INVESTIGATING THE LEVEL OF AWARENESS OF FISH FARMING IN DELTA STATE, NIGERIA.

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ABSTRACT

Studies have shown that aquaculture activities is currently the major growth in fish production in Nigeria, and the need arose due to the decrease in wild fish supply that is caused by over fishing, habitat destructions and pollutions. Aquaculture is the rational rearing of species of animals (fishes, crustaceans, molluscs, algae) and aquatic plants, which is normally achieved in an enclosed system and involves deliberate human intervention for provision of foods, and other factors that are essentials to the growth and development of the specie unlike capture fisheries. The results from the yield are more than those from the natural environment. The most important and acceptable cultured species in Nigeria are catfish and tilapia. However, 80% of the cultured species are Catfish and their hybrids (Clarias Heterobranchus). The level of awareness and challenges that farmers encounter in the production system for the sustainability of the sector was investigated in Uvwie LGA of Delta State and the investigation showed that fish farming awareness in the region is very high and most of the farmers take the farming as full time opportunity. The most farmed specie in the region is Catfish followed by Tilapia.

KEY WORDS: Studies, rational rearing, cultured species, production, sustainability, awareness

INTRODUCTION

The fishery sector in Nigeria is an important sector both from social and economic standpoint. The industry consists of aquaculture, industrial and artisanal. Aquaculture sub-sector is becoming very popular in the sector and currently contributing immensely to the domestic fish production in the country, in order to fill part of the huge local consumption demand and also the demand abroad. Aquaculture is currently contributing about 0.48% to the overall agricultural GDP of 20.24% in Nigeria (Nigeria Fishery Statistics, 2016).Fish has a very good nutritional profile and a very rich source of protein intake with high digestibility rate without any religious taboos like beef and pork meats (FAO, 2006). Fish provides income for many, especially in developing countries. For example, more than 10% of Nigerian population directly or indirectly depends on fishery sector for their livelihood. Asia (mainly China) contributes the highest aquaculture production in the world (FAO, 2017). The industry is providing substantial income for over ten million people in Nigeria who are engaged in fish production, processing and trading (New Partnership for African Development, NEPAD, 2005).

The export value from fishery sector in Nigeria is estimated to be around $2.7 billion (US). Meanwhile, this income generation from exportation are at chance due to the over exploitation of natural fish stock which is thought to be achieving its limits (Mutume, 2002). Most of the wide capture species of fish that were considered before to be vast and endless, are at present over exploited and unsustainable (Eyo, 2003). Moreover, the country's fish demand is far more than the supply. Nigeria currently produces about 1,123,000 metric tons against the national demand of about 3.32 million tons annually (Nigeria Fishery Statistics, 2016), which has kept increasing due to the growing number of people in the country. The country is therefore required to fill up these 2.197 million metric tons to meet up with the current demand, of which part (0.7 million metric tons) is being met through importations. The massive importations of fish into the county that is amounting to about $1 billion US dollar Kudi *et al*, 2008; Adewumi, 2015; Ekelemu, 2016) has led to further loss of Nigeria foreign exchange (FDF, 2008).

Nigeria mostly depends on fish for their animal protein intake. Fish contributes more than 60% of the world protein intake, especially in the developing regions (FAO, 2007). Fish contains important nutrients and very rich in minerals, amino acids and vitamins required for healthy being (Akinrotimi *et al*, 2007). The species that are mostly farmed in Nigeria aquaculture system include catfish, tilapia and carp (Adewumi and Olaleye, 2011), with catfish taking the lead by almost 80% followed by tilapia (*Oreochromis niloticus*) (Ozigbo *et al*, 2014).

Catfish Culture

Aquaculture industry in Nigeria is usually referred as catfish farming because it is native species and the hope of Nigeria fish supply largely depends on its culture (Ozigbo *et al*, 2014). Catfish which is the most cultured species in the country belongs to the family of *Claridae a*nd aquaculture production growth in the country are now mostly being boosted by the steady rise in its culture. Catfish production in the country is about 0.8 million metrics tons against the national increasing demand of about 3,000,000 metric tons (Kudi *et al*, 2008). Thus, about 2.2,000,000 metric tons haven't been exploited. This high market demand is further supported by the fact that Nigeria imports more than seven-hundred thousand metric tons of fish (Atanda, 2007; Anthonio and Akinwumi, 1991; Kudi *et al*, 2008) valued at approximately US$ 1 billion. Inadequate availability of seed quantity and quality; and feed represent the major hindrance to the production of catfish aquaculture in Nigeria (Atanda, 2007). Progress is being made tremendously to tackle these challenges.

Since the culture of catfish through hypophysation began in western part of Nigeria in 1973 and spread across the country, leading to increased aquaculture production of fish in the country from 1980's until now (Adewumi, 2015) The favoured catfish species in Nigeria aquaculture include: *Clarias gariepinus, Heterobranchus bidorsalis*, Clarias and Heterobranchus hybrid (*Hetero clarias*) and *Chrisichthys nigrodigitatus* (Okonji and Afegbua, 2004).

The culture of catfish (*clarias gariepinus)* requires multiple sorting to avoid cannibalism or survival of those with reduced growth rate. The growth period of the fish requires removing the smaller ones that are of the same size to another cultured tank for proper growth. Therefore, harvesting is achieved differently for the different groups. Rearing of fingerlings/fry in outdoor facility requires covering of the tanks using mosquito nets in order to avoid predators. The most significant factor in the culture of catfish is the feed and feeding (Ayinla, 1988; Alegbeleye *et al.,* 2008).Feeding cost is the most significant cost of all the inputs in catfish production, given that most of the feeds are imported and the ones produced locally is not much compare to the required need. Hence, the need to have adequate feed production and cost effective feed in country to help maximize profits for farmers. Efforts are being made to establish the crude protein and amino acid requirement of catfish. Ayinla, (1988) recommended 35 and 40% crude protein for raising table size and brood-stock respectively.

Resourcing of raw materials for feed products is one of the main issues affecting the sustainable production of farmed catfish (FAO, 2015). Fish meal and fish oil are derived from small pelagic fish species such as mackerel, anchovy and sardine (Pérona *et al*, 2010). The farming of carnivorous species in particular (such as salmon), puts a high demand on the wild stocks of these small oily fish which are required to make the fishmeal/fish oil. There are concerns that this high demand will continue to increase stress on the global pelagic fisheries industry and possibly undermine the sustainability of protein production through aquaculture (Kristofersson and Anderson, 2006). In order to formulate and compound aqua feeds that will meet the nutrient requirements of catfish at affordable cost, there is need to ensure that feed raw material are sourced from stocks that are within safe biological limits and management regimes should also ensure that stock remain within these limits (Mente, *et al*, 2006). Substituting of fishmeal from alternative protein resource, such as alternating marine animal protein raw material with ABPs (animal by – products, such as blood meal and poultry meal), plant proteins and soy as alternative sources of raw material is more sustainable (The Fish Site, 2016). Blood meals are highly rich in protein content as much as nutritious, very affordable and easily sourced worldwide. Plant-protein raw materials such as wheat, corn and peas or oil products from soy and sunflower crops protein content and acid digestibility are also good replacement of fishmeal (The Fish Site, 2016).

Catfish feed is produced in both sinking and floating pellets. The sinking pellets are relatively common and cheaper than the floating. Thus, using floating pelleted feeds achieves better results in the farming of catfish, as it is

being raised to mature within the period of six months. Feed conversion ratios are better achieved with floating feeds (PIND, 2014).

Tilapia farming

The total world tilapia production is estimated at over 5.3 million tonnes in 2014, valued at about $8.8 billion (The Fish Site, 2016). Tilapia is the second most popular fish used in Nigerian meals. Tilapia aquaculture production in Nigeria was not popular until 2000, when the production rate increased following catfish successful commercial expansion over the last decade (Alfred and Fagbenro, 2006; Afolabi et al., 2007). In the year 2000, the production was about 14,388 tonnes and in 2005 it increased to 19,546; mostly from *O. niloticus*(Fagbenro and Adebayo, 2005; Ayinla, 2007). However, only six (*tilapia zillii, T. guineensis; Saro therodongalilaeus; S. melanotheron; Oreochromis; O. niloticus and O. aureus*) out of the 25 tilapia species are culturable in Nigeria (Afolabi et al., 2007) and the most popular among the cultured ones is *O.niloticus and oreochromis* species. Tilapia culture can be done using concrete tanks, raceway, cage and ponds at small or large quantity. It can also be sold fresh, frozen or smoked. Tilapia market approach in Nigeria is niche market (The Fish Site, 2016). Niche marketing means focusing your marketing targets towards a selected group of customers, which comes with cost-effective way of competing in the seafood marketplace and achieving market share without the expenditures associated with mass marketing (Purdue Extension). More researches on the production of tilapia are going on and technology for the farming is established, especially on how to manipulate the growth hormones. The culture of tilapia does not require advanced technology. This is due to the fact that tilapia can utilize and explore its environment very well; known to tolerate wide range of environmental situations; can adapt to high stocking density; can efficiently consume both natural aquatic and supplementary foods and grow fast; can resist stress and handling and can reproduce in captivity (Fagbenro, 2001).The reproduction takes place in either natural mouth brooders or natural substrate brooders, which is an easy way of spawning. Contrarily, this method of producing offspring is not always the best, due to the fact that the survival rate of the offspring is usually low and the grow-out pond can become over-crowded. Thus, when the grow-out pond is over-populated, the tendency of the fish having stunted growth is very high and the supply of natural food organisms in the pond becomes low (Fagbenro, 2001). A study on the controlling of undesirable populations of tilapia in the ponds and their effects has been conducted such as use of local predatory fish species to control them, but most farmers that farm tilapia in Nigeria are yet to know and adopt this skill (Agbebi and Fagbenro, 2006). This may be partly because, the density control of the population by using local predators has not been effectively and thoroughly researched in Nigeria, as only very few indigenous predators have been investigated (Fagbenro, 2004). However, some plants that contains antifertility properties such as *hibiscus rosa-sinensis*, pawpaw (*Carica papaya*), neem and morinda (Uche-Nwachi *et al*., 2001; Kusemiju *et al*., 2002; Oderinde *et al*., 2002; Adebiyi *et al*., 2002, 2003; Raji *et al*., 2003; Yinusa *et al*., 2005; Jegede, 2010; Ellah, 201); and extracts of pawpaw seeds (Ekanem and Okoronkwo, 2003; Jegede, 2009) can be used in the production of their feeds in order to control their fertility. These plants are very rampant in Nigeria. Combination of tilapia and catfish has been very effective in Nigeria (Fagbenro, 2004). The *clariid* catfish hybrid such as *H. longifilis* x *C. gariepinus* and *H. bidorsalis* x *C. gariepinus* and their reciprocal-crosses have a higher growth rate than their parental species; and also have high propensity for piscivory, meaning they can be easily used for controlling of tilapia population in ponds (Fagbenro, 2004).

The supplementary feeds used in tilapia culture constitute around 40% to 60% of the cost of production (Fagbenro, 2006). The herbivorous tilapia feeds contains about 30% to 35% of crude protein while carnivorous tilapia feed constitutes 45% to 50% crude protein respectively (Fagbenro and Adebayo, 2005). In 2000, the industry consumed about 35,579 tonnes of fish feed (Fagbenro and Adebayo, 2005)

Fish Farming in Delta State

Delta state has the highest fish farming population in the country, especially with the existence of United Ufuoma Fish Farmers Association Ekpan Warri, which was recorded in 2013 to have over 6500 farmers with over 14,500 ponds, in one of the biggest fish farm settlements in the western Africa (The Nation News, 2013). The study of Chuka-Okonta (2014) that was carried out to examine the determinants of output and profitability of aquaculture fish farming in Burutu and Warri South West local government areas of Delta state shows that fish farming in Delta state is very popular and relatively profitable when efficiently marketed. More than 70% of the respondents of the study are between the age of 31 and 50 years, which shows that farmers in the area are very energetic and young. Studies have shown that age is an important factor of productivity, as the older you get the less productive you become in fish farming. The gender distribution of the study shows that male dominates in aquaculture fish farming in the area with more than 74%. This is in connection with the findings of Ele, *et al.* (2013) that found male dominance in fish farming with 81% and female with 19% in Calabar, Cross River state. In the analysis of marital status, it was shown that more than 66% of the respondents are married while the rest are single. It has been observed that majority of farmers that have children and spouse usually engage in the practice to lessen the cost of labor involved in fish farming. Over 49% of the married ones have a household sizes that ranges from 3 to 8 on the average. The implication of a large household in the field of agriculture can be viewed from two angles. It can provide a cheap source of labor as it can bring about the use of small amount of hired labor while it can as well negatively affect the family if most of the household members are not of productive age and hence cannot contribute to family labor in farming activities. The level of educational attainment of the respondents indicates that over 91% of sampled aquaculture fish farmers in the area are literate with only about 8% of them not having acquired western education through the formal process. 50% of the respondents were literate, which is a good sign that education is necessary in aquaculture practice. 52.5% of the respondents have been in the business between 4 and 6 years. Only a few (5.6%) of the farmers have been on the job for 10 years and above. In most cases the experience acquired over time improves the production skills of farmers. About 61% of the farmers were on part-time basis while the rest were full time, which implies that fish farming can be done along-side with other jobs. In Delta state, several aquaculture management practice such as extensive, semi-intensive and intensive aquaculture systems are present. The most common among them is semi-intensive farming. In semi-intensive farming system, low to medium input with dependency on both artificial feed and algae (using fertilizers) are used as a means to produce low to medium output (Omitoyin, 2007; Edwards, *et al*, 2017). Result of Okonji and Bekerederemo (2011) on management practices of fish farmers in before, during and after stocking shows that most of the respondents before stocking engage in semi-intensive fish farming with about 72% fertilizing their ponds to enhance growth of algae, which result in low farming intensity as the use of algae cannot support high stocking density (Omitoyin, 2007). The result also showed that most (83%) farmers get their fish seeds mostly from the hatchery. Majority of the respondents had less than three ponds with a stocking rate of below 5000 fish seeds. Majority of the respondents fed their fish with artificial feed in addition to their utilization of algae as natural fish food (semi-intensive system). Their water qualities were maintained by occasionally flushing the ponds in order to remove excess organic particles of algae and feeds.

Aim and objectives:

The aim and objective of this study is to find out the level of awareness and challenges of fish farming in Uvwie LGA of Delta State, Nigeria. Specifically to determine the level of catfish and tilapia farming in Uvwie LGA.

MATERIALS AND METHODS

Description of Study Area

Delta State is an oil and agricultural producing state of Nigeria, situated in the South-South geo-political zone. It has a population of around 4,098,291 (males: 2,674,306; females: 2,024,085). The capital city is Asaba, located at the northern end of the state, with an estimated area of 762 square kilometres (294 sq mi), while Warri is the economic nerve centre of the state and also the most populated located in the southern end of the state. The state has a total land area of 16,842 square kilometres (6,503 sq mi). Delta State ethnic groups comprise mainly Urhobo, Isoko, Delta Ibo (Anioma), Itsekiri and Ijaw. There are eight (8) local governments in the South Senatorial Districts which are Warri South-West, Warri South, Warri North, Burutu, Bomadi, Isoko South, Isoko North and Patani. The study was conducted in the north-east part of Delta state called Uvwie. Uvwie lies approximately between 5.40' and 5.50' East of Latitudes 5.30 and 5.50 North. The area presently covers a landmass of about 100 square kilometres and bounded by Okpe kingdom in the north and Udu and Ughievwen in the north-west, Agbarho kingdom in the north-east, Agbarho-Ame in the east, Okere kingdom in the south and Itsekiri in the south-west. Effurun is the headquarters of the Uvwie local government (Google Map). The area is commonly called Warri.

Participants

The participants used in this survey comprised a total of 50 farmers from United Ufuoma Fish Farmers Association (UUFFA)Ekpan Warri, Uvwie L.G.A. of Delta State. UUFFA has a large number of farmers with over 14,500 ponds (The Nations News, 2013). The participants responded through hard copy answers to questionnaires that took place via physical visits. Farmers who participated were only farmers with experience in the sector. They constituted a small group of participants who have deep understanding of the sector. All participants had to have a basic level of education.

Questionnaire

The instrument chosen for data collection was a structured hard copy questionnaire. The questions, which allowed participants to choose options, focused on eliciting the views of participants on the research questions. Data were collected on correspondent's socio-economic variables such as age, household size, Fish farming experience, pond types, stock size etc. Data was also collected on the level of awareness of fish farming and challenges encountered in fish farming.

Data analysis

The questionnaires were conducted in person by the researcher who visited the farms under study in order to ensure a high rate of return and prevent attrition. The data from the questionnaires were analyzed by examining the relationship between variables and interpreting the raw data using descriptive statistics (percentage and frequency).

Ethical Assurance

The questionnaires were all administered face-to-face by the researcher and retrieved directly from the respondents. Before engaging the participants, the researcher made a brief introduction and explanation of the research, during which the purpose of the study and the rights of participants were explained. The participants' identities were concealed to enable them to freely answer the questions, though some farmers were willing to disclose their identities. Close communication was maintained during the data collection process, in order to ensure quality responses from participants. The participants were assured of the confidentiality of their responses. It was also clearly stated that there was no unforeseeable harm or risk associated with the research. While there was no form of compensation or thank you gift to reciprocate for participation, an oral appreciation was delivered to thank all participants.

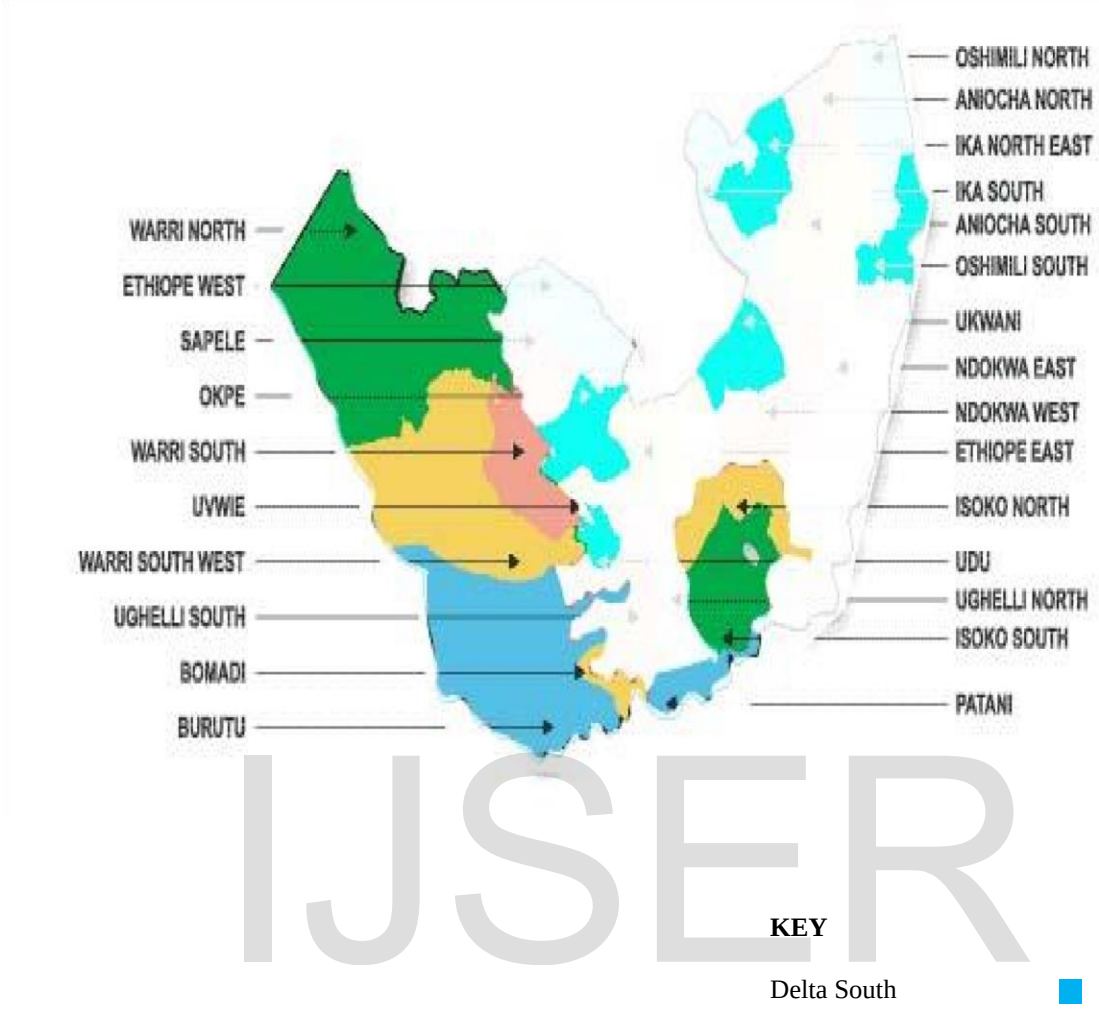

Figure 1- Map of Delta state showing study area. Google map

Results

Level of Awareness of Fish Farming in Uvwie LGA of Delta state.

Table 1 showed that majority (37 out of 50 respondents) were fully involved in the practice, while the rest (13 respondents) were partly involved. None of the respondents used only employees to run the business. This indicates that respondents who engaged in fish farming fully will have more time for their farm hence proper farm management and more productivity. Farmers who engaged in fish farming along with other business activities use extra cash gotten from their businesses and jobs in financing fish production as a compensation for the reduced effectiveness of management when they are absent. This indicates that fish farming is a major occupation in the study area.

Level of Awareness of Fish Farming in Delta South

From table 1, out of the 50 respondents, 47 of them knew what fish farming involved while the remaining (3 respondents) did not have all the details of what the practice requires. 41 (82%) of the respondents said that the enterprise in challenging; 88% of them thought the industry is lucrative. All the 50 respondents revealed that fish farming is common in their community. Fish farming can be practiced almost anywhere now using concrete tanks, plastic tanks and tarpaulin as substitutes in areas where soil conditions are not favorable for the construction of

ponds. 39 of them said the reason why it is common is because it is generally accepted; 50 of them said that ponds are readily available to buy or rent; 50 of them said it is because of the popularity of the sector; 36 of them mentioned water availability; 8 of them said it's because of the profit in it; 6 of them said there is market for the product. This shows that fish farming in Uvwie has great prospects in the area.From the result, all the respondents (50) believed that fish farming is a good source of employment, food and source of income for members of the community**.** 21 out of the 50 respondents got to know about fish farming from their parents and family members; 15 of them got to know through friends and neighbors; while the rest (14 respondents) knew from other fish farmers.

Table 1: Level of Awareness of Fish Farming in Uvwie LGA of Delta state(you can select more than one option)

Variable	Frequency
How involved are you in fish farming	
Fully involved	37
Partly involved	13
Not involved (use employers) 0	
Do you know what fish farming entails?	
Yes	47
No	3
What do you think about the enterprise	
Challenging	41
It is very lucrative	44
So many people are involved	49
Don't know much about it	
No government support	41
Others (Please specify)	
Is fish farming common in your community	
Yes	50
No	-
If yes, why is it common?	
It is generally accepted	39
Ponds are available to buy or rent	50
Aquaculture is very popular	50
Water is available	36
There is profit in it	8
There is market to sell	6
Others (Please specify)	
Benefits to the community	
Employment	50
Food	50
Source of income for members	50
Others (Please specify)	
How did you know about fish farming	
From parents/Family members	21
Friends/Neighbours	15
Other fish farmers	14

Government initiatives	0
Others (Please specify)	

Table 2: Level of Awareness on Profitability and Challenges

	Agree	Disagree	Undecided
Fish farming is a profitable venture	49	-	1
Fish farming can be practiced anywhere	36	5	9
Fish farming is becoming popular	50	-	-
Fish farming has many challenges	43	-	7
The challenges can be overcome	49	1	-
Means of Employment and Income	50	-	-

DISCUSSIONS

Level of involvement

Table 1 showed that majority (74%) were fully involved in the practice, while the rest (26%) were partly involved. None of the respondents used only employees to run the business. This indicates that respondents who engaged in fish farming fully will have more time for their farm hence proper farm management and more productivity. Farmers who engaged in fish farming along with other business activities use extra cash gotten from their businesses and jobs in financing fish production as a compensation for the reduced effectiveness of management when they were absent. This indicated that fish farming was a major occupation in the study area.

LEVEL OF AWARENESS OF FISH FARMING IN DELTA SOUTH

Knowledge of fish farming:

From Table 2, 94% of the respondents knew what fish farming involved while the remaining (6%) did not have all the details of what the practice requires. This implies that the people in the study area were highly aware of fish farming and it is also a well-known trade in the area. This shows that fish farming is the fastest growing animal based food production sector, particularly in the developing countries. Fish farming is quite popular in Delta and relatively profitable especially when efficiently marketed.

Opinion on fish farming:

Most of the respondents (82%) said that the enterprise in challenging; 44 of them thought the industry is lucrative. From the result obtained, fish business although faced with several challenges is certainly a lucrative business. This is in agreement with the result of Akarue *et al*, carried out analysis on the socio- economic analysis of catfish farming in Uvwie local government area, of delta state, who reported that the Benefit Cost Ratio (BCR) of 1.75; which according to Olagunji *et al*, (2007) is based on the concept of discount method of project evaluation. According to them, as a rule of thumb, project with cost ratio greater than one, equal to one or less than one indicate profit, break-even or less respectively. Since the ratio of 1.75 is greater than one, enterprise is believed to be

profitable. However, 98% of them said that so many people are involved in the business; while 82% of them thought that government supports is not present. Fish farming business in Uvwie LGA is very common, especially with the existence of UUFFA, which has over 14,500 ponds for renting and buying with so many experienced farmers you can learn from. That makes it easier for one to embark in the business once personal resources are available.

Benefits of fish farming to the communities:

From the result, all the respondents (50) believed that fish farming is a good source of employment, food and source of income for members of the community. There has been increasing awareness of the need for adequate protein in human diet to reduce infant morbidity and mortality which Igbedioh (1990) found were on the increase in the Nation. The Food and Agriculture Organizations (1995) also posits that protein intake in developing countries (such as Nigeria) was below the required 75g per person per day. According to Ajayi (2001), fish has been widely acknowledged as a rich source of dietary protein. However, fish farming is predominantly at small-scale subsistent level. Large scale commercial farming is yet to be popularized in spite of the fact that FAO (2005) has identified Nigeria as one of the countries in the Sub-Saharan Africa with great potentials to attain sustainable fish production considering her extensive mangrove ecosystem. Fish farming is providing employment opportunities to large number of the unemployed in the area.

Conclusion

The study investigated the level of awareness and challenges of fish farming in Delta South senatorial district. The result of the study showed that there is very high level of awareness of fish farming in the area. A good number of respondents engaged in fish farming as a full time job to generate income and provide food for their household. The study showed there is awareness on catfish and tilapia fish farming in Uvwie LGA of Delta state although emphasis is on mostly catfish as it was the most cultured specie in Delta state.

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