (BCR) of 1.59. The benefit-cost ratio (BCR) of 1.59 implies that every ₦1.00 invested in backyard fish farming will yield additional income of ₦0.59k. This means that backyard fish farming will yield additional income of ₦0.59k. This showed that backyard fish farming is profitable. This result is in agreement with the work of Okwu and Acheneje (2011) who unveiled fish farming in Benue State as profitable. The Rate of Return (ROR) in backyard fish farming is 59%. This shows that every ₦1.00 invested, 59 kobo is gained by the backyard fish farmer.

Table 2. Cost and returns analysis of backyard fish farming

Income/Cost items	Amount (₦)	Percentage
Variable costs		
Labour cost	319500	23.5
Fertilizer cost	40800	3.0
Fingerling cost	64750	4.8
Feed cost	869010	63.9
medication cost	13710	1.0
Transportation cost	51250	3.8
Total variable costs	1359020	100.0
Fixed cost items		
Tools/equipment	6900	15.2
Land depreciation	38360	84.8
Total fixed cost	45260	100.0
Total cost	1404280	
Revenue	**2233800**	
Gross margin	874780	
Net farm income (NFI)	829520	
Benefit cost ratio (BCR)	1.59	
Profitability index (PI) NI/TR	0.371	
Rate of Return on Investment	59.1%	

(Source: Survey data, 2018) 1USD = ₦365.5

Profitability Determinants of Backyard Fish Farmers

Regression Result on Personal Characteristics

The regression analysis was carried out to examine the personal characteristics of backyard fish farmers on profitability in the study area. Based on the economic and statistical criterion, the double-log model was chosen as the lead equation and the results as presented in Table 3. The coefficient of determination, R^2 values of 0.3659 indicates that 37% of the variation in the value of fish output is explained by the explanatory variables while 63% of the variation in the value of fish output is determined by other factors not considered. The performance of the analysis of variance showed that F-ratio of 33.95 was significant at 1% probability level.

The result in Table 3 displays that the coefficient of age (-1.796453) of the respondents was statistically significant at 1% probability level and negatively related to the profit of backyard fish farming. This means that as age of the respondents increased, profit decrease with output. The decreased of profit among the elderly respondents could be due to the fact that at old age, the respondents become very weary, conservative and less innovative on backyard fish farming.

The coefficient of years of fishing experience (0.7849744) was significant at 1% probability level and positively influenced profitability of backyard fish farming. This implies that as years of fishing experience increases, profit generated also increases. This finding is in consonance with previous study (Ugwumba and Chukwuji, 2010).

The coefficient of educational level (0.6723942) was statistically significant at 1% probability level and positively related to profit of backyard fish farming. This means that as educational level increased, profit generated from backyard fish farming is also increased.

The coefficient of household size (0.0328392) was significant at 5% level and positively related to profit of backyard fish farming. This means that as household size of the respondents increases, profit increases as output of labour increases.

The coefficient of marital status (0.9567213) was significant at 1% level and positively related to profit. This means that as more of the respondents get married, backyard fish farming increased resulting to profit maximization.

Table 3. Personal characteristics influencing profitability of backyard fish farmers

Variables	Linear	Exponential	Semi-log	Double log
Age of farmer	-1031.398	-0.0423359	-43568.82	-1.796453
	(-3.33)***	(-5.60)***	(-3.80)***	(-6.52)***
Fish experience	2074.197	0.1038209	17076.82	0.7849744
	(2.90)**	(5.95)***	(3.64)***	(6.95)***
Gender	-854.9106	0.3124044	135.6866	0.1493057
	(-0.15)	(2.28)**	(0.23)	(1.36)
Education	7022.121	0.2933751	15921.92	0.6723942
	(2.19)**	(3.74)***	(2.54)**	(4.46)***
Household size	2185.501	0.0500514	5944.908	0.0328392
	(1.36)	(1.28)	(1.30)	(2.27)**
Marital status	12948.75	0.6170156	18577.08	0.9567213
	(2.28)**	(4.44)***	(2.03)**	(4.35)***
Constant	26319.13	6.861168	169592.6	1.205411
	(1.30)	(13.89)***	(3.99)***	(1.18)
R^2	0.1270	0.3351	0.1425	0.5830
F-ratio	8.56	29.65	9.78	44.23

(Source: Survey data, 2018) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Regression Result on Farm Characteristics

The double-log model was chosen as the lead equation and the results as presented in Table 4. The coefficient of determination, R2 value was 0.6579 indicating that 66% of the variation in the value of fish output is explained by the explanatory variables while 34% of the variation in the value of fish output is determined by other factors not considered. The performance of the analysis of variance showed that F-ratio was 136.18 and significant at 1% probability level.

The coefficient of pond size (0.2006892) was positive and significant at 1% probability level. This implies that an increase in pond size would lead to a corresponding increase in fish profitability. The result agreed with the findings of Inoni and Oyaide (2007) who reported that pond size had a positive influence on fish output. This implies that the larger the size of the pond, the higher the quantity of fish harvested.

The coefficient of feeds cost (-0.3186127) was negative and statistically significant at 1% probability level. The sign of the variables is consistent with a priori expectation. This implies an inverse relationship with profit of the backyard fish farmers. This indicates that decrease in the cost of feed would increase the profit level of the respondents. This agreed with the findings of Nwosu and Onyeneke (2013) study on the effect of productive inputs of pond fish production on the output of fish in Imo State, Nigeria.

The coefficient of fingerling cost (-0.1974257) was negative and highly statistically significant at 1% probability level. The sign of the variable is consistent with a priori expectation. This implies that an increase in fingerling cost would lead to decrease in the profit level of backyard fish farmers. The result is in tandem with Ezeh et al., (2008) who obtained similar result.

The coefficient of fixed inputs cost (0.2630881) was positive and significant at 1% probability level. The implication is that the more the amount expended on fixed inputs, the higher amounts that will be realized from fish farms in the study area. This result is in consonance with the findings of Yusuf et al (2002). The coefficient of fertilizer cost (-0.3620293) was negatively significant at 1% probability level. This implies that increase in fertilizer cost will lead to a corresponding decrease in the value of fish profit in the study area. The result agrees with the findings of Agboola (2011).

Table 4. Farm characteristics influencing profitability of backyard fish farmers

Variables	Linear	Exponential	Semi-log	Double log
Pond size	703.7406	0.0209556	9114.499	0.2006892
	(2.10)**	(2.81)**	(3.42)**	(3.98)***
Feed cost	-0.0857462	-3.51e-06	-	-0.3186127
	(-6.40)***	(-11.75)***	6589.437	(-10.86)***
			(-4.25)***	
Fingerling cost	-0.0830751	-3.51e-06	-	-0.1974257
	(-6.14)***	(-11.63)***	3842.277	(-6.21)***
			(-2.29)**	
Fixed inputs	0.2093426	8.79e-06	6649.021	0.2630881
	(1.34)	(-2.52)**	(2.23)**	(4.67)***
Fertilizer cost	-0.0181072	-1.70e-06	-	-0.3620293
	(-1.52)	(-6.42)***	7812.198	(-12.52)***
			(-5.11)***	
Constant	61819.75	10.38062	141002	13.96797
	(12.59)***	(94.87)***	(3.32)**	(17.41)***
R^2	0.1958	0.4902	0.2504	0.6579
F-ratio	17.24	68.08	23.65	136.18

(Source: Survey data, 2018) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5 shows the results of the combine effect of farmers and farm characteristics on profitability of backyard fish farming.

Table 5. Factors influencing profitability of backyard fish farmers (Pooled)

Variables	Linear	Exponential	Semi-log	Double log
Age of	468.3775	0.0228949	20420.83	0.7033695
farmer	(1.51)	(3.51)***	(1.74)*	(3.32)**
Fish	550.0365	0.0406886	5020.697	0.1960263
experience	(0.75)	(2.65)**	(1.05)	(2.28)**
Gender	-8290.15	-0.1276305	-1725.486	-0.0345476
	(-1.41)	(-1.03)	(-2.86)**	(-3.17)***
Education	3195.631	0.1578444	6424.67	0.2420319
	(1.02)	(2.40)**	(1.08)	(2.26)**
Household	2704.843	0.0849036	6360.182	0.198519
size	(1.75)*	(2.62)**	(1.50)	(2.59)**
Marital	7839.483	0.4197825	6444.217	0.455944
status	(1.43)	(3.64)***	(0.75)	(2.95)**
Pond size	673.8244	0.0178523	9676.102	0.2108254
	(2.01)**	(2.54)**	(3.67)***	(4.43)***
Feed cost	-	-2.64e-06	-3658.203	-0.2173888
	0.0685785	(-8.45)***	(-2.01)**	(6.62)***
	(-4.62)***			
Fingerling	-0.078782	-2.69e-06	-2916.14	-0.1470537
cost	(-4.69)***	(-8.45)***	(-1.62)	(-4.53)***
Fixed	0.1622181	7.88e-06	5491.28	0.2248882
inputs	(1.02)	(2.36)**	(1.88)*	(4.19)**
Fertilizer	-	-1.82e-06	-8980.687	-0.3841844
cost	0.0241327	(-7.07)***	(-5.76)***	(-13.64)***
	(-1.98)***			
Constant	34094.5	8.978581	20730.65	8.568836
	(1.58)***	(19.84)***	(0.29)	(6.53)***
R^2	0.2252	0.5634	0.2879	0.7035
F-ratio	9.20	40.82	12.79	75.08

(Source: Survey data, 2018) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Constraints facing backyard fish farmers

The result in Table 6 revealed that the major constraints affecting backyard fish farming are access to credit facilities which has the highest with 97.2% which tends to hindered efficient production of fish. About 96.7% are faced with problem of inadequate capital. Market price instability was confirmed as a constraint factor by 95.0% of the respondents. This can discourage further production to avoid incurring a loss. About 92.8% of the respondents encountered problem of theft which make it difficult to enhance maximum production to realize huge gain. 86.7% of the respondents indicated that water supply hampers their productivity which reduced their profitability in backyard fish farming. The result showed that 86.1% of the respondents faced problem of disease which reduced their output to affect profit maximization. Access to land was stated a factor influencing their production as demonstrated by 81.1% of the respondents in the study area. This result is in agreement with Osondu and Ijioma (2014) on their study on analysis of profitability and production determinants of fish farming in Abia State.

Table 6. Constraints facing backyard fish farmers

Constraints	Frequency	Percentages (%)	Constraint Ranking
Theft	167)	92.8	4th
Access to credit facilities	175	97.2	1st
Water supply	156	86.7	5th
Disease outbreak	155	86.1	6th
Market price instability	171	95.0	3rd
Inadequate capital	174	96.7	2nd
Access to Land	146	81.1	7th

(Source: Survey data, 2018)

CONCLUSION

Profitability of backyard fish farming in South-South, Nigeria was investigated in this study. The result revealed that backyard fish farming was carried out by mostly male. The studies showed that all the respondents involved in backyard fish farming were educated implying that education is a necessary condition to encourage participation in adopting modern technologies. The findings showed that the experience of the backyard fish farmers was 8 years is indicative of the new entrant. Backyard fish farming is a profitable venture with BCR of 1.59. The factors that contributed positively to profitability of backyard fish farming in the study area were gender, age, educational level, household size, marital status, pond size, fish farming experience, fixed inputs, feeds, fertilizer cost and cost of fingerlings. These were statistically significant at 1%, 5% and 10% respectively.

The problems confronting backyard fish farmers were access to credit facilities, inadequate capital, market price instability, theft, water supply, disease outbreak, and access to land. Considering the developmental benefits derivable from backyard fish farming, it is imperative to expand backyard fish farming to engage also the females for increase production for sustainability. It can be concluded that backyard fish farming is a profitable venture for the study area. Considering the above, the following recommendations are made:

1. More females should be encouraged to engage in backyard fish farming. This will go a long way to increase national income since more involvement will increase aggregate fish output and contribution to gross domestic product (GDP).

2. The Federal government should establish special credit scheme for the aquaculture sector because fish farming is capital intensive.

3. Fish farmers should be exposed to aquaculture-specific workshops and training to improve their human capital for enhance productivity.

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REFERENCES

Agboola, W.L. (2011). Improving fish farming productivity towards achieving food security in Osun State, Nigeria: A Socio-economic analysis. *Annals of Biological Research*, 2(3): 62 - 74

Anyawu-Akeredolu, B. (2005). Urban aquaculture in Nigeria. World Aquaculture Society. Annual Report.www.was.org/meetings/abstract data.

Biummett, R.E., Yonaleu, J.L.N., Tian, A. & Kenmegne, M. (2010). Women's traditional fishery and alternative aquatic resource livelihood strategies in the Southern Cameroonian Rain Forest. *Fisheries Management and Ecology*, 17: 221 – 230. DOI: 10.1111/j.1365-2400.2009.00702.x

Dada, R.V. (2004). Profitability of artisanal fish farming in Badagry Local Government Area of Lagos State. Unpublished B.Tech. Thesis, Ladoke Akintola University of Technology Ogbomoso Oyo State Nigeria.

Ezeh, C.I., Anene, A. &. Anya, I.P. (2008). The socio-economic and profitability of pond catfish production system in Abia State, Nigeria. *Journal of Food and Fibre Production*, 1(1): 127 – 136.

Fagbenro, O.A., (2005). Aquaculture in Nigeria: history, status and prospects. A report of FAO World Fish Centre Workshop. Cameroon.

FAO, (2006). Fisheries management in the Federal Republic of Nigeria. www.fao.org/fi/fcp/en/NGA/body, retrieved on January 13, 2006.

FDF, (2008). Fisheries Statistics of Nigeria. Fourth edition, 1995 –2007, Nigeria pp. 48

Inoni, O.E., & Oyaide, W.J. (2007). Socio-economic analysis of artisanal fishing in the South Agro-ecological zone of Delta State, Nigeria. *Agricultura Tropical et Subtropica*, 40(4): 135 – 149.

Maroyi, A. (2009). Traditional home gardens and rural livelihoods in Nhema, Zimbabwe: a sustainable agroforestry system. *International Journal of Sustainable Development and World Ecology*, 16(1), 1–8. DOI: 10.1080/13504500902745895

Nawrotzki, R.J., Robson, K., Gutilla, M.J., Hunter, L.M., Twine, W., Norlund, P. (2013). Exploring the impact of the 2008 global food crisis on food security among vulnerable households in rural South Africa. *Food Security*, 6: 283–297. DOI: 10.1007/s12571-014-0336-6

National Bureau of Statistics (2017). Demographic Statistics Bulletin. nigerianstat.gov.ng › download

Nwosu, C.S., & Onyeneke, R.U. (2013). Effect of productive inputs of pond fish production on the output of fish in Owerri Agricultural zone of Imo State, Nigeria. *Global Advanced Research Journal of Agricultural Science*, 2 (1): 23 – 28.

Okwu, O.J. & Acheneje, S (2011). Socio economic analysis of fish farming in Makurdi, Local Government Area, Benue State, Nigeria. *European Journal of Social Sciences*, 23(4): 508 – 519.

Olaoye, O.J., Awotunde, J.M., Onifade, O.T., Akintayo, I.A. & Agunbiade, D (2015). Assessment of youth attitude towards fish production in Abeokuta metropolis, Ogun State, Nigeria. *International Journal Agricultural Economics and Rural Development*, 7(1): 24 – 31.

Osondu, C.K., & Ijioma, J.C. (2014). Analysis of profitability and production determinants of fish farming in Umuahia capital territory of Abia State, Nigeria. *World Journal of Agricultural Science*, 2(7): 168 – 176.

Sunwar, S., Thornstrom, C., Subedi, A. & Bystrom, M. (2006). Home gardens in western Nepal: opportunities and challenges for on-farm management of agrobiodiversity. Biodiversity Conservation, 15, 4211–4238. DOI: 10.1007/s10531-005-3576-0

Ugwumba, C.O.A. & Chukwuji, C.O (2010). The economics of catfish production in Anambra State, Nigeria. *Journal of Agriculture and Social Sciences*, 6(4): 105-109.

Yusuf, S.A., Ashiru, A.M. & Adewuyi, S.A. (2002). Economics of fish farming in Ibadan Metropolis. *Tropical Journal of Animal Science*, 5(2): 81 – 88. DOI: 10.4314/tjas.v5i2.50137