

# Awareness and Fish Farming Technologies usage among Fish Farmers in Nasarawa State, Nigeria

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**ABSTRACT**— The study assessed awareness and fish farming technologies usage among fish farmers in Nasarawa State, Nigeria. Random sampling technique was used to select ninety available fish farmers in Lafia and Keffi Local Government areas from the list of registered fish farmers obtained from Agricultural Development Project Headquarters in the State. Data were obtained through structured interview scheduled which were analyzed using frequency counts and percentages while Chi square and Pearson Product Moment Correlation (PPMC) was used to test level of significant relationship among the variables ( $p < 0.005$ ). The majority (76.7%) of the respondents was male; greater proportion (41.1%) was between 31-40 years of age, majority (60%) was married. For the education, majority (44.4%) had Tertiary education while 72.2% have fish farming as their primary occupation. However, 56.7% had contact with extension agents on quarterly basis. The majority of the respondents agreed that they were aware of most of the innovations available in fish farming; liming and fertilization of ponds (94.4%), water inlet and outlet devices (91.1%). Perceived benefits of innovations were expansion of fish farm size ( $\bar{x} = 3.82$ ) and reduction in fish mortality ( $\bar{x} = 3.63$ ). Major innovations used by fish farmers are fertilization of ponds (94.4%), inlet and outlet devices (91.1%). There is a significant relationship between awareness of fish farming technologies and usage among fish farmers ( $p < .0001$ ). The study concluded that awareness of fish farming technologies enhanced its usage among the fish farmers in the study area. Efforts at sustaining the level of usage recorded should be put in place.

**KEYWORDS:** Awareness, fish farmers, farming, innovation, perceive

## 1. INTRODUCTION

Semi-urban and urban communities have also become key players in the process of reducing the production deficit through fish farming. This becomes quite important considering the unemployment and underemployment rates as it can be used to engage the labour potential that is going to waste [4]. Success of a new innovation relies strongly on mechanisms of its dissemination. The effective transfer of technology is facilitated when knowledge, information, and skills pertaining to new technologies get transferred from its source of invention to a wide range of potential end users [3]. In what is essentially a communication process, knowledge gathering agencies (e.g., extension) bridge the gap between source of innovation (researchers) and end users (farmers). Some of the key approaches used by extension agents to promulgate technology transfer along with detailing their role in propagating useful technologies cannot be over emphasized. Contact with

extension personnel is a very important positive determinant of technology adoption as it counterbalances the negative effects arising from technology complexities [6], thus promoting innovation transfer. The traditional agricultural extension follows a linear approach wherein research results are extended to farms, leading to adoption and increased productivity. Fish farming has experienced spectacular growth in the past decades, during which continuous innovation has played a significant role, but it faces increasing criticism regarding its ecological and social sustainability practices and the resulting challenges for future innovation usage. Therefore the study aimed at investigating awareness and modern fish farming technologies usage among fish farmers in Nasarawa State, Nigeria. The Specific objectives were to:

(i) identify the socio-characteristics of the respondents (ii) examine the respondents' awareness of modern fish farming technologies, also (iii) determine respondents' perceived benefits of modern fish farming technologies and (iv) assess the usage of modern fish farming technologies among the respondents. The hypothesis tested is the relationship between the perceived benefits of modern fish farming technologies and usage among fish farmers ( $p < 0.000$ ).

## **2. MATERIALS AND METHODS**

### ***2.1 Study Area***

The study was carried out in Nasarawa State, Nigeria. Nasarawa is located between Latitude  $7^{\circ}$  and  $9^{\circ}$  N and Longitude  $7^{\circ}$  and  $10^{\circ}$  E. It is bounded in the North by Kaduna State, in the West by the Federal Capital Territory, in the South by Kogi and Benue States and in the East by Taraba and Plateau States. The State has 13 Local Government Areas with three Senatorial Districts (South, North and West) and a population of 1,869,377, with agriculture being the dominant occupation of the inhabitants [10].

### ***2.2 Sampling Techniques***

The list of registered fish farmers in Lafia and Keffi Local Government Areas was obtained from Agricultural Development Programme (ADP) Headquarters in Lafia. Random sampling technique was used to select sample size of ninety fish farmers (82%) out of one hundred and ten total population sizes. Sampling frame was drawn from the two Local Government Areas because they have the highest number of fish farmers and farms that are functional.

### ***Measurement of variables***

Research questionnaire was divided into sections thus:

Socio-economic characteristics: Fish farmers were asked to indicate through tick(v) sex as either male or female; age in years; marital status - single, married or widowed; any educational status applicable to them as 'no formal education', 'primary education', 'secondary education' or 'tertiary education'; fish farming experience in years; major occupation – fish farming or others; extension agent contacts with options as 'forth nightly', 'monthly', 'quarterly', 'never'.

Awareness of modern fish farming technologies and usage among fish farmers: The respondents were asked to indicate 'yes' or 'no' if they were aware and usage of 'floating feeds', 'soil testing before site selection', 'water test kit', 'liming and fertilization of ponds', 'inlet and outlet devices,' 'improved species of fish', 'feed formulation', 'aerated transporting containers', 'solar dryers', 'integrated fish farming'.

On perceived benefits of modern fish farming technologies usage, respondents ticked score on 5 point Linkert scale for each of the itemized benefits on 'expansion of fish farm', 'reduction in fish mortality', 'fish farm disease management', 'save cost on fingerling and juvenile purchase', 'proper water quality management', 'less dependent on improved feed', 'technical training'. Constraints to modern fish farming technologies usage by the respondents were established through their response of either 'Yes' or 'no'

### 2.3 Data analysis

Data were obtained from fish farmers with the aid of structured schedule interview which had relevant questions based on the objectives of the study. Data obtained were analyzed using frequency, percentage, mean score, Chi square analysis and Pearson Product Moment Correlation (PPMC) to test level of significant relationship among the variables ( $p < 0.005$ ).

## 3. RESULTS AND DISCUSSION

### 3.1 Socio-economic of the respondents

#### Sex

Table 1 indicated that the majority (76.7%) of the fish farmers are male while 23.3% were females. This in line with [16] that fisheries activities are mostly dominated by men. According to [5], closing the gender gap in fish farming and building the capacity of women for participation in fish farming is likely to boost the productivity of fish farming and generate gains in terms of lifting many households out of poverty and ensuring household food security, economic growth and social welfare.

#### Age

The highest age range between 31-40 years was 41.1%, the second age class of 21-30 years was 25.6% while the least age  $> 60$  years was 16.7%. Age is a factor through which farmers gain more experience and acquaintance with new technologies and are hence expected to have higher ability to use new technologies more efficiently. [14], reported majority of fish farmers were within the age bracket of 31-40 years. Age is usually considered to be a primary latent characteristic to adoption or use of innovations decisions [15].

#### Marital status

Marital status of respondents presented in Table 1 indicated that there was no even distribution of marital status of the respondents. Respondents that were married was 60.0%, single accounted for 37.8% and widow/widower 2.2%. Higher number of married respondents was an indication that marriage is highly cherished and has placed familial responsibilities on the fish farmers. It is therefore expected that the fish farmers are likely to use technologies that have the potential to increase their income in order to ensure the survival of their households. [13], attributed marriage to need for an extra income to meet family needs and the advantage of utilizing family labour to carryout activities required.

#### Educational level

Table 1 showed that a greater proportion of the respondents (44.4%) had acquired tertiary education, 26.7% acquired secondary education, 21.1% primary education and 7.8% no formal education respectively. It is widely believed that education creates a favorable mental attitude for the acceptance of new ideas and practices. It enable the farmers to seek for and utilize useful information both media and print therefore accelerating the rate of awareness and usage of innovations [15]. Many research studies have confirmed that education plays a vital role in the adoption process because it is easy to understand and getting required information by educated persons than the illiterate ones [9].

#### Fish farming experience

Majority (44.4%) of the fish farmer had 6-10 years experiences in fish farming, 32.2% with 1-5 years, 11-15 years recorded 13.3% and 16 and above years was 10.0% respectively. Fish farming experience is vital in management practices on the farm because it dictates or influences the usage of farming technologies.

#### Major occupation

Table 1 presented the major occupation of the respondents. The majority (72.7%) were majorly full time fish farmers while 27.8% were engaged in other businesses aside fish farming. Occupation remains valid in our

society as people are engaged in one or two businesses which gave them a sense of satisfaction and belonging in the society [15].

#### Extension agent contact

Extension agents visited the respondents (Table 1) 56.7% quarterly, 10.0% monthly, 4.4% forth nightly while 28.9% had to extension agent contact. The result implied that on overall assessment majority of the fish farmers had contact with extension agents though the frequency varies. The result is at variance with [1]. who reported that Majority of the fish farmers had no contact at all with agents [12].

**Table 1:** Socio-economic characteristics of the respondents

<b>Socio economic characteristics</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Sex</b>		
Male	69	76.7
Female	21	23.3
<b>Age (years)</b>		
20 – 30	23	25.6
31 – 40	37	41.1
41 – 50	15	16.7
51 – 60	15	16.7
<b>Marital status</b>		
Single	34	37.8
Married	54	60.0
Widowed	2	2.2
<b>Educational status</b>		
No formal education	7	7.8
Primary education	19	21.1
Secondary education	24	26.7
Tertiary education	40	44.4
<b>Fish farming Experience (years)</b>		
1 – 5	29	32.2
6 – 10	40	44.4
11 – 15	12	13.3
>16	9	10.0
<b>Major occupation</b>		
Fish farming	65	72.2
Fish farming and others	25	27.8
<b>Extension agent contact</b>		
Forth nightly	4	4.4
Monthly	9	10.0
Quarterly	51	56.7
Never	26	28.9

### 3.2 Awareness of modern fish farming technologies among fish farmers

Results on fish farmers' awareness of modern fish farming technologies are presented in Table 2. It showed that the majority of fish farmers were aware of inlet and outlet devices (92.2%), liming and fertilization of ponds (94.4%), improved species of fish (86.7%) integrated fish farming (88.9%), floating feed (87.8%), feed formulation (75.6%), water test kit (71.0%) and aerated transporting containers (63.3%). This implies that all of fish farmers in the study area had knowledge of all the modern fish farming technologies used to improve the fish farming conditions of their farms. So, it could be suggested that there is a high level of modern fish farming technologies among the sampled fish farmers. [9], affirmed that the level of awareness and usage on water for fish culture and soil testing techniques for pond construction are good for obtaining disease free fish with very high yield from ponds resulting in maximum profit.

**Table 2:** Awareness of modern fish farming technologies among fish farmers

<b>Innovations</b>	<b>Yes</b>	<b>%</b>
Floating feeds	79	87.8
Soil testing before site selection	51	56.7
Water test kit	64	71.0
Liming and fertilization of ponds	85	94.4
Inlet and outlet devices	83	92.2
Improved species of fish	78	86.7
Feed formulation	68	75.6
Aerated transporting containers	57	63.3
Solar dryers	55	61.1
Integrated fish farming	80	88.9

### 3.3 Usage of modern fish farming technologies by the fish farmers

Table 3 indicated liming and fertilization of ponds (91.1%), inlet and outlet devices (91.1%), floating feeds (85.6%), improved breed of fingerlings (81.1%), while soil testing before site selection was the least (51.1%). [6], the usage of fish farming technologies by farmers is dependants on its cost, readily availability and ease of utilization. Decision to adopt any technology can sometimes be complex, and the fish farmers must consider wide options of factors to arrive at the best which will put the farmer at an advantage [7]. Usage as the integration of technology into fish farmers' normal farming operation is not a permanent behavior of the farmers sometimes if the perceived result is not achieved this is the more reason for awareness. [1], reported that educational attainment of fish farmers suggests usage of technologies and it can be accelerated since level of education is known to be influential in usage decision of farmers.

**Table 3:** Usage of modern fish farming technologies by the fish farmers

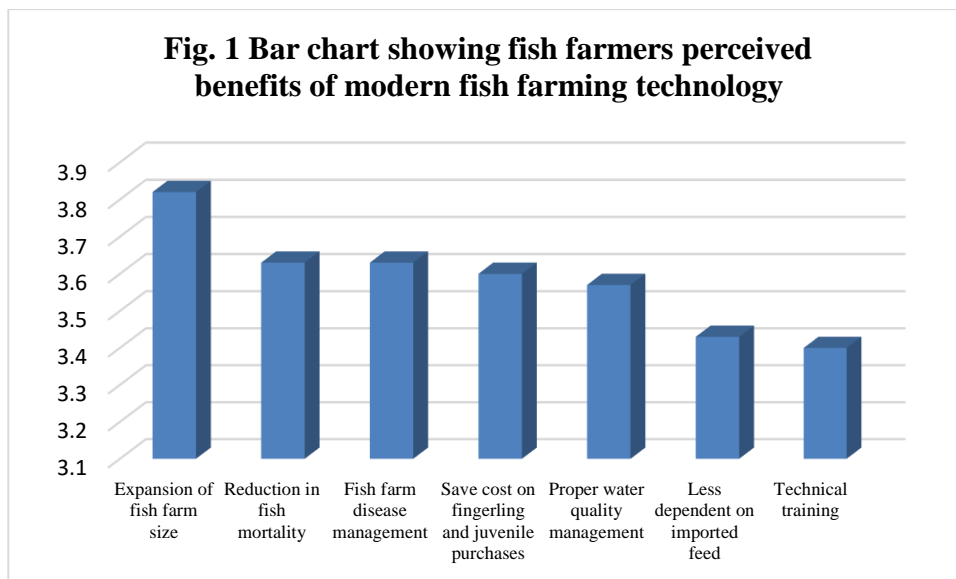
<b>Fish farming innovation</b>	<b>Yes</b>	<b>%</b>
Floating feeds	77	85.6
Soil testing before site selection	46	51.1
Water test kit	58	64.0
Liming and fertilization of ponds	82	91.1
Inlet and outlet devices	82	91.1
Improved species of fish	73	81.1
Feed formulation	54	60.0
Aerated transporting containers	57	63.3
Solar dryers	42	46.7
Integrated fish farming	58	64.4

Source: Field survey 2021

### 3.4 Perceived benefits of modern fish farming technologies usage

Majority of fish farmers were in agreement with all the statements on perceived benefits of modern fish farming technologies considering the weighted mean as shown in Fig.1. It indicated that the use of modern fish farming technologies led to expansion of fish farm size ( $\bar{x} = 3.82$ ), reduction in fish mortality ( $\bar{x} = 3.63$ ), fish farm disease management ( $\bar{x} = 3.63$ ), save cost on fingerlings, juvenile purchases ( $\bar{x} = 3.60$ ); and proper water quality management ( $\bar{x} = 3.57$ ). It implies that analyzing how modern fish farming technologies has been perceived by the end users who are the fish farmers will not only identify research gaps, but also inform future technology management models to support aquaculture growth and contribute to global food system sustainability. Fish farmers may not utilize technology if they lack understanding of its benefits. This confirms with the opinion of [8] that technologies have enabled the growth of fish farming business sector within a broad spectrum of production systems. According to [7], technologies dissemination such as fish breeding of

commercially important species, diseases management, improved feeds and feeding have accelerated fish farming expansion



**3.5 Constraints to adoption of modern fish farming technologies by fish farmers**

Table 4 indicated that high cost of feed (91.1%), inadequate capital (81.1%), high cost of land acquisition (63.3%) water scarcity (64.4%), high cost of establishing commercial hatchery (75.6%), poor extension service delivery (57.8%), insecurity of farm /theft (53.3%), poor transportation facilities (67.8%), poor marketing structure (66.7%) and disease outbreak (66.7%) were the constraints facing the usage of modern fish farming technologies in the study area. Despite the potential market and growing awareness of fish farming there is obvious limitation of knowledge of many improved technologies that would have helped boost output and increase practitioners' revenue from their production [11].

**Table 4:** Constraints to modern fish farming technologies usage by fish farmers

Variables	Yes	%
Inadequate capital	73	81.1
High cost of land acquisition	57	63.3
Water scarcity	58	64.4
High cost of feed	82	91.1
High cost of establishing	68	75.6
Poor extension service delivery	52	57.8
Insecurity of farm/theft	48	53.3
Poor marketing structure	60	66.7
Scarcity of labour	44	48.9
Poor transportation facilities	61	67.8
Diseases outbreak	56	62.2
Poor managerial skill	42	46.7

Source; field survey 2021

**3.6 Relationship between the socio-economic characteristics of the respondents and awareness on fish farming technologies**

Table 5 showed that there was a significant association between the demographic characteristics of the respondents (educational status  $P < 0.004$  and major occupation  $P < 0.011$ ) and awareness on fish farming



innovation in the study area. The implication is that the higher the educational status of the respondents the more exposed or enlightened they are about awareness on fish farming technologies meaning more information on fish farming technologies are easier for them to get. Also respondents whose major occupation is fish farming have no divided attention rather focused on means of getting information on fish farming technologies. Hence, awareness on fish farming technologies was influenced by the educational status and major occupation of the respondents in the study. It implies that depict the availability of appropriate fish farming technologies, some personal factors determine whether or not farmers would be aware or not.

**Table 5:** Relationship between the socio-economic characteristics of the respondents and awareness on fish farming technologies

Demographic characteristics	Chi-square value	Contingency co-efficient	Correlation	P-value	Remarks
Sex	.131	.038	.038	.717	Not sig.
Age	2.624	.168	-.021	.453	Not sig.
Marital status	3.533	.194	-.076	.171	Not sig.
Educational attainment	13.491	.361	.272	.004*	Sig.
Fish farming experience	2.069	.150	.059	.558	Not sig.
Major occupation	8.961	.301	.026	.011*	Sig.

\* Sig. P< 0.05 level

### 3.7 Relationship between the perceived benefits of modern fish farming technology and the usage among the fish farmers

Table 6 showed that there is no significant relationship between the perceived benefit of modern fish farming technology and the usage among the fish farmers ( $X^2$ -Crit=3.81,  $\chi^2$ -value =0.051,  $p>.05$ ). Hence, the perceived benefits of modern fish farming technology do not influence its usage among the respondents in the study. **Table 5** Chi-square analysis showing the relationship between the perceived benefits of modern fish farming technology and the usage among the fish farmers

Perceived benefits of modern fish farming technology	Usage of modern fish farming technology		Total	Contingency coefficient	$\chi^2$ - value	df	P-value
	Low	High					
Low	1 2.6%	1 1.9%	2 2.2%	0.024	0.051	1	.822
High	37 97.4%	51 98.1%	88 97.8%				
Total	38 100.0%	52 100.0%	90 100.0%				

## 4. CONCLUSION AND RECOMMENDATIONS

The study found that most of the fish farmers were, male, married, had tertiary education, majority had over ten years fish farming experience, majorly fish farming as their occupation and many had previous contact with extension agents. Respondents were aware and used all the fish farming technologies available to them. It was concluded that the use of modern fish farming technologies has had positive effect on fish farming business. It is recommended that other non conventional feeding methods should be introduced to the fish famers to reduce cost of feeding fish and that Government at all levels should assist fish farmers with capital in form of loan which can be easily assessable to the fish farmers. More fish farming innovations should be introduced to the fish farmers by researchers through the Extension agents. Also efforts at sustaining the level

of usage recorded in this study should be put in place while intervention programmes should be implemented to increase the level of introduced technologies and awareness for maximum productivity of the sector in the Nigerian's economy.

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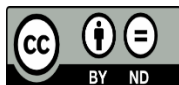
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