

## AWARENESS AND UTILIZATION OF FISH VATS FOR FISH CULTURE AMONG FISH FARMERS IN ASARI-TORU LOCAL GOVERNMENT AREA OF RIVERS STATE, NIGERIA

<sup>1</sup>Angela. I. Emodi, <sup>2</sup>Omfoweuvie.O. Efajemue, and <sup>2</sup>Hilda.O. Amachree

<sup>1</sup> Department of Agricultural Economics and Extension, University of Port Harcourt, Port Harcourt , Nigeria.

<sup>2</sup>Department of Home Economics, Federal College of Education( Technical), Omoku, Rivers State, Nigeria

### ABSTRACT

The study examined the awareness and utilization of fish vats for fish culture among fish farmers in Asari-Toru Local Government Area ( LGA) of Rivers State, Nigeria. Questionnaire was administered to 100 fish farmers randomly selected from Abalama and Buguma fishing communities in Asari-Toru LGA and data was analysed using descriptive statistics. The results revealed that majority (61%) of the farmers were male; 42% were aware of plastic tanks use in fish culture; 54% were familiar with the black plastic tanks while 48% were aware of fish vats through extension agents. The results showed that farmers used vats for incubation and hatching ( $\bar{x}=2.67$  ), as nursery tanks( $\bar{x}= 3.32$  ); to raise fingerlings ( $\bar{x}=3.17$  ); recognized that fish vat is mobile and its position can be moved from place to place( $\bar{x}=3.68$  ); fish vats are cheap and economical compared to other fish culture systems ( $\bar{x}=3.39$  ); easy to maintain( $\bar{x}=3.50$  ); enabled the farmers see the bottom of the tank ( $\bar{x}=3.54$  ) and fish vats required less land space ( $\bar{x}=3.44$  ); while fishes are denied access to natural food ( $\bar{x}=3.56$ ) was the major constraint faced by respondents in the use of fish vats. Based on the findings of this study, good proportion of the farmers recognized that fish vat is cheap and economical; it is mobile and its position can be moved from place to place. The study recommends that there is need for National Institute for Freshwater Fisheries Research Nigeria (NIFFR), to develop extension linkage with the state Agricultural Development Programmes (ADPs); other extension service providers (such as Green River Project (GRP) an initiative of Nigeria Agip Oil Company Nigeria (NAIOC)) should be strengthened to reach end-users for sustainable increase in innovation diffusion, extension education, fish food supply and economic benefits. These will invariably help in sustainable fish production for sustainable development.

**Keywords:** Awareness, Utilization, Fish vats, Fish culture, Farmers, Asari-Toru, Rivers

## INTRODUCTION

The increasing population of the world has threatened mankind in several ways amongst which is the need for food, and not just ordinary food but nutritious food. Malnutrition and starvation are the two serious problems being faced by millions of rural poor in most of the developing countries; which emanates mainly from lack of animal protein in their diets (Kumar, 1992). Fish seems not too expensive as it is easily assessable, digestible source of animal protein and is essential for growth, maintenance and repair of body tissues. Kumar (1992) opined that fish contains about 16-20% protein compared to about 12% in egg, 3.5% in milk and 6-8% in rice and wheat. Moreover, fish has natural taste, highly nutritional and of good source of minerals, vitamins and essential amino acids.

Fish farming is an ancient practice that has provided many profitable opportunities. The raising and selling of fish on a commercial basis has proven to be economically successful throughout the world today. It has not only provided job opportunities to the general mass but has also proven to be economically successful throughout Nigeria. According to Helfrich and Libey (2010), fish are excellent animals to rear; they can convert more of their feed into body tissue more efficiently than most farm animals, transforming about 70% of their feed into flesh.

Nigeria is generally endowed with abundant natural resources, with rivers and favourable tropical climate. Rainfall is generally adequate and fairly well distributed throughout the country (Ukpong, Eubuomwon, Ukeje, and Afelumo, 1995). Nigeria is the largest fish producer in Africa, with an annual output of over 635,399 tonnes (National Bureau of statistics/Central Bank of Nigeria, 2005) which constitutes about 4% of the nation's agricultural Gross Domestic Product (GDP). According to the Central Bank of Nigeria (CBN, 2005), fisheries contribute greatly to agricultural sector of the Nigerian economy.

Catfish is the most sort after species, very popular with fish farmers and commands a very good commercial value in Nigerian markets (Ugwumba and Okoh, 2010), as a result it is very important to the sustainability of the aquaculture industry (Osawe, 2004). Fish can be cultured in concrete ponds, fibre glass tanks and also in vats. Fish vats are moveable structures, chambers or rearing compartments where fishes are cultured (Yinka, Gbemiga and Remi, 2003).

In Asari-Toru local government of Rivers State, some of the fish farmers capture the fishes directly from the sea, maybe due to lack of awareness of the availability of fish vats. Farmers can easily take up fish culture in village ponds, in plastic, tarpaulin or wooden vats or any new water body and can improve their financial position substantially. The benefits of fish vat usage as a culture system is that they can be moved from place to place, it makes use of available materials for construction and it is not capital intensive.

In a changing world with rapid changes in population and taste, fish farming has been recognized as a variable means of increasing domestic fish production. About 90% farmed fish in Nigeria is the catfish which is now a major attraction to private investors (Omotoyin, 2006). In some countries, fish provides up to 70% animal protein which is particularly important for body development and growth (Atanda, 2007). The South- South zone of Nigeria is blessed with so many rivers

and streams that if harnessed can be potential source for fish farming. Fish farming offers an effective way of generating food and income from declining land spaces. In spite of this natural potential, fish farming in Rivers State is still poorly developed. The awareness on the potential of fish farming to contribute to domestic fish production has continued to increase in the country (Bairagya, 2010).

According to Hankins, Summerfelt and Durant (1995), fish culture medium and their accessories add up to a large portion of farm capital. The need therefore arises to choose the best production system with a good operating strategy to optimize fish farm profitability; taking knowledge of the fact that the use of vats is also a culture medium. It is in this view that it became relevant to assess the awareness and encourage the utilization of fish vats by farmers in the study area if it is not being utilized. The study therefore sought to:

- i. ascertain the socio-economic characteristics of fish farmers;
- ii. identify types of fish vats used by the farmers in the study area;
- iii. determine the source of information on fish vat usage by fish farmers;
- iv. examine the processes in fish vat usage among farmers and
- v. examine the constraints encountered by farmers in fish vat usage.

## **Literature Review**

It has become a thing of great pleasure the rapid increase in human interest in balance diets especially among the developing countries such as Nigeria. The high demand in animal protein and need for low cholesterol intake, seem to have drawn the attention of the increasing population to alternative source of protein as fish. This has led to increase in the number of fish farming among individuals who are into fish farming as hobby and those whose primary occupation is fish farming. Research has provided that an individual is food unsecured when he could not have access to balanced diet as at when needed to sustain an active and healthy livelihood ( Emodi, Emah, Isife and Chukuigwe , 2009).

The sub- Saharan Africa is faced with lack of food security with ever increasing population. This is a major problem which seems to have led to high mortality rate, slow death out of malnutrition. Emodi *et al* (2009), recognized that not only energy given food does the body need, but eating meals that contains all the classes of food especially protein to make it a balanced diet. They emphasized that fish is an essential source of protein, which is highly nutritious with essential minerals.

### ***Fish Production in Nigeria***

Nigerians seem to be large consumers of fish and it remains one of the main products consumed in terms of animal protein. The fisheries sector is estimated to contribute 3.5% of Nigeria's Gross Domestic Product (GDP) and provides direct and indirect employment to over six million people (Siyanbola, and Adebayo, 2012). Nigeria has many rivers and water bodies which would serve as good locations to set-up fish farms. Opportunities seem to exist in various areas of the fishing sub-sector such as Production of table fish, construction of fish farms, storage, processing and preservation of captured fish, fish seed multiplication, transport, financing. Early fish farmers in Nigeria raised their fish in burrow pits, abandoned minefields and in earthen ponds on extensive production system (Woolock, 2007). The introduction of concrete tanks and fish vats allows for manageable pond size and modification of the environment through a water flow-through system, and

supplementary feeding thus allowing for higher fish yield. The advent of the indoor water re-circulatory system (WRS) has ushered in a new prospect for aquaculture. The introduction of WRS has created a turning point in the production of fish in Nigeria especially catfish.

### ***Fish Farming and Sustainable Livelihood Development***

A livelihood comprises the capabilities, assets, and activities needed for a means of living (Scoones, 1998). A livelihood is sustainable when it can cope with and recover from stresses and shocks, and maintain or enhance its capabilities both now and in the future (World Bank, 1995). The key indicators for assessing sustainable livelihoods are;

### ***Provision of Food***

An important indicator of sustainable livelihood development is freedom from hunger, dwindling level of mortality (infants and adults). When a country is experiencing slow death in malnutrition, then there is no development. It is a generally acceptable fact that the quantity of protein in the Nigerian diet is very inadequate (Amao, Awoyemi, Omonona and Falusi, 2009). Fish is an important source of protein and other essential nutrients required in the human diet. Increased productivity in the fisheries sector will not only make available more fish food to the ever increasing population of this country but will also ensure that the price of such is within the reach of the average Nigerian and the home demand is satisfied.

### ***Employment Generation***

A developed fishery industry will not only lead to increased fish production, but will also stem the movement of labour (Islam, 2007). If earnings in the fishery industry compare favourably with what the fishermen can hope to get in an alternative employment, the odds are that they will carry on as fishermen instead of migrating into the cities to add to the reserved army of the unemployed. In that way, the fisheries industry would have contributed to employment opportunities available to the country's citizens (Dada, 2004).

### ***Fish Farming Techniques***

Different types of fish culture techniques can be described from different perspectives. They can be described on the type of rearing facilities, technology of production, number of species cultured, and type of fish (Yusuf, Ashiru and Adewuyi 2002).

## **METHODOLOGY**

The study was carried out in Asari-Toru Local Government Area (LGA) of Rivers State, Nigeria. Asari Toru lies within longitude 6° 48' E of Greenwich Meridian and latitude 4° 40' N to 4° 50' N of the Equator within the transition zone of the Niger Delta region. The New Calabar River

is the major river that flows through this Local Government Area. It is a tidal river having a highly productive mangrove community (Unaeze and Ibim, 2013). The local Government Area is one of the twenty three (23) LGAs of Rivers State. The indigenes of the LGA are mainly involved in fishing activities. The population of this study comprised of fish farmers in Buguma and Abalama which are the two main fish farming communities in Asari-Toru LGA of Rivers state. There is a total of 250 fish farmers registered with the Agricultural Development Programme in the state. Out of these 250 fish farmers in the study area, 50 fish farmers were randomly selected each from Buguma and Abalama communities making a ( i.e. 2 x 50) total of 100 fish farmers, that were used for this study. Interview and structured questionnaire were used to obtain data from the respondents. Information on awareness and utilization of fish vats for fish culture among fish farmers were determined using a 4 point Likert rating scale of ‘strongly agree =4’, ‘agree=3’, ‘disagree=2’ and ‘strongly disagree=1’. The mean was calculated thus:  $4+3+2+1=10/4=2.50$ . In the decision rule, any variable with mean score of 2.50 and above were considered as influencing factors on awareness and utilization, whereas any variable less than 2.50 were not considered. Socioeconomic profile of the respondents and awareness were analyzed with percentage. Data on factors influencing utilization and constraints were analyzed using mean.

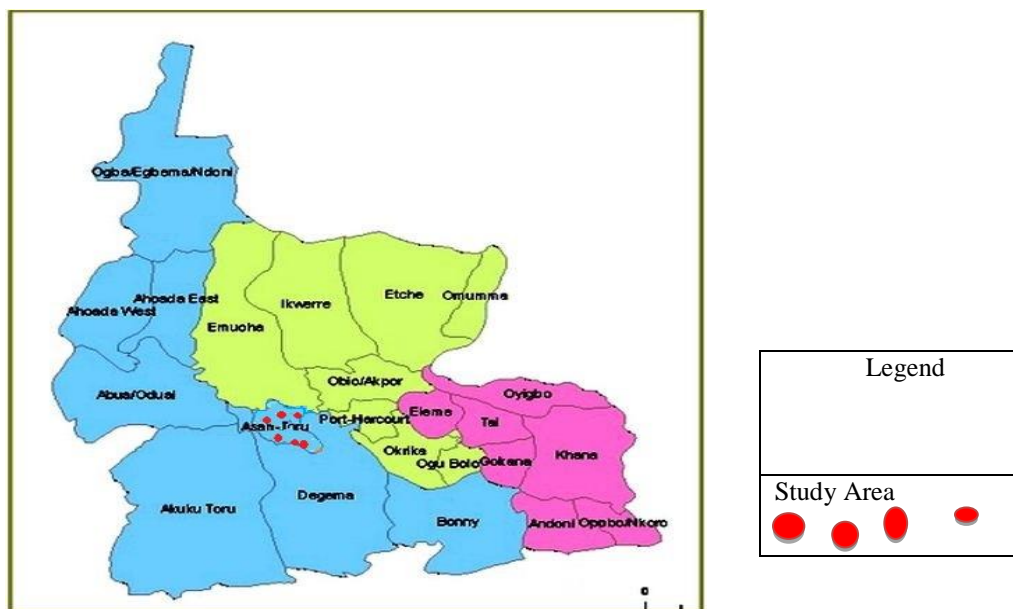


Fig 1: Map of Rivers State showing the study area

## RESULTS AND DISCUSSION

### Socio-economic characteristics of the fish farmers

Table 1 show that greater proportions (61%) of fish farmers were males. This indicates that more males were engaged in fish farming. It could be assumed that the male dominance implies the laborious nature of fish farming operations which are very tedious for females to handle. In marital status, married (61%) were greater than all the listed categories (singles, widowed). This might imply that they have growing children, more married fish farmers means more responsibilities to take care of, and this may subject them to sought best practice on fish farming to boost their income.

**Table 1: Socio-economic characteristics of farmers**

<b>Socio-economic characteristics</b>	<b>Percentage (%)</b>
Gender	
Male	61.0
Female	39.0
Marital status	
Single	61.0
Married	29.0
Widowed	10.0
Educational background	
No formal education	13.0
Primary	21.0
Secondary	20.0
Tertiary	46.0
Years of fish farming practice	
0-5years	54.0
6-10years	28.0
11-15years	12.0
16-20years	6.0
Breeds of fish cultured	
Catfish	17.0
Tilapia	49.0
Catfish and tilapia	34.0

Source: Field survey, 2015

As indicated in the Table above, about 13% of the respondents had no formal education; 21% had primary education; 20% had secondary education; their tertiary education level rated highest (46%), while the least (13%) was non-formal education. It is clear that their educational level is of great advantage in their fish farming knowledge. Majority of the respondents (54%) had 0-5 years of experience, the least years of respondents (6%) had 16-20years of farming experience. This result shows that fish farming practice is relatively new in the study area. About 49% of the respondents culture Tilapia, while the least 17% cultured Catfish; this indicates that Tilapia is the most cultured and preferred breed of fish. This was also supported by Akinbile (1998) who observed that fishes grow better when cultured individually under monoculture system and it helps the specie to grow to its biggest size.

### **Awareness of methods of fish culture among fish farmers**

Table 2 shows that majority (54%) of the fish farmers were familiar with black plastic tanks, while the least (5%) were familiar with the wooden vat and glass fibre respectively. This implies that the black plastic tank has the highest percentage, indicating that more of black plastic tanks are used for fish culture. This could be because the black plastic tanks do not allow the rays of the sun to pass through them thereby preventing the water in the vat from getting hot. The reason for low percentage in wooden and glass fibre vats could either be that respondents were not aware of its existence as a fish culture method or that they are expensive to purchase.

From the results 42% were aware of plastic tanks and the earthen pond respectively; It can be deduced that the fish culture methods prevalent among fish farmers was use of plastic tanks and the earthen pond. This could be as a result of the geographical location of the study area (Riverine) which is surrounded by water and less land, so respondents prefer moveable structures to culture their fish rather than permanent structures. Also, about (43%) of respondents prefer to use fish vats as a fish culture method. The use of fish vats is the most preferred fish culture method; this could be because fish vats are mobile, easy to maintain and it seem to have good management strategies. The concrete pond culture method was the least preferred with 16%, probably it might be expensive to build and with the toxic nature of cement which can cause harm to the fishes if not well treated.

**Table 2: Methods of fish culture known among farmers**

<b>Variables</b>	<b>Percentage (%)</b>
Known Fish culture methods	
Concrete pond	12.0
Earthen pond	28.0
Plastic tank	42.0
All of the above	18.0
Type of fish vats familiar with	
Wooden vats	5.0
Tarpaulin vats	26.0
Black plastic tanks	54.0
White plastic tanks	10.0
Glass fibre vats	5.0
Preferred fish culture methods	
Concrete ponds	16.0
Earthen ponds	41.0
Fish vats	43.0

**Source:** Field survey, 2015

#### **Source of information on the knowledge of fish vat usage among farmers**

Data in Table 3 reveal that majority (48%) of the respondents got their information on fish vats through the service of extension agents, while the least (13%) source information from adverts on radio and television. The majority of the respondents being aware of fish vats, shows that the extension agents are effective in dissemination of innovation to the farmers.

**Table 3: Percentage distribution of respondents' source of information on fish vats**

<b>Sources</b>	<b>Percentage (%)</b>
Friends and family	16.00
Extension Agents	48.0
Radio and television	13.0
Other fish farmers	23.0

**Source:** Field survey, 2015

#### **Processes in fish vat usage among farmers**

The presentation below shows that 34% of the respondents raised a platform to place the fish vat; 16% constructed a shade over their fish vat; 16% washed their fish vat with chlorine before use; 34% constructed water inlets and outlets using PVC



pipes. Adoption of the raising of platforms could be for safety reasons to prevent meddling children from falling into the fish vat, it could also be a means to increase the shelf life and durability of the fish vat. The constructing of water inlets and outlets in the vat could be to ease the stress of filling up the vats with buckets or hose pipes. However, 16% of respondents agreed with washing of vats with chlorine before use. This could be as a result of the respondents being unfamiliar with use of chlorine or maybe they believe that the chlorine could cause harm to the fishes.

**Table 4: Percentage distribution of processes in fish vat usage among farmers**

Items	Percentage (%)
Raise a platform to place the vat	34.0
Construct a shade over the vat	16.0
Wash vat with chlorine before use	16.0
Construct inlet and out let using PVC pipes	34.0

Source: Field survey, 2015

#### Extent of utilization of fish vat among farmers

The mean scores of the respondents in Table 5 indicate use of vats for incubation and hatching ( $\bar{x}=2.67$ ); this might be why fish vats are used for nursery tanks ( $\bar{x}=3.32$ ); and the use of fish vats to raise fingerlings up to table size fish ( $\bar{x}=3.17$ ). The reason for the high utilization of fish vats could be as a result of the size of the vats, for instance the black plastic tanks are large in size in a way that it can accommodate thousands of hatched fries; and extension management practices can be done more effectively in such fish vats.

**Table 5: Extent of utilization of fish vat usage among farmers**

Adoption variables	LAE	ME	LE	NA	MEAN ( $\bar{x}$ )	SD
Use of fish vat for incubation and hatching	40	17	13	30	2.67*	1.28
Use of fish vat as nursery tank	57	25	11	17	3.32*	0.93
Use of fish vat to raise fingerlings up to table size	56	19	7	18	3.17*	1.16

Mean ( $\bar{x}$ )  $\geq 2.50$

Source: Field survey, 2015

#### Benefits of using fish vats among farmers

The mean scores in Table 6 indicate that all respondents agreed that use of fish vat as a culture method is of great benefit to the fish farmer. The results show that respondents ( $\bar{x}=3.68$ ) agreed strongly that fish vats is mobile and its position can be changed from place to place, this implies that even tenants and the land-less can go into fish farming; ( $\bar{x}=3.39$ ) strongly agreed that fish vat is cheap and economical compared to other culture systems ( $\bar{x}=3.39$ ); ( $\bar{x}=3.50$ ) strongly agreed that fish vat is easy to maintain; enables farmer see the bottom of the tank ( $\bar{x}=3.54$ ).

**Table 6: Mean distribution of perceived benefits of using fish vats among farmers**

Items	SA	A	D	SD	Mean ( $\bar{x}$ )	STD
Fish vat is cheap and economical	60	37	3	-	3.39*	0.879
Fish vat requires less land space	54	42	2	3	3.44*	0.691
Fish vats is easy to maintain	55	43	2	-	3.50*	0.720
Fish vats are mobile	70	28	2	-	3.68*	0.510
Enables farmer see the bottom of the tank	59	38	1	2	3.54*	0.631

**Mean ( $\bar{x}$ )**  $\geq 2.50$

**Source:** Field survey, 2015

### Constraints to utilization of fish vats among farmers

The mean scores of the respondents in Table 7 indicate constraints as: stocking density is low ( $\bar{x}$ =3.22), and could be due to the size of vat purchased by the fish farmer; fish vats are not durable ( $\bar{x}$ =2.21), and may due to wooden vats construction which might be attacked and destroyed by termites; fishes reared in vats are denied access to natural food ( $\bar{x}$ =3.56). The following findings are of less constraint: leads to high mortality rate of fish ( $\bar{x}$ =1.67), fishes reared in vats have poor taste ( $\bar{x}$ =1.59), people dislike vat cultured fish for consumption ( $\bar{x}$ =1.58).

**Table 7: Mean distribution of constraints to utilization of fish vats among farmers**

Items	SA	A	D	SD	Mean ( $\bar{x}$ )	STD
Leads to high mortality rate of fish	3	13	32	52	1.67**	0.817
Stocking density is low	60	15	12	13	3.22*	1.097
Fishes reared in vats have poor taste	2	5	43	50	1.59**	0.683
Fish vats are not durable	17	22	26	35	2.21*	1.103
People dislike vat cultured fish for consumption	2	16	20	62	1.58**	0.831
Fishes are denied access to natural food like algae	64	26	9	1	3.56*	0.658

**Mean( $\bar{x}$ )**  $\geq 2.50$

**Source:** Field survey, 2015

### CONCLUSION

The raising and selling of fish in fish vats on a commercial basis has proven to be economically successful in Nigeria. It has not only provided job opportunities to the unemployed but has proven to be economically successful throughout Nigeria. In the study area it was observed that most of the respondents were aware of fish vats through extension agents (48%), and (34.0%) utilized rising of platforms for use of vats and construction of inlets and outlets in the vat respectively . More of the respondents strongly agreed that fish vats enabled the farmers see the bottom of the tank ( $\bar{x}$ =3.54) and required less land

space when compared to other culture systems. Among other constraints, a majority of the respondents strongly agreed that the constraint to fish vat usage is that fishes are denied access to natural food ( $\bar{x}=3.56$ ). For sustainable economic development, the study recommends that the National Institute for Freshwater Fisheries Research (NIFFR), extension-linkage with the State ADPs and other extension service providers be strengthened to reach end users for sustainable increase in diffusion of innovation on fish farming through extension education, supply of fish food, and its economic benefits within the study area.

## REFERENCES

Akinbile, L. A. (1998). Group formation and group dynamics. Paper presented at NAERLS workshop on Extension Communication Techniques. Moor Plantation, Ibadan, pp11.

Amao J.O, Awoyemi 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.*, vol. 2(2): 14

Atanda, A.N. (2007). Freshwater fish seed resources in Nigeria. Assessment of freshwater fish seed resources for sustainable aquaculture. FAO fisheries technical paper, NO. 501 Rome, FAO

Bairagya, R.,( 2010). Impact of education on fish farming in West Bengal: A Study Report. Department of Economics, SambhuNath College, Labpur, Birbhum, West Bengal, India.

Dada, B.F. (2004). Contribution of Fisheries to Employment, National Economy and Food Security in Nigeria. Fish network, Fisheries society of Nigeria quarterly publication. Vol.(11) 1:2

Emodi, A.I, Emah G.N, Isife B.I, Chukuigwe, E.C. ( 2009). Pattern of soyabean awareness, use and consumption among selected households in Port Harcourt Metropolis, Rivers State, Nigeria. *Global Approaches to Extension Practice (GAEP)*, vol. 5(1):28-33.

Hankins, J.A., S.T. Summerfelt, M.D. Durant.(1995), Impacts of feeding and stock management strategies upon fish production within water recycle systems M.B. Timmons (Ed.), *Aqua cultural Engineering and Waste Management* Northeast Regional Agricultural Engineering Service, Ithaca, New York. pp. 70–86

Helfrich, L.A. and Libey, G.S (2010).Should You Attempt Fish Farming? Considerations for Prospective Fish Growers Virginia Cooperative extension. Virginia State University..[https://pubs.ext.vt.edu/420/420-897/420-897\\_pdf.pdf](https://pubs.ext.vt.edu/420/420-897/420-897_pdf.pdf)

Islam, N. (2007). Reducing poverty and hunger in Africa: the role of agricultural and rural development. International Food Policy Research Institute (IFPRI), pp 15.

Kumar, D. (1992). Fish culture in undrainable ponds.A manual for extension-FAO fisheries technical paper No.325, p 239.<http://www.fao.org/docrep/003/t0555e/T0555E00.htm>

National Bureau of statistics/Central Bank of Nigeria (NBS/CBN) (2005). Socio-economic survey on Nigeria, NBS, Abuja

Omotoyin, B.O (2006). Introduction to Fish Farming in Nigeria. Ibadan University Press, Publishing House, University of Ibadan, Ibadan, Nigeria. p.60 .

Osawe, M. (2004). Catfish fingerlings production and hatchery management techniques. Success attitude development center (SADC) Lagos, Nigeria workshop paper. Pp 32

Scoones, I. (1998), Sustainable Rural Livelihoods: a framework for analysis. Institute of development studies (IDS) working paper 72, Brighton, UK

Siyambola, O., and Adebayo, J. (2012). Aquaculture in Urban and Peri-urban Areas: The Economics of Sustainable Fisheries, Aquaculture and Seafood Trade: Proceedings of the Sixteenth Biennial Conference of the International Institute of Fisheries Economics and Trade, July 16-20, Dar es Salaam, Tanzania. Edited by Ann L. Shriver. International Institute of Fisheries Economics and Trade (IIFET), Corvallis.

Ugwumba, C.O.A and Okoh, R.N (2010). African Crayfish farming in concrete and earthen ponds: A comparative profitability analysis. *Journal of Fisheries International*. Vol 5 (1): 14-18. <http://www.medwelljournals.com/fulltext/?doi=jfish.2010.14.18>

Ukpong, G. E, Eubomwon, G. O., Ukeje, E. U. and Afelumo, F. O. (1995). "Agribusiness, the Environment and Sustainable Economic Growth in Nigeria." CBN Bullion publications Vol. (19): 4. 23-24.

Unaeye, H.1 and Ibim, A. (2013). Adaptive Mechanisms of Rural Fishermen Towards Climate Change On Quantity of Fish Caught in Asari-toru Local Government Area of Rivers State Nigeria. *Journal of Biology, Agriculture and Healthcare*. Vol.3(17):43-48. [www.iiste.org](http://www.iiste.org)

Yinka, A., Gbemiga O. and Remi A. (2003), advanced commercial catfish farming: Women's traditional fishery and alternative aquatic resource livelihood strategies in the southern Cameroonian Rainforest. *Fisheries Management and Ecology* 17:221 – 230 oak ventures, Abeokuta Ogun state, Nigeria.

Yusuf, S.A, Ashiru, A.M. and Adewuyi, S.A, (2002). Economics of Fish Farming in Ibadan Metropolis. *Tropical Journal of Animal Science*, vol5(2): 116-128.

Woolock, M. (2007), Social Capital and Economic Development towards a theoretical synthesis and policy framework. In *theory and society*, vol 27(2): 151-208

World Bank, (1995). Marketing Africa's High-value Foods: Comparative Experiences of an Emergent Private Sector. Steven J. and John M (eds). pp. 1-17.

#### **ABOUT THE AUTHORS:**

Angela .I. Emodi is a Lecturer at the Department of Agricultural Economics and Extension, Faculty of Agriculture, University of Port Harcourt, Port Harcourt, Nigeria.

Hilda .O. Amachree is a graduate of Department of Agricultural Economics and Extension, Faculty of Agriculture, University of Port Harcourt, Port Harcourt, Nigeria.

Omofowevue O. Efajemue is a Lecturer at the Department of Home Economics, Federal College of Education (Technical), Omoku, Rivers State, Nigeria.