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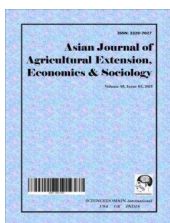
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## **Capabilities for Use of Improved Catfish Production Technologies among Fish Farmers in Delta State, Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Author MNO designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors MNO and ENM managed the analyses of the study. Authors ENM and DOE managed the literature searches. All authors read and approved the final manuscript.*

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### **ABSTRACT**

The survey was conducted to assess use of improved catfish production technologies among fish farmers in Delta State, Nigeria. Data were collected from a sample of 50 different fish farmers in Delta State using questionnaire. Frequency, percentage and mean score were used in analyzing data for the study. Results indicated that majority (70.0%) of the respondents were male, 40.0% were between the ages of 25 and 34 years, 72.0% were married, 60.0% had a household size of 6-10 persons, 50.0% got an annual income of above ₦300,000 with 92.0% having formal education. Sources of funds for the respondents were personal savings (60.0%), friends/relations

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(20.0%), cooperative society (12.0%) and loans from banks (8.0%). Findings showed that improved catfish production technologies used by the respondents included fortification of cat fish feeds using root and tuber crops (M= 2.2), improved techniques in pond construction and maintenance (M= 1.7), non-conventional feed stuff for catfish (M= 1.6), fertilization and liming of catfish pond (M= 1.6), improving water quality in catfish culture (M= 1.3), prevention and control of catfish diseases (M=1.0), among others. Also, constraints to use of improved catfish production technologies were inadequate processing and storage facilities (M= 2.5), disease infestation (M= 2.3), high cost of feeds (M= 2.2), high cost of inputs (M= 2.1), inadequate funds (M= 2.1), poor market network (M= 2.0), etc. The study recommended that financial institutions should ensure timely availability of credit facilities to enable catfish farmers make provision for improved processing and storage facilities in order to boost their productivity.

**Keywords:** Capabilities; catfish; Delta State; farmers; Nigeria; technologies.

## 1. INTRODUCTION

Fish farming occupies a unique position in the agricultural sector of the Nigeria economy. The contribution of the fisheries sub-sector to GDP rose from N76.76 billion in 2001 to N162.61 billion in 2005 [1]. Fish farming is the principal form of aquaculture. It involves rearing fish commercially in tanks or enclosures, usually for food. Nigeria has a vast network of land waters like rivers, flood plains, natural and man-made lake and reservoirs [2]. All these great potentials need to be effectively harnessed to provide sufficient fish protein for the teeming population, create job opportunities and reduce poverty. Modern fish farming involving the use of improved technologies is the only solution to the excess demand for fish in Nigeria. It is worthy of note that fish production in Nigeria is from three major subsectors: artisanal, aquaculture and industrial [3]. Artisanal fishing has been noted to contribute the largest proportion because the majority of the fishers in Nigeria are artisanal fishers operating with crude fishing tools and implements, little or no credit facilities, and lack of skills.

According to [4], artisanal fish production contributed 85.5%-89.5% while aquaculture and industrial production stood at 5.5%-12.0% of the total local fish production in Nigeria, respectively. Contribution of aquaculture has been reported to be on the increase since 2001 in Nigeria. Despite the abundant human and non-human resources that the nation is blessed with, the country is yet to bridge the gap between the demand and supply of fish, thereby making the nation one of the protein deficient nations. Improved aquaculture technologies could cover fish management areas such as fish enclosure technologies, neutralizers, fertilizers, fish stock selectivity, fish stock management, fish nutrition technologies, integration, pond bottom

excavation, fish culture systems, fish harvesting gear system drainage systems, among others.

Aquaculture fish production has maximally increased and has the under listed advantages which include fish grow quickly and can get a return on investment fast; fish farmers must not live next to ocean, lake, river or stream to farm fish although a constant source of clear fresh water is required for fish farming; there is ready market for fish both locally and internationally; demand can be met in a timely and efficient manner, small quantity can be harvested for sell to avoid spoilage; fish rarely suffer from diseases unlike other types of livestock; land unsuited to other productive uses - even small plots can be used for fish farming; once established, fish farms are easy to maintain leaving more time for other tasks and; fish is very nutritious, providing a good source of high quality protein and other essential nutrients which are especially important for mothers and growing children [5].

Access to accurate and adequate information on fish production technologies by farmers is essential for increased fish production. Such information must come from credible sources at the right time and the farmers should be able to utilize them correctly. Information on fish farming technologies needed by farmers cover a wide range of areas such as pond construction and management, breed selection, stocking, feeding, water management, spawning, sorting, harvesting, processing, storage, marketing and record-keeping [6]. The technologies used by most Nigerian fish farmers are relatively simple, often based on small modifications that improve the growth and survival rates of the target species, e.g. improving food, seeds, oxygen levels and protection from predators.

High cost of fish feeds, low level of credits, poor transportation network among others have been

identified as the problems of catfish improved technologies usage by researchers [7]. Many small-scale farmers in Nigeria and Delta State in particular are yet to integrate fish production technologies into their fish farming system hence the need for this study. The study was designed to provide answers to the following research questions: What are the socio-economic characteristics of the catfish farmers? What are sources of funds available for the catfish farmers? What are sources of information used by the catfish farmers? What are improved catfish production technologies used by the farmers? What are constraints to use of improved catfish production technologies by the farmers?

### 1.1 Purpose of the Study

The purpose of this study was to assess capabilities for use of improved catfish production technologies among fish farmers in Delta State, Nigeria.

Specifically, the study sought to:

- i. Describe the socio-economic characteristics of the catfish farmers;
- ii. Identify sources of funds available to catfish farmers;
- iii. Ascertain sources of information used by catfish farmers;
- iv. Ascertain improved catfish production technologies used by catfish farmers; and
- v. Identify constraints to use of catfish production technologies by the farmers.

## 2. METHODOLOGY

### 2.1 The Study Area

The study was conducted in Delta State, Nigeria. The state is found in the Niger Delta Area of Nigeria. It is located between longitude 5°00' and 6°45' East and latitude 5°00' and 6°30' North with a total land area of 7,440 km of which one third is swampy and water logged. Delta State is bounded on the North by Edo State, on the East by Anambra State, on the South by Bayelsa State and the West by Atlantic Ocean. The state consists of 25 local government areas. It is divided into three Agricultural Zones by Delta State Agricultural Development Programme (DTADP). These zones include Delta North, Central and Delta South having Agbor, Effurun and Warri as the headquarters, respectively. One (Central Agricultural Zone) out of the three

agricultural zones was selected for the study. There are six local government areas in the zone, namely; Ethiope East, Ethiope West, Ughelli North, Ughelli South, Okpe and Isoko North. Ughelli North was selected purposively for this study. This is as a result of having fish farming as a predominant activity in the area. Ughelli North Local Government Area is made up of seven (7) communities comprising Ughelli, Agbarha, Ogor, Ewreni, Owheru Agbarho and Orogun. Ughelli North covers an area of 50km<sup>2</sup> with population of about 323,478 people [8].

Ughelli North is described as one of the major food baskets of the state since greater percentage of people in the area are predominantly farmers and depend solely on agriculture for livelihood. The inhabitants of the area are engaged in farming activities such as crop and livestock production as well as fish farming. Crops produced are rice, cassava, yam, maize, cocoyam, okra, melon, cowpea and pigeon pea. The climate is characterized by two distinct seasons (rainy and dry season). The main annual rainfall is between 1,500 mm and 1,600 mm which are distributed through April to October every year. In the area of catfish farming, the Delta State Agricultural Development Programme (DSADP) has disseminated improved catfish production technologies to the farmers in the area to create business opportunities in catfish farming and to alleviate poverty.

### 2.2 Method of Data Analysis

The population of the study comprises all the catfish farmers in Ughelli North LGA. A multi-stage sampling procedure was used to select 5 communities in the LGA. In stage 1, all the communities in the LGA were selected. Stage 2 involves selection of 10 catfish farmers from each of the communities using simple random sampling technique. This gave a total of 50 respondents used for the study. Questionnaire was used to collect data from a sample of 50 respondents. Data were analyzed using frequency, percentage and mean score.

## 3. RESULTS AND DISCUSSION

### 3.1 Socio-economic Characteristics of the Catfish Farmers

Majority (70.0%) of the respondents were male while 30.0% were female (Table 1). This implies that fish farming in the study area is dominated

by male folks. This is to enable them as head of households to obtain income that will make them to be economically strong to take care of family responsibilities.

Table 1 showed that 40.0% of the respondents were aged 25-34years, 20.0% were between 45 and 54 years, 16.0% were aged 35-44years, among others. This implies that the respondents were middle-aged, energetic and in their productive years hence greater involvement on the use of catfish production technologies.

A greater percentage (72.0%) of the respondents were married while 12.0% and 12.0% were single and widowed respectively (Table 1). This implies that most of the respondents were married, having greater responsibility that has made them to engage in fish farming for economic empowerment.

Results in Table 1 reveal that 92.0% of the respondents had formal education in school while 8.0% had non-formal education. It implies that the respondents were literate enough which will help them on the use of catfish production technologies for greater productivity. The findings agree with [9] who stated that most fish farmers in his study area had formal education.

About 60.0% of the respondents had a household size of 6-10 persons, 30.0% and 10.0% had above 10 persons and 1-5 persons respectively (Table 1). This implies that the respondents had a relatively large household size. This implies that the respondents had fairly large size of family members who can serve as source of labor used in catfish production.

Table 1 showed that 40.0% of the respondents had a farming experience of 1-10 years, 36.0% had 11-20 years while 24.0% had above 20 years. This implies that the respondents have been involved in catfish production for a long period of time which could be an added advantage that will help them to improve on methods used in fish farming.

Entries in Table 1 indicate that 50.0% of the respondents got an annual income of above ₦300,000, about 30.0% obtained ₦200,001-₦300,000, among others. This indicates that the respondents had reasonable amount of money from sale of fish which will enable them to be able to take care of their family responsibilities economically.

All (100.0%) the respondents had extension contact in the last one year (Table 1). It shows

that the respondents were visited by extension agents and information they got from them could improve their catfish production.

A greater percentage (60.0%) of the respondents had an extension contact more than twice while 40.0% had between 1 and 2 times (Table 1). This implies that the respondents had adequate extension service coverage which will enhance adoption of catfish production technologies.

Results in Table 1 showed that 34.0% of the respondents were civil servants, 30.0% were engaged in farming, 20.0% were traders while 16.0% were hairdressers. This implies that the predominant occupation of the respondents in the study area was civil service.

### 3.2 Sources of Fund Available to Catfish Farmers

Results in Table 2 showed sources of fund available to catfish farmers which include personal savings (60.0%), friends/relations (20.0%), cooperative society (12.0%) and loans from banks (8.0%). This implies that the respondents obtained funds mostly from informal sources. High dependence on informal sources could be attributed to certain factors such as lack of access to credit facilities, delay in disbursement, lack of collateral, high interest rates, fear and uncertainties characterized by formal credit institutions.

### 3.3 Sources of Information Used by Cat Fish Farmers

Sources of information used by catfish farmers were extension agents (40.0%), radio (20.0%), research institutes (20.0%), fellow farmers (10.0%) and television (10.0%) (Table 3). This implies that the respondents received adequate information from extension agents which could boost their productivity and enhance increase in income. This is in line with [10] who observed that extension agents were the major source of information for the farmers in the study area.

### 3.4 Improved Catfish Production Technologies Used by Farmers

Results in Table 4 indicated improved catfish production technologies used by farmers which include fortification of cat fish feeds using root and tuber crops (M= 2.2), improved techniques in pond construction and maintenance (M= 1.7), non-conventional feed stuff for catfish (M= 1.6), fertilization and liming of catfish pond (M= 1.6),

improving water quality in catfish culture (M=1.3), prevention and control of catfish diseases (M=1.0), among others. This implies that the catfish farmers were using improved production technologies that will increase productivity which brings about high returns.

**Table 1. Distribution of socio-economic characteristics of the respondents (n=50)**

<b>Socio-economic characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Sex</b>		
Male	35	70.0
Female	15	30.0
<b>Age (years)</b>		
25-34	20	40.0
35-44	8	16.0
45-54	10	20.0
55-64	5	10.0
Above 64	7	14.0
<b>Marital status</b>		
Single	6	12.0
Married	36	72.0
Widowed	6	12.0
Separated	2	4.0
<b>Level of education</b>		
Non-formal education	4	8
Primary education	30	60
Secondary education	16	32
Tertiary education	-	-
<b>Household size (numbers)</b>		
1-5	5	10.0
6-10	30	60.0
Above 10	15	30.0
<b>Farming experience (years)</b>		
1-10	20	40.0
11- 20	18	36.0
Above 20	12	24.0
<b>Estimated annual income (Naira)</b>		
≤100,000	4	8.0
100,001-200,000	6	12.0
200,001-300,000	15	30.0
Above 300,000	25	50.0
<b>Extension contact</b>		
Yes	50	100.0
No	-	-
<b>Number of visits</b>		
1-2	20	40.0
Above 2	30	60.0
<b>Major occupation</b>		
Farming	15	30.0
Trading	10	20.0
Hair dressing	8	16.0
Civil service	17	34.0

**Table 2. Percentage distribution of sources of fund for the respondents (n=50)**

<b>Sources of fund</b>	<b>Frequency</b>	<b>Percentage</b>
Personal savings	30	60.0
Friends/relations	10	20.0
Cooperative society /isusu	6	12.0
Loans from banks	4	8.0

**Table 3. Distribution of the respondents according to their sources of information (n=50)**

Sources of information	Frequency	Percentage
Radio	10	20.0
Television	5	10.0
Extension agents	20	40.0
Research institutes	10	20.0
Fellow farmers	5	10.0

**Table 4. Mean score of improved catfish production technologies used by farmers**

Technologies	Mean score
Improved techniques in pond construction and maintenance	1.7
Techniques of improving water quality in catfish culture	1.3
Feed management for efficient catfish pond	0.9
Fortification of catfish feeds using root and tuber crops	2.2
Fertilization and liming of catfish pond	1.6
Non-conventional feed stuff for catfish	1.6
Prevention and control of catfish diseases	1.0
Control of predations in catfish pond	0.8
Techniques for hatchery and triggering production	0.5
Integrated fish farming for increased catfish production	0.2

**Table 5. Mean score of constraints to use of catfish production technologies by farmers**

Constraints	Mean score
Inadequate funds	2.1
High cost of inputs	2.1
Poor market network	2.0
Inadequate processing and storage facilities	2.5
Poor weather conditions	1.4
High cost of feed	2.2
High cost of transportation	1.5
Poor pricing by buyers	1.0
Lack of access to credit facilities	1.4
Poor road network	1.4
Inadequate technological knowledge	1.3
Disease infestation	2.3
Inadequate water supply	1.3
Poor supply of electricity	1.3

### 3.5 Constraints to Use of Catfish Production Technologies by the Farmers

Findings in Table 5 revealed constraints to use of catfish production technologies by farmers which include inadequate processing and storage facilities (M= 2.5), disease infestation (M= 2.3), high cost of feed (M= 2.2), high cost of inputs (M= 2.1), inadequate funds (M= 2.1), poor market network (M= 2.0), high cost of transportation (M= 1.5), poor supply electricity (M= 1.3), inadequate water supply (M= 1.3), among others. It implies that the respondents were highly constrained by processing and

storage facilities which hinder optimum production of fish in the study area.

### 4. CONCLUSION AND RECOMMENDATIONS

The study concluded that the respondents were mostly male and in their productive age. Additionally, funds used for catfish production were obtained from informal sources such as personal savings and friends/relations. Also, major constraints to use of improved catfish production technologies include inadequate processing and storage facilities, disease infestation, high cost of feed, high cost of inputs,

inadequate funds, etc. The study recommends that financial institutions should ensure availability of credit facilities to enable catfish farmers make provision for improved processing and storage facilities in order to boost their productivity.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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