Original Research Article

Exploring the Adoption of Fish Production Using Concrete Tank in the Municipal Area Council, Abuja

Idayat Adenike Oyetola[1*], Samson Olayemi Sennuga[1], Hauwa Bako[2], Albert Glory Wilberforce[1]

[1]Department of Agricultural Extension and Rural Sociology, Faculty of Agriculture, University of Abuja, FCT, P.M.B. 117, Abuja, Nigeria

[2]National Space Research and Development Agency (NASRDA), Obasanjo Centre, Abuja, Nigeria

*Corresponding Author: Idayat Adenike Oyetola

Department of Agricultural Extension and Rural Sociology, Faculty of Agriculture, University of Abuja, FCT, P.M.B. 117, Abuja, Nigeria

Abstract: This study accessed fish farming in AMAC the Federal Capital Territory, Nigeria. Data were collected from 100 respondents using structured questionnaires. The data were analyzed using descriptive statistics. Borehole water 80 percent and river water 20 percent were top sources of water for fish farming in the FCT. 40 percent of the respondents cleaned their concrete tank twice in six weeks. Some of the major constraints faced by farmers were high cost of feed at 30 percent response, 26 percent admitted their constraint, as lack of funds, lack of ready market was found to be 18 percent. 71 percent did not receive any support from the government to enhance their fish farming, only 10 percent of the respondent got loans from the government as support to fund their fish. The study recommended Governments interventions must be integrated into the local development planning to ensure that basic inputs, extension services, loans and grants are provided for small-scale fish farming, while also taking measures to address the negative environmental impacts of such activities through proper mitigation plans.

Keywords: Adaptation, fish, concrete fishpond.

INTRODUCTION

The dependence on fish by millions of people around the world, coupled with increased consumer demand for aquatic food and the depletion of global fisheries has created an impetus to expand fish production through aquaculture, or fish farming (Adeogun *et al*., 2014). Thus, the increasing supply of farmed seafood, worldwide per capita fish supply has reached a record high in 2014. World aquaculture production now provides half of all fish for human consumption, and for the first time ever has surpassed the contribution of wild-caught fish (Oladimeji *et al*., 2015; FAO, 2016). Therefore, fish farming has been viewed as a measure of increasing and improving food security, livelihood diversification and income supplements of families (Ibrahim *et al*., 2014).

Fish farming activity in Nigeria started about 50 years ago, with the establishment of a small experimental station at Onikan Lagos and an industrial farm about 20hct at Panyam in Plateau State by Federal Government. This generated a lot of interest in fish farming with the involvement of other levels of government and some private establishment (Fawehinmi *et al.,* 2017). Fisheries occupy a unique position in the agricultural sector of the Nigerian economy. In terms of Gross Domestic Product (GDP), the fishery sub-sector has recorded the fastest growth rate agriculture's contribution to GDP the contribution of the fishing subsector to GDP increased from N76.76 billion in 2001 to N 162.61 billion in 2005 at current factor cost (CBN Report, 2005). Fish is a significant source of protein for Nigeria's massive teaming population. Fish accounts for 40 percent of the average Nigerian's animal protein consumption (FCWC, 2016). Fish and fish products account for more than 60% of total protein intake in adults, especially in rural areas, according to (Ifeonu *et al.,* 2019). Okpeke and Akarue (2015). enumerated the importance of fish in Human Nutrition as follows:

1. Food fish has a nutrient profile that is superior to all terrestrial meats (beef, hog, chicken, etc.) and is a good source of high-quality animal protein and easily digestible energy.
2. Sulphur and important amino acids like Lysine, Leucine, Valine, and Arginine are abundant in fish. As a result, it's a good choice for adding to high-carbohydrate diets.
3. Fish is also a strong source of thiamine, as well as Omega-3 polysaturated fatty acids, fat-soluble vitamins (A, D, and E), and water-soluble vitamins (B complex), as well as minerals (Calcium, Phosphorus, Iron, Iodine and Selenium).
4. It contains a lot of polyunsaturated (Omega III) fatty acids, which are good for decreasing blood cholesterol and lowering blood pressure. In adult populations, it can help to reduce platelet (cholesterol) aggregation and different arteriosclerosis diseases.
5. It decreases the danger of sudden death from heart attacks and decreases rheumatoid arthritis.
6. Omega-3 fatty acids as well lower the danger of age-related muscular degeneration and vision impairment.
7. It reduces the danger of bowel cancer; and decreases insulin resistance in skeletal muscles.

FISH POND
Pond is a body of standing water, either natural or artificial, that is usually smaller than a lake. They may arise naturally in floodplains as part of a river system, or they may be somewhat isolated depressions. Typically, they contain shallow water with marsh and aquatic plants and animals. Ponds are frequently human constructed. A wide variety of artificial bodies of water are classified as ponds. One of the most important features of ponds is the presence of standing water, which provides habitat for wetland plants and animals.

Pond is defined as an artificial structure used for the farming of fish, it is filled with fresh water, is fairly shallow and is usually non-flowing. Pond is described as an earthen vessel for collecting and holding water with dikes and bottom soil to reduce seepage to a barest minimum (Igwe and Mgbaja, 2014). Pond fish culture refers to the farming and husbandry of fish under controlled or semi controlled conditions. Freshwater fish pond differs according to their sources of water, the way in which water can be drained from the pond, the material and method used for construction and method used for fish farming (Alemayehu and Tamiru, 2019). In fish cultivation a pond is fairly shallow water used for the controlled farming of fish and laid out to facilitate easy and complete drainage (Sintayehu and Seblewengel, 2015). This definition excludes water contained in such structures as pools, natural ponds, and lakes which cannot be drained and in which fish are caught with lines, traps or nets.

CONCRETE FISH POND
Concrete ponds are usually constructed with concrete and reinforce with concrete to make them stronger. Construction of concrete ponds is often handled by highly professional in construction engineering.

TYPES OF CONCRETE FISH POND
Concrete ponds are constructed using cements, blocks, and aggregate of appropriate ratio. A concrete pond can be classified into the following;
1. **Stagnant Concrete Pond**: this type of pond is cheaper to construct, water here is seldom replaced.
2. **Free Flow Concrete Pond**: this type of pond construction includes the water flow-out channel. Water flow is regulated and this continuous at a stipulated period, this ensure water freshness and turbulent that create the agile for improved feeding rate. The problem of the pond is that water wastage can be on the high side.
3. **Water Re-Circulatory Concrete Pond**: the construction of this type of pond includes a complete water refining or filtration system. Waste water out of the fish pond is either stored in another chamber or passed directly through a bio-filter re-circulation and it is a continuous action. This type of pond is the most advanced in water efficiency, stock capacity and water quality.

The purpose of the study is to explore the adoption of concrete tanks for fish production by fish farmers in Abuja Municipal Area Council (AMAC). The Specific objectives of the study are to:
   i.   Describe the socio-economic characteristics of the farmer using concrete tank in the study area;
  ii.   Evaluate the knowledge of farmers using concrete tank for the production of fish;
 iii.   Analysis the productivity of the fish pond among the farmers using concrete tank;
 iv.   Ascertain the constrain faced be the farmers in the study area;

MATERIAL AND METHODS
Study Area
This study was conducted in Abuja Municipal Area Council (AMAC). Abuja Municipal Area Council (AMAC) is the largest and most developed of the six area councils, while Kuje Area Council falls within the semi-urban settlement

location of the Federal Capital Territory. The bulk of the built-up area of AMAC is made up of the Federal Capital City (FCC).

AMAC is located between latitude 8^040^1 and 9^020^1 north of the equator and longitude 6^040^1 and 7^040^1 east of the Greenwich meridian. The Abuja FCT has a land mass of approximately 8000sq km of which the FCC occupies about 250sq km with population recent census at 778,567 for Abuja Municipal Area Council (Federal Republic of Nigeria Official Gazette, 2007).

POPULATION OF THE STUDY AND RESEARCH DESIGN
The study was conducted in Abuja Municipal Area Council (AMAC) on the purposive sampling bases, eight (8) ADP blocks from Abuja Municipal Area Council (AMAC) were purposively and randomly selected for the work namely Gwarimpa, Gui, Gwagwa, Nyanya, Orozo, Garki, Karshi and Kabusa 100 concrete fish farmers were randomly selected from the villages mentioned in the study area. They were purposively selected due to fact that they are similar in agro climatic, ethnic group, religion and cultural settings. There is no climatic or agronomic difference between these communities; they are just 300 metres apart. The communities are similar and have virtually everything in common. The study employed descriptive research design (Sennuga, *et al*., 2020) in order to explore and obtain in-depth information related to adoption of fish production using concrete tank in the municipal area among farmers in their real-life settings.

SAMPLE SIZE AND SAMPLING TECHNIQUES
Abuja Municipal Area Council (AMAC), has more than 20 wards of which all of them has equal probability of been chosen, however eight (8), Gwarimpa, Gui, Gwagwa, Nyanya, Orozo, Garki, Karshi and Kabusa were randomly sampled for their closeness. Purposive sampling technique was employed to select the farming communities for the study. They were purposively selected due to fact that they are similar in agro climatic, ethnic group, religion and cultural settings. There is no climatic or agronomic difference between these communities; they are just 300 metres apart. 100 concrete fish farmers were randomly selected from each of the villages mentioned in the study area.

DATA COLLECTION AND ANALYSIS
Primary data were used for the study; the data was collected with the aid of well-structured questionnaire which were administered to the fish farmers with the help of an enumerator. Descriptive statistics (frequency, percentage) was used for data analyses with the aid of Statistical Package for Social Science (SPSS) to analysis the data. The descriptive statistics was used to present the results. Descriptive statistics was used to summarize data in an organized manner by describing the relationship between variable in a sample or population.

RESULTS AND DISCUSSION
Socio-Economic Characteristics of Respondents
Table 1 below shows the Socio-economic characteristics of concrete fish farmers in the study. The table contained information on; gender, age, occupation, marital status, family size, literacy level and farming experience of respondents. The table further reveals that, majority constituting about 71.1 percent of the fish farmers numbering 70 were male, while the rest constituting about 30 percent attracting 27 respondents were found to be female. This result indicates that, there were more male involved in fish farming in the study area this agreed with (Aluko *et al*., 2021) who stipulated that male are the future of agricultural sector.

Similarly, the family size of the respondents shows that, 52 percent of respondents were at the majority and they have a family size that range between 6 and 10 people, while the remaining 40, and 8 percent constituting 40, and 8 respondents have family sizes of between 1 and 5, 6 and 11 and 15 persons respectively.

The marital status of the respondents from the results obtained in table 1 also reveals that, 43 percent of the fish farmers in the study area were married with about 35 percent was found to be unmarried, 15 percent were divorced and 7 percent widowed. The contribution of marital status on fish production can be explained in terms of the supply of labor. Family labor would be more where the household head is married and vice versa.

Majority of the respondents representing about 50 percent of the respondents constituting 50 had tertiary education, about 22 percent had secondary school education while only 18 percent constituting 18 respondent had primary education and 10 percent had non-formal education. As asserted by (Ojo *et al.,* 2021), that there exists a positive relationship between education and practice of best fish farming practices. The implication of this is that, there is every likelihood that there will be more people exploring fish farming in the study area as educated farmers tend to be better farmers, because education is one of the important factors that determines their ability of to understand policies, programmes and innovations of their time. Education affects productivity through effective resource use, allocation and choice of inputs for production activities, all things been equal according to (Oyewole and Sennuga, 2020).

The result of family source of income from the table further shows that majority, 40 percent accounting for 40 respondents were salary earners, 39 percent business earned their income from businesses, while about 21 percent accounting for 21 respondents said they earned their income from other sources. This indicates that most of the farmers had others sources of income apart from fish farming. This finding agrees with the findings of FAO, (2016) that a lot of fish farmers in sub-Saharan African have no alternative access to funding of agricultural activities and result to self-funding from their meager earnings.

The result obtained on religious status of the respondents shows that, majority constituting about 49 percent of the respondents numbering 49 practiced Christianity, 39 percent constituting 39 respondents were Muslims, 5 percent practiced African traditional religion while 3 percent with 3 respondent practiced other forms of religion. From the analysis, it indicates that, majority of the fish farmers in the study area were adherents of Christianity Islam. This finding is in agreement with the findings of (Lai-Solarin *et al*., 2021), that most farmers in the FCT were predominantly Christians and Muslims.

Table 1: Socio-Economic Characteristics of Respondents

Variables	Percentage
Gender	
Male	70
Female	30
Age (years)	
18-22	8
23-28	43
29-34	22
35-40	11
40>	10
Marital status	
Single	35
Married	43
Divorced/separate	15
Widow/ widower	7
Education	
Non former	10
Primary	18
Secondary	22
Tertiary	50
Household size	
1-5	40
6-10	52
11-15	8
Family source of income	
Salary	40
Business	39
Other	21
Religion	
Christianity	49
Islam	43
Tradition	5
Others	3

Source: Field survey 2021

Knowledge of Farmers About Fish Farming

Table 2 shows the knowledge of farmers about fish farming and this shows that majority of them which is 69 percent indicated that they used organic manure in their fish pond, 27 percent indicated they used in-organic fertilizers that. This finding agrees with the findings of (De young, 2013) that most fish farmers use organic fertilizers in their pond because it's cheaper and easy to get. This is because, material for preparation of compost are in abundance in the study area. 80 percent of respondents sourced for water from bore hole, while the remaining 20 percent said they go all the way to the streams and rivers to get their water.

Table 2 also shows that 65% of the respondents use family member for labor, 32% use hired labor while the remaining 3% uses other methods of labor for the fish farm work. 20% of the respondents clean their fish tank once a

month, 10% cleans theirs twice a month, 30% clean their fish tank twice in three months while the remaining 40% clean their fish tank twice in six months. Table 2 also shows that 60% of the fish farmers runs pH test of the water use for the fish pond while the remaining 40% carry out temperature of the water. 35% of the respondents get their fingerling from the local hatchery while the remaining 65% got theirs from hatching farms. 37% of the correspondent uses concrete tank for their fish farming, 40% use earthen, while the remaining 23% uses collapsible tank for fish farming.

Table 2: knowledge of farmers about fish farming

Variable	Percentage
Fertilizer used to fertilize fish pond	
Organic	69
Inorganic	27
Source of labour	
Family	65
Hired	32
others	3
How often do you clean the tank	
Once a month	20
Twice a month	10
Twice in three	30
Twice In six months	40
Sources of water	
Bore hole	80
River	20
Water test run	
Temperature	40
PH	60
Years of experience in fish farming	
<2	38
2-4	39
5-7	13
>8	10
Source of fingerlings	
Local hatchery	35
Hatching farm	65
Medium for farmer	
Earthen pond	40
Concrete tank	37
Collapsible tank	23

Source: Field survey, (2021)

Constraints Faced by Fish Farmers

Fish farming in the study area is faced with numerous challenges which can also result to various levels of difficulties in fish production. The result on Fig 1 below shows that some of the problems faced by the fish farmers are, high cost of feed accounting for majority at 30 percent of the respondents, lack of funds, 26 percent and 18 percent of the respondents reported lack of ready market as a constraint.
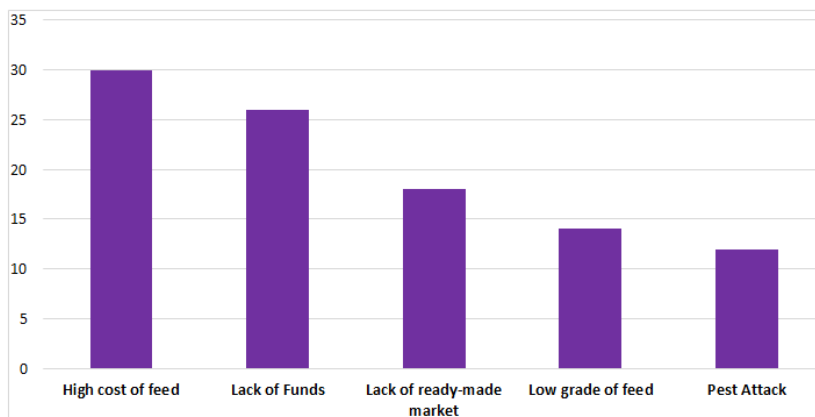

Fig 1: Constraints Faced by Fish Farmers
Source: Field survey, (2021)

GOVERNMENT SUPPORT FOR FISH FARMING

Fig 2 shows government support for fish farmers in the study area, majority of respondents about 71 percent say they have never at any time received government intervention to support their fish farms, 10 percent of the respondents received loans to support fish farming, 7 percent of the respondents received training and market information from government sources, another 7 percent said they got feed as input distribution to support fish farming. In the findings of (Sennuga *et al.,* 2021), found that government in sub-Saharan Africa have not done enough in support of agricultural activities that enhance food production and improve livelihood of farmers.
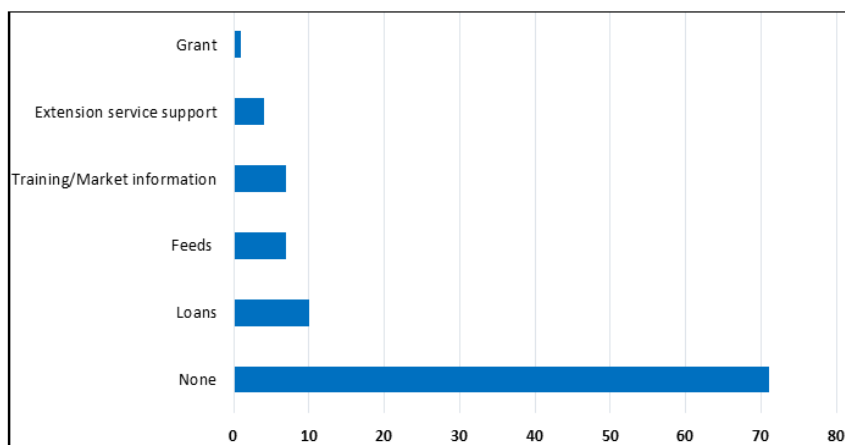

Fig 2: Government support for fish farming
Source: Field survey, (2021)

CONCLUSION

The main research aim of this paper was to examine fish farming using concrete tank as a livelihood strategy amongst urban farmers in the Federal Capital Territory of Nigeria. Like other towns and cities in sub-Saharan Africa, FCT is experiencing accelerated migration of people from rural areas, growing unemployment levels, and, because of high poverty levels and lack of personal incomes, residents are particularly vulnerable to urban deprivation, including food insecurity. However, urban agriculture can make a positive contribution towards improving livelihood sources, thereby reducing the intensity of these vulnerabilities. Apart from characterizing the demographic profile of selected urban fish farmers in FCT, the results of this study have confirmed that small scale fish farming is an important livelihood strategy towards poverty alleviation and increased food security.

RECOMMENDATIONS

Nevertheless, to transform the current small scale fish farming practices into a path of sustainable productivity and positive outcomes, there is an urgent need for government interventions that can empower and enable participants with resources and skills. Many respondents in this study have highlighted the high costs of production which are affecting their effectiveness and efficiency in a negative manner. To help circumvent these problems, these farmers need to be enabled through training interventions that emphasize business and financial planning skills, so that they can make informed decisions. Also, the need for extension services to these farmers cannot be over emphasized.

Most crucially, high cost of feed, pest infestation, funding, lack of ready-made market and low quality feed in the market as well as most of the farmers got of clean or potable water from the streams is not encouraging. Government interventions must be integrated into the local development planning to ensure that basic inputs, extension services, loans and grants are provided for small-scale fish farming, while also taking measures to address the negative environmental impacts of such activities through proper mitigation plans.

REFERENCES

- Adeogun, O., Alimi, T., & Adeyemo, R. (2014). Comparative analysis of profitability and technical efficiency of fish farming using different rearing techniques in Nigeria. *Asian Journal of Agricultural Extension, Economics and Sociology*, 3(5), 405-418.
- Alemayehu, A. W., & Tamiru, C. G. (2019). Socio-economic importance of Fish production and consumption status in Ethiopia: A review. *International Journal of Fisheries and Aquatic Studies,* 7(4), 206-211.

- Aluko K. J., Sennuga, S. O., & Ezinne, M. E. (2021). Exploring Smallholder Farmers' Perception on the Uptake of Agricultural Innovations in Kuje Area Council, Abuja. *International Journal of Agricultural Economics.* 6(6), 315-319.
- Central Bank of Nigeria. (2005). Economic reports for the month of February, 2005.
- De Young, R. (2013). Green organization: Environmental Psychology overview. Publisher: Routledge
- FAO. (2016). Addressing rural youth migration at its root causes: A conceptual framework: Rome.
- FAO. (2016). State of world fisheries and aquaculture report: 2016 edition. Food and Agriculture Organization, Rome, Italy, FAO, 10-14.
- Fawehinmi, O., Omitoyin, S., & Jim-George, O. (2017). Determinants of Output of Small- Scale Fish Farmers in Ikorodu, Nigeria. *African Journal of Resources Management Fisheries and Aquatic* 2(1), 55-65.
- Fishery Committee for the West Central Gulf of Guinea (FCWC). (2016). Nigeria fishery statistics-2016 Summary report. Retrieved from https://www.fcwcfish.org/fisheries/statistics/nigeria/901-nigeria-fishery-statistics-2016-summaryreport on 11th June 2016.
- Ibrahim, U. I., Shamaki, B. U., Sanda, K. A., Lawal, J. R. Saidu, A. M., Majama, Y. B., Gambo, B. G., Badau, S. J., & Kushi, C. D. (2014). Socio-Economic Importance of Fish Farming in Maiduguri, *Nigerian Journal of Fisheries and Aquaculture*, 2(1), 81-82.
- Ifeonu, C. F., Chukwuemeka, V., & Agwu, E. A. (2019). Challenges of Youths Involved in Fish Farming in the Federal Capital Territory, Abuja, Nigeria. *Journal of Agricultural Extension,* 23(3), 15-23.
- Igwe, K. C., & Mgbaja, J. U. (2014). Evaluation of pond fish production in umuahia south local government area of Abia State, Nigeria. *Global Journal of Science Frontier Research*, 14(1): 39-48
- Lai-Solarin, W. I., Adeoye, W. A., & Sennuga, S. O. (2021). Technology Adoption Capabilities of Small Farm Dairy Cattle Holders in Gwagwalada, Abuja: Effects of Asymmetric Information and Extension Approaches. *International Journal of Agricultural Economics,* 6(6), 320-328.
- Okpeke, M. Y., & Akarue, B. O. (2015). Analysis of the profitability of fish farming in warri south local government area of Delta State, Nigeria. *Journal of Agriculture and Veterinary Science,* 8(12), 45-51.
- Oladimeji, Y. U., Abdulsalam, Z., Damisa, M. A., & Omokore, D. F. (2015). Estimation of efficiency differentials in artisanal fishery: implications for poverty reduction in selected States in North Central, Nigeria, *Nigerian Journal of Basic and Applied Sciences,* 23(2), 121-128.
- Oyewole, S. O., & Sennuga, S. O. (2020). Factors Influencing Sustainable Agricultural Practices among Smallholder Farmers in Ogun State of Nigeria. *Asian Journal of Advances in Agricultural Research,* 14(1), 17-24.
- Sennuga, S. O., Alo, A. O. O., & Sokoya, O. E. (2021). Agricultural Extension Theories and Practice in Sub-Saharan Africa: A Critical Review. *Journal of Agricultural Science and Soil Science,* 1(1), 20-28
- Sennuga, S. O., Fadiji, T. O., & Thaddeus, H. (2020). Factors Influencing Adoption of Improved Agricultural Technologies (IATs) among Smallholder Farmers in Kaduna State, Nigeria. *International Journal of Agricultural Education and Extension,* 6(2), 382-391.
- Sintayehu, B., & Seblewengel, L. (2015). Fish consumption pattern and determinants at house hold level in Asella town, South Central Ethiopia. *Nutrition,* 6(5), 159-170.