

Assessment of Attitude of Artisanal Fish Farmers Towards the Utilization of Hatchery Production Technologies in Ondo State, Nigeria

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ABSTRACT

The study assessed the attitude of artisanal fish farmers towards hatchery production technologies in Ondo State, Nigeria. A structured questionnaire was used to collect data from 90 respondents, selected through a multi-stage sampling procedure. Data analysis involved frequency counts, percentages, and correlation analysis. Findings revealed that 71.1% of respondents were male, while 51.1% were under 40 years old, with a mean age of 43 years. Most farmers (81.2%) had 1–5 years of experience, with an average of five years. The study found that the utilization of hatchery production technologies was relatively high, possibly due to high educational attainment among farmers. Correlation analysis indicated significant relationships between technology utilization and socio-economic factors such as age ($P=0.000$), sex ($P=0.002$), marital status ($P=0.023$), religion ($P=0.001$), years of experience ($P=0.000$), income ($P=0.000$), and farm size ($P=0.000$). These factors significantly influenced technology adoption. The study concluded that respondents had a favorable attitude toward hatchery technologies. It recommended reintroducing and popularizing underutilized technologies among fish farmers. Regular training and empowerment programs should be implemented to enhance adoption rates. Additionally, environmental pollution in the study area should be effectively managed to improve hatchery productivity and sustainability.

Keyword: Artisanal, Fish Farmers, Hatchery, Production, Technologies.

1.0 INTRODUCTION

In Nigeria, the role of fish farming in achieving household and national food security, as well as poverty alleviation, cannot be overstated. Fish farming, an artificial method of raising fish for human consumption, is an ancient practice that continues to offer a profitable means of livelihood for both rural and urban dwellers. As the principal form of aquaculture, fish farming involves raising fish commercially in tanks or enclosures, primarily for food. Fish is a popular source of protein and white meat throughout Nigeria. It is highly nutritious, providing a rich source of high-quality protein and essential nutrients, which are particularly important for mothers and growing children. Fish is low in calories and cholesterol, while being rich in protein (Food and Agriculture Organisation, 2023).

Aquaculture plays a vital role in the nation's economic development, especially at a time when the government is seeking ways to diversify the economy beyond oil dependence. It is a potential contributor to the nation's food security, both directly, by producing fish for food, and indirectly, by generating employment for the large unemployed population. Furthermore, it can save foreign exchange and generate revenue through the export of fish and fish products. Fish provides 19% of the protein in

most developing countries, contributing up to 180 calories per capita per day (FAO, 2023). In Nigeria, fish is one of the main sources of animal protein, obtained through captured fisheries, fish aquaculture, or the importation of frozen fish (Akinrotimi *et al.*, 2019). In captured fisheries, wild fish are sourced from naturally occurring stocks. Small-scale or artisanal fishermen, as well as industrial fishers, carry out this process. Production in artisanal fisheries is typically achieved by individuals or small groups using labor-intensive methods (Cliffe *et al.*, 2021). Artisanal fishers are known for using dugout and wooden boats, often motorized. Currently, artisanal fishermen dominate fish production in Nigeria (Anene *et al.*, 2010). However, due to limited knowledge about the technology required to enhance fish output, aquaculture development has been slow in several regions of the country (Akinrotimi *et al.*, 2019).

Access to accurate and adequate information on fish production technologies is essential for increasing fish production. Such information must come from credible sources, be delivered at the right time, and be usable by farmers. The information required by farmers spans a range of areas, including pond construction and management, hatchery operations, spawning, sorting, harvesting, processing, storage, marketing, and record-

keeping (Ofuoku *et al.*, 2021). Most Nigerian fish farmers use relatively simple technologies, often involving small adjustments to improve growth and survival rates, such as better food, seeds, oxygen levels, and protection from predators. However, hatchery technology has been largely neglected (Amali and Solomon, 2022).

Njoku (2020) identified improved aquaculture technologies as processes involved in establishing a fish farm, which include water quality management, soil topography, pond use, stocking techniques, improved fish species, pond construction, and overall pond management. Ogbonna (2021) revealed that many fish farmers in Nigeria earn higher incomes from fish production than from other agricultural enterprises, underscoring the great potential of fish farming in contributing to food security, income generation, poverty reduction, and the socio-economic growth of Nigeria. However, fish production in Nigeria faces several challenges, including adverse climate change, poor technology adoption, and various shocks that lead to reduced fish output. As a result, fish farmers adopt different farming technologies to exploit potential advantages.

The need to increase fish production in Nigeria has become even more pressing due to the high cost of beef (Fagade and Olaniyan, 2022). Fisheries are crucial to Nigeria's agricultural economy because they provide employment and income for fish farmers (Njoku, 2020). Unfortunately, the aquaculture production system in Nigeria is not ideal, as a large proportion of output is controlled by smallholder farmers, with average pond sizes of just 1-3 ponds (Nlewadim *et al.*, 2014). Access to improved aquaculture technologies remains limited, and the general conditions do not encourage substantial investment in capital inputs or labour (Deji and Koledoye, 2019). Moreover, there is limited application of new biotechnologies, with most farmers still relying on wild stocks from capture fisheries. Advanced biotechnology-linked resources are needed to develop selective breeding programs and realize the economic benefits of fish farming (Madji and Rachel, 2019).

Diverse training programs on new aquaculture technologies have recently been held in Nigeria to address these issues, but there has been less focus on evaluating the extent of adoption and the challenges farmers face in the production process. In recent decades, a number of new fish farming technologies have been developed and made available to farmers across the country. With effective dissemination, adoption, and transfer of these technologies, it is anticipated that the

aquaculture sector in Nigeria will undergo significant change (Akinrotimi *et al.*, 2021). The aim of these technologies is to streamline processes and enhance productivity. Therefore, it is essential to assess the extent to which these technologies have been transferred and adopted. This study, therefore, evaluates the attitudes of artisanal fish farmers toward the use of hatchery technologies in Ondo State, Nigeria.

In Nigeria, most fish production comes from artisanal fisheries, though there is growing awareness of the potential of fish farming. Unfortunately, despite this growing awareness, many farmers continue to operate extensive fish culture systems in their ponds, where fish are left to forage for their own food. These systems often neglect the health of the fish, water quality, and nutrition. To address these issues, the government has made concerted efforts to introduce improved technologies, especially in the area of hatchery management, to enhance production levels. Access to these improved technologies is crucial for increasing fish production, and they must come from reliable sources, be delivered at the right time, and be correctly utilized by farmers. However, despite the availability of such information, Adereti *et al.* (2020) noted that these technologies have not been fully utilized, contributing to the ongoing fish supply shortage in the country.

1.1 Research Questions

The study was guided by the following research questions:

- i. What are the personal characteristics of the respondents in the study areas?
- ii. What is the attitude of artisanal fish farmers toward the utilization of hatchery production technologies in the study area?
- iii. What are the sources of information on these hatchery production technologies among artisanal fish farmers in the study area?
- iv. What is the level of awareness of these hatchery production technologies among artisanal fish farmers in the study area?
- v. What is the level of utilization of these hatchery production technologies among artisanal fish farmers in the study area?
- vi. What problems are encountered by these respondents in the study area?

1.2 Research Hypothesis

The hypothesis is presented in the null form:

H₀: There is no significant relationship between the socio-economic characteristics of respondents and their attitude toward the utilization of hatchery production technologies in the study area.

2.0 RESEARCH METHODOLOGY

2.1 Study Area

This study was carried out in Ondo State, which served as the case study. Ondo State shares boundaries with Osun and Ogun States to the west, while Ekiti and Kogi States border it to the north. The study relied on primary data, which was collected through a well-structured questionnaire and an interview schedule. The target population comprised all artisanal fish farmers in the state.

A multi-stage sampling technique was employed to select three senatorial districts within Ondo State—Ondo Central, Ondo North, and Ondo South. One local government area (LGA) was chosen from each senatorial district based on their fish production volume. The selected LGAs included Ondo West, Owo, and Igbokoda. From each LGA, 30 fish pond owners were purposively selected, resulting in a total of 90 respondents.

Data was gathered using structured questionnaires, and descriptive statistics such as frequency counts and percentages were utilized to analyze socio-economic variables. Chi-square and linear regression analyses were applied to test the study's hypotheses. The attitudes of artisanal fish farmers towards hatchery production technologies were assessed using a 5-point Likert scale: Strongly Agree (5), Agree (4), Undecided (3), Disagree (2), and Strongly Disagree (1). Additionally, the awareness level of hatchery production technologies was measured using a 4-point rating scale: Highly Aware (4), Moderately Aware (3), Fairly Aware (2), and Not Aware (1). Similarly, utilization levels of these technologies were evaluated on a 4-point scale: Highly Utilized (4), Moderately Utilized (3), Fairly Utilized (2), and Not Utilized (1).

3.0 RESULTS AND DISCUSSION

3.1 Socio-Economic Characteristics

This section provides a descriptive analysis of the respondents' socio-economic characteristics (Table 1). According to Table 1, 51.1% of the respondents were below 40 years of age, 7.8% were aged between 41 and 50, 35.5% were between 51 and 60 years old, while 5.5% were 61 years and above. The average age of the respondents was 43 years, indicating that most were young and in their active years, capable of handling the physical demands of farming. This finding aligns with Opiyo et al., (2017), who noted that men, being more energetic, tend to dominate agricultural activities in

Nigeria. The table also showed that 71.1% of the respondents were male, while 28.9% were female. Although both genders participated in fish farming, male respondents dominated the industry, suggesting that farming is more commonly pursued by men.

The distribution of respondents based on marital status revealed that 44.4% were single, 45.6% were married, and 10.0% were divorced. Marital status plays a crucial role in farming activities, as family members can assist in the production process, particularly in providing labor. Regarding educational attainment, 6.7% of the respondents had no formal education, 14.4% had adult education, 7.8% completed primary school, 20.0% attained secondary education, while 51.1% had tertiary education. This indicates a high literacy rate among the respondents. Education is a key socio-economic factor influencing farmers' awareness, perception, and adoption of innovations that can enhance productivity.

This study found that 73.3% of the respondents were Christians, while 26.7% were Muslims, indicating that Christianity was the predominant religion among the fish farmers. As presented in Table 1, 81.2% of respondents had between 1 and 5 years of farming experience, 6.7% had 6 to 10 years, and 12.2% had been farming for 11 to 15 years. The average farming experience was five years. Farming experience is often linked to access to capital, age, and willingness to adopt new technologies (Ibitoye & Onimisi, 2023). Household size is an essential factor in agricultural production, particularly in labor supply. The study revealed that 63.3% of respondents had household sizes of 1-5 members, 34.4% had 6-10 members, while only 2.2% had more than 10 members. The mean household size was three, indicating a relatively small household size among the respondents.

Table 1 further shows that 45.6% of respondents earned between ₦26,000 and ₦50,000 per month, while 54.4% earned between ₦51,000 and ₦100,000. The average monthly income was ₦52,300, indicating that most respondents earned above the minimum wage. This suggests that adopting modern agricultural technologies contributes to improved farm productivity and income levels. The analysis showed that 44.4% of respondents owned farms ranging from 1 to 3 hectares, 33.4% had farms between 4 and 5 hectares, while 22.2% cultivated more than 5 hectares. The average farm size was 3 hectares. The preference for larger farmland was likely due to the availability of fertile land, which enhances productivity and revenue generation.

Table 1: Distribution of respondents by their gender, age, religion, marital status, household size, Years of Farming Experience, Educational Attainment, Monthly Income and Farm Size

n= 90

Variables	Frequency	Percentage	Mean	Standard Deviation
Gender				
Male	64	71.1		
Female	26	28.9		
Age (years)				
Less than 40	46	51.1	43.11	19.69
41 – 50	7	7.8		
51 – 60	32	35.5		
61 & above	5	5.5		
Religion				
Christianity	66	73.3		
Islam	24	26.7		
Marital status				
Single	40	44.4		
Married	41	45.6		
Divorced	9	10.0		
Household size				
1-5	57	63.3	3.04	1.21
6-10	31	34.4		
10 above	2	2.2		
Years of Farming Experience				
1 – 5 years	73	81.2	5.01	2.42
6 – 10 years	6	6.7		
11 - 15 years	11	12.2		
16year and above	0	0		
Educational Attainment				
No formal Education	6	6.7		
Adult Education	13	14.4		
Primary Education	7	7.8		
Secondary Education	18	20.0		
Tertiary Education	46	51.1		
Monthly Income				
Less than ₦25,000	0	0.0	52,300	21,700
₦26,000 – ₦50,000	41	45.6		
₦51,000 - ₦100,000	49	54.4		
Above ₦100,000	0	0.0		
Farm Size				
Less than 1 hectare	0	0	3.01	1.21
1 – 3 hectares	40	44.5		
4 – 5 hectares	30	33.4		
Above 5 hectares	20	22.2		

Source: Field Survey, 2024

3.2 Attitude of Artisanal Fish Farmers Towards the Utilization of Hatchery Production Technologies in the Study Area

The study examined the attitude of artisanal fish farmers towards adopting hatchery production technologies in the study area. Findings (as presented in Table 2) revealed an overall positive perception, as indicated by the grand mean score of 3.47. The results showed that respondents strongly agreed that the proper utilization of hatchery technology has significantly improved farming activities ($\bar{x} = 4.70$). They also acknowledged that improved hatchery technology saves time ($\bar{x} = 4.41$) and requires a

high labour input ($\bar{x} = 4.40$). Additionally, many farmers believed that using hatchery technology has contributed to increased profits ($\bar{x} = 4.10$). Furthermore, respondents agreed that hatchery technologies are not always culturally suitable ($\bar{x} = 3.91$) but acknowledged that a better environment in hatchery production has led to higher yields ($\bar{x} = 3.59$). Some farmers found the technology to be complex ($\bar{x} = 3.59$) but believed that it has not been significantly affected by climate change ($\bar{x} = 3.09$).

However, there were areas where respondents remained undecided. Some were unsure whether the lack of capital for setting up hatchery technology had impacted yield ($\bar{x} = 2.87$), while others were uncertain about whether poor transportation networks affected services ($\bar{x} = 2.79$). Additionally, some farmers were unsure whether their investment in hatchery technology had been profitable ($\bar{x} = 2.68$) or if it had led to an increase in labor ($\bar{x} = 2.53$). The marketing of fingerlings under hatchery production technology was also met with uncertainty, as respondents

did not find it particularly encouraging ($\bar{x} = 2.46$). In all, this study suggests that artisanal fish farmers generally have a favourable attitude towards hatchery production technologies, particularly in terms of their efficiency, profitability, and ability to enhance farming activities. However, concerns persist regarding the complexity of the technology, cultural suitability, and challenges related to capital investment and marketing.

Table 2: Distribution of respondents by their attitude towards the utilization of hatchery production technologies in the study area

Items	SA		A		U		D		SD		Mean	Decision
	(F)	(%)	(F)	(%)	(F)	(%)	(F)	(%)	(F)	(%)		
Proper utilization of hatchery technology have improved farming activities.	63	70.0	27	30.0	0	0	0	0	0	0	4.70	Strongly Agree
Improve hatchery technology save time.	48	53.3	31	34.4	11	12.2	0	0	0	0	4.41	Strongly Agree
Hatchery technology have high labour requirement.	36	40.0	54	60.0	0	0	0	0	0	0	4.40	Strongly Agree
Utilization of hatchery technology has increased my profit.	18	20.0	63	70.0	9	10.0	0	0	0	0	4.10	Strongly Agree
Hatchery technology are not culturally suitable.	21	23.3	51	56.7	7	7.8	11	12.2	0	0	3.91	Agree
Better environment in hatchery production technologies have created more yield.	14	15.6	56	62.2	0	0	9	10.0	11	12.2	3.59	Agree
Improve hatchery technology are too complex for my liking.	20	22.2	37	41.1	21	23.3	0	0	12	13.3	3.59	Agree
Hatchery technology has not being affected by climate change.	9	10.0	32	35.6	18	20.0	20	22.2	11	12.2	3.09	Agree
Lack of capital to setting up hatchery technology has not affected the yield.	11	12.2	18	20.0	9	10.0	52	57.8	0	0	2.87	Undecided
Poor Transportation network does not affect services.	0	0	11	12.2	49	54.4	30	33.3	0	0	2.79	Undecided
Investment in hatchery technology has not paid off at all.	19	21.1	0	0	13	14.4	49	54.4	9	10.0	2.68	Undecided
Investment in hatchery technology has not increase our labour.	12	13.3	7	7.8	9	10.0	51	56.7	11	12.2	2.53	Undecided
Marketing of fingerling under this hatchery production technology has not being encouraging.	20	22.2	13	14.4	0	0	12	13.3	45	50.0	2.46	Undecided

Source: Field Survey, 2024

SA=Strongly Agree, A=Agree, U=Undecided, SD = Strongly Disagree, D= Disagree, (%); M= mean, < Grand Mean = 3.47; Rating scale = SA= 5.00-4.00, A = 3.99-3.00, U = 2.99-2.00, D= 1.99-1.00, SD= 0.99-0.00

3.3 Sources of Information on these Hatchery Production Technologies Among Artisanal Fish Farmers in the Study Area

Table 3 below presents the various sources of information on hatchery production technologies among artisanal fish farmers in the study area. The table revealed that 44.4% of the respondents obtained information through television and radio, while 66.7% relied on fellow fish farmers. Additionally, 24.4% accessed information from print media, 76.7% from agricultural extension agents, and 80.0% from private consultants. The Internet also served as a major source of information, with 80.0% of respondents utilizing it. These results suggest that the farmers' educational background played a crucial role in their ability to access and utilize multiple information sources. Their capacity to hire private consultants indicates a commitment to improving production efficiency and adopting modern hatchery technologies to enhance productivity (Adereti *et al.*, 2020).

Table 3: Distribution of respondents by sources of information on these hatchery production technologies among artisanal fish farmers in the study area

Sources	Frequency (F)	Percentage (%)
Television and radio	40	44.4
Fellow fish farmer	60	66.7
Print Media	22	24.4
Agric extension agents	69	76.7
Private consultant	72	80.0
Internet	72	80.0

Source: Field survey, 2024

Multiple responses

3.4 Level of Awareness of These Hatchery Production Technologies Among Artisanal Fish Farmers in the Study Area

This study reveals the level of awareness of hatchery production technologies among artisanal fish farmers in Table 4. The findings indicate that respondents were highly aware of several key hatchery practices. The highest-ranked practices, with a mean score of 3.80, included frequent water changes, regular sampling and sorting of fish, and the use of water testing kits for oxygen levels. Following closely, good storage techniques ranked 4th with a mean score of 3.68, while optimum stocking rates and integrated fish farming for fish production both ranked 5th with a mean score of 3.67. Additionally, respondents demonstrated high awareness of daily sanitation ($\bar{x} = 3.56$, ranked 7th) and aerating containers for transporting fingerlings to reduce stress ($\bar{x} = 3.54$, ranked 8th).

On the other hand, respondents exhibited moderate awareness of other hatchery technologies. Improving water quality ranked 9th ($\bar{x} = 3.48$), followed by fertilization and liming of fish ponds ($\bar{x} = 3.46$, ranked 10th). Awareness of the provision of inlet and outlet devices in ponds ranked 11th ($\bar{x} = 3.44$), while standard feeding regimes ranked 12th ($\bar{x} = 3.36$). Similarly, improved feed for fingerlings and soil testing before site selection both ranked 13th with a mean score of 3.33. The use of floating feed ranked lowest at 15th with a mean score of 3.21. These results suggest that while artisanal fish farmers are well-informed about fundamental hatchery practices, there is room for improvement in their awareness of advanced techniques, particularly those related to water quality management, feeding regimes, and site preparation (Ogbonna, 2021).

Table 4: Distribution of respondents by level of awareness of these hatchery production technologies among artisanal fish farmers in the study area

Items	HA		MA		FA		NA		Mean	Rank	Remarks
	(F)	(%)	(F)	(%)	(F)	(%)	(F)	(%)			
Frequent change of water	72	80.0	18	20.0	0	0	0	0	3.80	1 st	Highly Aware
Regular sampling/sorting of fish	72	80.0	18	20.0	0	0	0	0	3.80	1 st	Highly Aware
Water testing kit for oxygen	72	80.0	18	20.0	0	0	0	0	3.80	1 st	Highly Aware
Good storage technique	61	67.8	29	32.2	0	0	0	0	3.68	4 th	Highly Aware
Optimum stocking rate	60	66.7	30	33.3	0	0	0	0	3.67	5 th	Highly Aware
Integrated fish farming for fish production	60	66.7	30	33.3	0	0	0	0	3.67	5 th	Highly Aware
Daily sanitation	61	67.8	18	20.0	11	12.2	0	0	3.56	7 th	Highly Aware



IJS GS FUGUSAU VOL. 11(2)										WEBSITE: https://fugus-ijsgs.com.ng	
Aerating countenance for transporting fingerlings to reduce stress	49	54.4	41	45.6	0	0	0	0	3.54	8 th	Highly Aware
Improving water quality	52	57.8	29	32.2	9	10.0	0	0	3.48	9 th	Moderately Aware
Fertilization and liming of fish pond	41	45.6	49	54.4	0	0	0	0	3.46	10 th	Moderately Aware
Provision of inlet and outlet devices in pond	40	44.4	50	55.6	0	0	0	0	3.44	11 th	Moderately Aware
Standard feeding Regime	41	45.6	40	44.4	9	10.0	0	0	3.36	12 th	Moderately Aware
Improved feed of fingerlings	41	45.6	38	42.2	11	12.2	0	0	3.33	13 th	Moderately Aware
Soil testing before site selection	41	45.6	38	42.2	11	12.2	0	0	3.33	13 th	Moderately Aware
Use of Floating feed	40	44.4	29	32.2	21	23.3	0	0	3.21	15 th	Moderately Aware

Source: Field Survey, 2024

HA=Highly Aware, MA=Moderately Aware, FA=Fairly Aware, NA = Not Aware, (%) M= mean, < Grand Mean = 3.54

Key for Decision = HA =3.5-4.4; MA= 2.5-3.4; FA = 1.6-2.4; NA= <1.5

3.5 Level of Utilization of these Hatchery Production Technologies Among Artisanal Fish Farmers in the Study Area

Table 5 presents the level of utilization of hatchery production technologies among artisanal fish farmers in the study area. The findings indicate that respondents highly utilized several hatchery technologies. Soil testing before site selection and frequent water changes ranked 1st, both with a mean score of 3.81. Other widely adopted practices included improving water quality, standard feeding regimes, improved feed for fingerlings, fertilization and liming of fish ponds, regular sampling and sorting of fish, and the use of water testing kits for oxygen levels, all of which ranked 3rd with a mean score of 3.69. Additionally, respondents demonstrated significant utilization of daily sanitation and integrated

fish farming for fish production, both ranked 9th with a mean score of 3.57. The use of floating feed and aerating containers for transporting fingerlings to reduce stress were also highly utilized, ranking 11th with a mean score of 3.54. On the other hand, certain hatchery technologies were moderately utilized. The provision of inlet and outlet devices in ponds ranked 13th ($\bar{x} = 3.43$), while good storage techniques ranked 14th ($\bar{x} = 3.42$). The optimum stocking rate ranked the lowest at 15th with a mean score of 3.31. These findings suggest that while artisanal fish farmers actively implement many hatchery production technologies, there is still room for improvement in areas such as pond infrastructure, storage techniques, and stocking rate optimization (Deji and Koledoye, 2019).

Table 5: Distribution of respondents by level of utilization of these hatchery production technologies among artisanal fish farmers in the study area

Items	HU		MU		FU		NU		Mean	Rank	Remarks
	(F)	(%)	(F)	(%)	(F)	(%)	(F)	(%)			
Soil testing before site selection	73	81.1	17	18.9	0	0	0	0	3.81	1 st	Highly Utilized
Frequent change of water	73	81.1	17	18.9	0	0	0	0	3.81	1 st	Highly Utilized
Improving water quality	62	68.9	28	31.1	0	0	0	0	3.69	3 rd	Highly Utilized
Standard feeding Regime	62	68.9	28	31.1	0	0	0	0	3.69	3 rd	Highly Utilized
Improved feed of fingerlings	62	68.9	28	31.1	0	0	0	0	3.69	3 rd	Highly Utilized
Fertilization and liming of fish pond	62	68.9	28	31.1	0	0	0	0	3.69	3 rd	Highly Utilized
Regular sampling/sorting of fish	62	68.9	28	31.1	0	0	0	0	3.69	3 rd	Highly Utilized
Water testing kit for oxygen	62	68.9	28	31.1	0	0	0	0	3.69	3 rd	Highly Utilized



IJS GS FUGUSAU VOL. 11(2)							WEBSITE: https://fugus-ijsgs.com.ng				
Daily sanitation	62	68.9	17	18.9	11	12.2	0	0	3.57	9 th	Highly Utilized
Integrated fish farming for fish production	62	68.9	17	18.9	11	12.2	0	0	3.57	9 th	Highly Utilized
Aerating countenance for transporting fingerlings to reduce stress	61	67.8	17	18.9	12	13.3	0	0	3.54	11 th	Highly Utilized
Use of Floating feed	61	67.8	17	18.9	12	13.3	0	0	3.54	11 th	Highly Utilized
Provision of inlet and outlet devices in pond	50	55.6	29	32.2	11	12.2	0	0	3.43	13 th	Moderately Utilized
Good storage technique	50	55.6	28	31.1	12	13.3	0	0	3.42	14 th	Moderately Utilized
Optimum stocking rate	50	55.6	29	32.2	0	0	11	12.2	3.31	15 th	Moderately Utilized

Source: Field Survey, 2024

HU=Highly Utilized, MU=Moderately Utilized, FU=Fairly Utilized, NU = Not Utilized, (%) M= mean, < Grand Mean = 3.36
Key for Decision = HU =3.5-4.4; MU= 2.5-3.4; FU = 1.6-2.4; NU= <1.5

3.6 Problems Encountered by these Respondents in the Study Area

This study identified various challenges faced by artisanal fish farmers in the study area. The findings as presented in Table 6 revealed that the most significant problems included high cost of inputs and poor-quality fingerlings, both cited by 87.8% of respondents. Additionally, 84.4% of respondents highlighted the lack of good storage facilities, while 80.8% pointed to limited access to credit facilities as a major constraint. Market uncertainty was another prevalent issue, affecting 66.7% of respondents, whereas high land rent and costly labor were reported by 53.3% and 47.8% of respondents, respectively. A significant proportion (74.4%) of respondents also identified theft as a challenge, while

71.1% reported difficulties due to changing weather conditions.

Further challenges included lack of adequate technical knowledge on improved hatchery production technologies (58.9%), poor access to good roads for transportation (57.8%), and the complex nature of hatchery technologies (50.0%). Additionally, 27.8% of respondents cited the high cost of hatching materials as a limiting factor. These findings suggest that addressing financial constraints, improving infrastructure, enhancing technical training, and ensuring access to quality inputs could significantly improve fish farming operations in the study area.

Table 6: Distribution of respondents by problems encountered in the study area

Items	Frequency (F)	Percentage (%)
High land rent	48	53.3
Costly labour	43	47.8
High cost of inputs	79	87.8
Quality of fingerlings	79	87.8
Market uncertainty	60	66.7
Limited credit facilities	72	80.8
Lack of adequate technical know-how on improved hatchery production technologies	53	58.9
High cost of hatching material	25	27.8
Theft	67	74.4
Change in weather condition	64	71.1
Poor access to goof road in transportation	52	57.8
Lack of good storage facilities	76	84.4
Complex nature of technologies	45	50.0

Source: Field survey, 2024

Multiple responses

3.7 Testing of Hypothesis

3.7.1 Correlation Analysis of the Relationship Between Socio-Economic Characteristics of

Respondents and the Attitude Towards the Utilization Of Hatchery Production Technologies in the Study Area

The regression analysis examined the relationship between the socio-economic characteristics of respondents and their attitude toward the utilization of hatchery production technologies at a 0.05 level of significance is presented in Table 7. The results indicated that several variables had a significant influence on farmers' attitudes toward adopting these technologies. Notably, Age (X_1) ($p = 0.000$), Sex (X_2) ($p = 0.002$), Marital Status (X_3) ($p = 0.023$), Religion (X_5) ($p = 0.001$), Years of Farming Experience (X_7) ($p = 0.000$), Monthly Income (X_8) ($p = 0.000$), and Farm Size (X_9) ($p = 0.000$) all showed a significant relationship with the respondents' attitudes toward hatchery production

technologies. This suggests that older farmers, males, married individuals, those with more farming experience, higher income levels, and larger farm sizes were more likely to adopt hatchery technologies.

However, Educational Attainment (X_4) ($p = 0.140$) and Household Size (X_6) ($p = 0.310$) did not have a significant relationship with farmers' attitudes toward hatchery technology adoption. This implies that formal education and household size did not strongly influence the decision to utilize these technologies in the study area. These findings highlight that financial capability, farming experience, and farm size play crucial roles in technology adoption, whereas education and household composition appear to have less impact (Deji and Koledoye, 2019).

Table 7: Result of Regression Analysis showing relationship between the socio-economic characteristics of fish farmer and their level of awareness to improved aquaculture management practices

Variables	B	Standard error	β	T-value	Sig.	D
Age	0.011	0.003	0.319	4.270**	0.000	S
Sex	-0.195	0.062	-0.192	-3.159**	0.002	S
Marital Status	0.115	0.049	0.164	2.316**	0.023	S
Educational Attainment	0.026	0.018	0.076	1.489	0.140	NS
Religion	0.202	0.059	0.195	3.428**	0.001	S
Household Size	0.046	0.045	0.082	1.021	0.310	NS
Years of Farming Experience	0.182	0.018	1.603	10.008**	0.000	S
Monthly Income	-0.037	0.000	-1.871	-13.595	0.000	S
Farm Size	-0.096	0.018	-0.399	-5.222**	0.000	S

Source: Author's Computation, 2024

$P \leq 0.05$ Significant

4.0 CONCLUSION AND RECOMMENDATIONS

The study concluded that artisanal fish farmers in the study area had a relatively high level of awareness and a positive attitude toward the utilization of hatchery production technologies. However, the effective adoption and utilization of these technologies were hindered by several challenges, including high land rent, costly labour, high input costs, poor-quality fingerlings, and limited access to credit facilities, among others. To address these challenges, the study recommends organizing enlightenment campaigns at local, state, and national levels to enhance fish production and improve the socioeconomic well-being of farmers through the adoption of hatchery technologies. Additionally, technologies with low awareness among fish farmers should be reintroduced and popularized, emphasizing their benefits and potential opportunities to encourage adoption. Furthermore, regular training and empowerment programs should be implemented to enhance farmers' awareness, perception, and practical application of aquaculture practices. To mitigate the impact of erratic power supply, the study suggests promoting alternative energy sources such as solar power

and standby generators to ensure continuous and efficient hatchery operations.

REFERENCES

- Adereti, F.O., Fapojuwo, O.E. and Onasanya, A.S. (2020). Information utilization on cocoa production techniques by farmers in Oluyole Local Government Area of Oyo State, Nigeria. *European Journal of Social Science*, 3(1): 1-7
- Akinrotimi, O.A., Onunkwo, D.N, Cliffe, P.T., Anyanwu, P.E, and Orokotan, O.O, (2019) The role of fish in the nutrition and livelihoods of families in Niger delta, Nigeria. *International Journal of Tropical Agriculture and Food Systems* 1(4): 344-351. DOI: [10.4314/ijotafs.v1i4.40941](https://doi.org/10.4314/ijotafs.v1i4.40941)
- Akinrotimi OA, Cliffe PT, and Ibemere IF (2021) Integration of rural aquaculture into small scale farming in Niger Delta region of Nigeria. *Global Approaches to Extension Practice* 7(1): 43-48. <https://www.ajol.info/index.php/gaep/article/view/78672>
- Opiyo, M.A., Orina, P., and Charo-Karisa, H. (2017). Fecundity, growth parameters and survival rate of three



- African catfish (*Clarias gariepinus*) strains under hatchery condition. *J Aquacult Eng Fish Res* 3:75–81.8. <https://hdl.handle.net/20.500.12348/21>
- Amali, O. and Solomon, S. (2022). Measuring and understanding the drivers of agricultural innovation: evidence from Ireland. *Food Policy* 51:1–8
- Anene, A., C. I. Ezeh & Oputa, C. O., (2010). Resources use and efficiency of artisan fishing in Oguta, Imo State Nigeria. *J. Dev. Agric. Econ.*, 2: 094 –099
- Cliffe, P.T., Akinrotimi, O.A., and Ibemere, I.F. (2021) The role of fish in improving child nutrition in Nigeria. *Journal of Technology and Education in Nigeria*, 16(7):20-30. <https://www.ajol.info/index.php/joten/article/view/78575>
- Deji O. F. and Koledoye, G. F. (2019). Gender Analysis of Fish Farming Technologies Adoption by Farmers in Ondo State. *Academic Journals*, 8 (26): 1219-1225.
- Fagade, B. and Olaniyan, D. (2022). Adoption of Simple Technologies for Poverty Alleviation. Proceedings of the 19th Fisheries Society of Nigeria, FISON Annual Conference, New Bussa, Niger State.
- Food and Agriculture Organization of the United Nations (2023): Fish Statistics Plus. <http://www.fao.org/fi/statist/FisoFt/Fishplus.asp> accessed on the 20th June, 2024, pp. 14 – 17.
- Ibitoye S. J. and Onimisi, J.A. (2023). Economic Assessment of Yam Production in Kabba- Bunu Local Government Area of Kogi State, Nigeria. *Journal of Development and Agricultural Economics*, 5(11): 470-475. <https://www.globalscienceresearchjournals.org/abstract/economic-assessment-of-yam-production-in-kabbabunu-local-government-area-of-kogi-state-nigeria-45555.html>
- Madji, D. and Rachel, R. (2019). Talk highlights. Role of New Technologies in Aquaculture and fisheries; Excellence in Marine Biotechnology, Fish Information and Services, SQU Oman, United States.
- Njoku, D.C. (2020). Harnessing Fisheries Resources of Nigeria for National Development. *International Journal of Agriculture and Rural Development*, 14(2):3637 – 3647.
- Newadim, A. A., Nwaobiala, C.U. and Anyanwu, C. G.(2014). Fishes based off Farm Research Reading in Farming System Research and Development in Nigeria. Michael Okpara University of Agriculture press, Umuahia, Nigeria.
- Ofuoku, L., Lambert, D.M., Croxton, K.L, Garcia-Dastugue, S.J., Knemeyer, M. & Rogers, D.S., (2021). Supply Chain Management Processes, Partnerships, Performance (Jacksonville, FL: Hartley Press Inc.).
- Ogbonna, S.I. (2021). Analysis of food Security Status of Smallhold Farm Household in Imo State, Nigeria.