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Adoption of Artisanal Fishing Innovations among Fisherfolks in Delta State, Nigeria

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Abstract

The study examined the extent of adoption of artisanal fishing innovations among artisanal fisherfolks in Delta State, Nigeria. Data for the study were obtained through interview schedules from 120 household heads of artisanal fishermen. Percentages, mean and exploratory factor analysis were used in analysing the data. The study revealed that synthetic fishing nets ($\bar{x}$= 4.0); smoking kilns ($\bar{x}$= 4.0), post-harvest processing techniques ($\bar{x}$= 4.0), and mending of synthetic fishing nets ($\bar{x}$= 4.0) had higher adoption scores when compared to other innovations. Most (65.8%) of the respondents were males and married (68.1%) with a mean age of 45.7 years. Findings also show that the majority (72.4%) of the artisanal fisherfolks had 11 – 40 years of experience in artisanal fishing. The major constraints to adopting innovation in the artisanal fishery include family problems, environmental problems, and contact problems. Increased extension contacts and training should be done to guide, educate, and

enhance the skills of artisanal fisherfolks for increased productivity and improved socioeconomic well-being.

Introduction

Artisanal fishing is small-scale fishing in waters like lakes, streams, rivers, and along coastal nutrient-rich upwelling Exclusive Economic Zones (EEZs) off continents. Artisanal fishing is characterized by dugout canoes which may or may not carry engines but simple traditional fishing gears used to harvest fish close to the fishing base because many fishing communities are inaccessible and usually lack cold storage facilities and this leads to fish spoilage, low income and capital including small fishing business enterprises that plagues artisanal fisherfolks (Ahmed et al., 2021).

Globally, artisanal fisheries provide employment opportunities, food security, and poverty alleviation so government policies and interventions should be implemented to improve the livelihoods of fisherfolks inhabiting fishing communities (Kurohman et al*.,* 2020; Umehai et al., 2023). Between 2012 and 2018, the fisheries sub-sector contributed 2.1% to the Nigerian economy's Gross Domestic Product (GDP) Klynveld, Peat, Marwick, and Goerdeler (KPMG, 2019). This shows it provides vital foreign exchange, employment, income, and essential human nutrients. Fish is a healthy food with nutritional benefits like omega-3, protein (15%-20%); moisture (65%-80%), fats (0.5%-2%), ash (1%-2%), calcium (0.5%), phosphorus (0.25%), vitamins A, B, C, D and B2 (riboflavin) which shows the vital role of fish in the diet of humans (Balami et al., 2019 and Kumar et al., 2020).

Artisanal fishing done by fisherfolks contributes to the nation’s economy through job creation and employment for those actively participating in fishing and the ancillary occupations associated with fishing (Umehai et al.; 2023). Food and Agricultural Organization (FAO) (2020) reported that small-scale fisheries and aquaculture make critical contributions to development in the area of employment generation while it is also recorded that over 500 million people worldwide are engaged in various fishery-related occupations with a majority living in developing countries where artisanal fishing is done by traditional fishing gears including the uncertainties and risk associated with fishing.

The Food and Agricultural Organization (FAO) (2019) defines agricultural innovations as a process where individuals or organizations bring new ways, products, and processes to organizations to increase their effectiveness, competitiveness, and resilience to shocks or environmental sustainability and this contributes to food security, nutrition, and the overall economic development including sustainable management of natural resources. Innovation is doing something new and different, addressing a new problem, and solving an old problem in a new way (United Nations Innovation Network, 2019). Sabjeet and Surjya (2021) reported that modernized fishing boats made from fiberglass with increased velocity and reduced fuel efficiency reduce the time spent fishing and this increases fishermen's income by reducing their cost of operation. Other innovations are improved fishing poles and lines including nets made from polyester resin. The Food and Agricultural Organization of the United Nations (FAO) and World Fish (2020) listed other innovations in artisanal fishing like mobile phones, voice messages, and global positioning systems (GPS) used by both

artisanal fisherfolks and modern fishing trawlers for communication and safety in rivers and at sea including blockchain technology used in bringing transparency to fish supply chains globally when handling fish from different countries around the world.

Many factors influence the extent of adoption of innovations. Fadeyi, Ariyawardana, and Aziz, (2022) asserted that the farm practice (small or large-scale farming); the adopters, extension workers, socioeconomic, physical, and biological environment in which the innovation adopted significantly affect the adoption of improved innovations on artisanal fishing while Olaoye et al.; 2021) reported that lack of capital was the major constraint affecting the adoption of improved fisheries innovations by artisanal fishers in Yewa Lagoon, Ogun State Nigeria.

Alhassan et al.; (2023) posited that extension services should disseminate scientific innovations from research to artisanal fisherfolks and inadequate extension services were one of the major constraints to artisanal fisheries development along Shiroro and Kainji Dams, in Nigeria. They recommended that extension agents should educate artisanal fisherfolks to improve their knowledge, attitude, and skills (KAS). Adoption of innovations by fisherfolks in Nigeria would increase their income, and harvest, and improve processing and preservation techniques that would prolong the shelf life of fish and other aquatic resources. Innovations like outboard engines on boats would also greatly reduce the time spent on long fishing trips and voyages by artisanal fisherfolks. Therefore agricultural extension workers have a vital role to play in disseminating innovations to fisherfolks living in rural areas.

Objective of the study

This study examined the extent to which artisanal fisheries innovations were adopted by artisanal fisherfolks in Delta State, Nigeria. Specifically, the study examined the adoption levels of artisanal fishing innovations disseminated through extension and ascertained the major constraints to the adoption of innovation in artisanal fishing.

Methodology

The study was conducted in Delta State, Nigeria. Delta State lies between longitude $5^0\,00^{'}$ and $6^0\,45^{'}$ East; and latitude $5^0\,00^{'}$ and $6^0\,00^{'}$ North of the equator. The State has twenty-five (25) local government areas with a land mass of 16,842 square kilometers and a population size of 4,112,445 inhabitants. The study area is divided into three (3) agricultural zones: namely Delta North, Delta South, and Delta Central (National Population Census, 2006). Delta State is richly endowed with fertile agricultural land which is suitable for farming and fishing. The State is located in the Niger Delta region and the environment contains veritable fishing areas and villages that are scattered including numerous water bodies like lagoons, rivers, creeks, and swamps. Many inhabitants of various fishing communities derive their livelihood from fishing, fish processing, fish marketing, aquaculture, farming, and processing of different agricultural produce.

A multistage random sampling procedure was used. Stage one involved the purposive selection of the three agricultural zones because of the practice of artisanal fishing activities. Stage two involved random selection of agricultural extension blocks. There are eight blocks in each of the three agricultural zones. Two blocks were selected from

each of the agricultural zones using a simple random sampling technique making a total of six (6) blocks. Stage three involved the selection of six artisanal fishing town communities from each of the selected blocks using a purposive sampling technique because of the prevalence of artisanal fishing activities, making a total of eighteen artisanal fishing communities. At stage four a purposive sampling technique was used to select one hundred and twenty artisanal fisherfolk household heads across the selected communities. Data was collected through interview schedules from all the respondents with the assistance of extension agents assigned to the area and familiar with the artisanal fisherfolks. The instrument was subjected to content validity by three experts in agricultural extension and rural sociology.

To examine the stage of adoption, a five-point adoption scale of awareness (1), interest (2), evaluation (3), trial (4), and adoption (5) was adopted. Respondents were asked to indicate their stage of adoption on the five-point scale. Response categories and corresponding weighted values were computed.

Finally, major constraints were extracted from the responses of the fisherfolks. Three constraint factors were extracted from the responses of the fisherfolks. Variables with loadings of 0.40 and above (10%) overlapping variance were used in naming the factors while variables loading in more than one factor or that have loadings of less than 0.40 were not used. The major constraints to artisanal fisherfolks' adoption of innovations were family problems, environmental problems, and extraneous problems. The extent of constraint was measured using a 4-point Likert-type scale of; to a great extent = 4, to some extent = 3, to a little extent = 2, and a very little extent = 1. Data were analyzed using percentages, mean statistics, and factor analysis using varimax rotation.

Results and Discussion

Adoption of artisanal fisheries innovations

Entries in Table 1 show synthetic fishing nets; smoking kilns, post-harvest processing techniques, and mending synthetic nets ($\bar{x}$ = 4.0 each) were all at the trial stage. Fiberglass canoes; outboard engines, aquatic resources management, and integrated agriculture and aquaculture farming ($\bar{x}$ = 3.0 each) were at the evaluation stage. Ice boxes on boats and canoes ($\bar{x}$ =1.0) were still at the awareness level. The grand mean ($\bar{X}$) adoption score for all the innovations was 3.2 while the adoption index was 0.6. The result depicts that many of the artisanal fisherfolks were still at the evaluation stage. This could be attributed to low income, low level of education, complexity, and compatibility of the innovations adopted by fisherfolks. Hassan et al.; (2020) listed income, complexity of innovation, inadequate credit facilities, and low extension contact as factors influencing the adoption of fish processing technology while Olaoye et al.; (2021) asserted that the high cost of inputs to practice innovations, inadequate capital, low extension contact and uncertainty about the life span of the technological innovations were some of the challenges to the adoption of improved fishing technologies.

Table 1: Adoption of artisanal fisheries innovations

Innovation	Mean ($\bar{x}$) Adoption Score	Grand Mean($\overline{\bar{X}}$) Adoption Score	Adoption Index
Fibre glass Canoe	3.0		
Out board Engine	3.0		
Synthetic Fishing nets	4.0		
Smoking Kiln	4.0		
Post-harvest Processing & Preservation Techniques	4.0	3.2	0.6
Aquatic resource Management	3.0		
Integrated Agriculture & Aquaculture Farming	3.0		
Education on Fish enclosures & Traps	3.0		
Ice on Boats	1.0		
Mending Synthetic nets	4.0		

Source: Field Data, 2021

Constraints to adoption of innovations on artisanal fishing

Table 3 shows the constraints affecting artisanal fisherfolks. The factors clustered were social, environmental, and contact. Under (social problems), the specific constraint variables with high loadings include diversion of profits/incomes to wives or taking titles (-0.753), mobility to other jobs (-0.620), and domestic problems (extended family problems) (-0.560). Specific issues with high loadings (environmental) were weather (hamattan, rains, sun) (-0.743), lack of cold storage and refrigerators (-0.628), and frequent boat mishaps and accidents (-0.498) while items that loaded high under contact problems (factor 3) include illness amongst artisanal fisherfolks (-0.751) and poor contact between extension and artisanal fisherfolks (0.507). According to Omitoyin and Aderanti (2020), major constraints faced by fisherfolks were a lack of credit facilities, a lack of information on sources of modern fishing technology, and corruption between government officers and extension agents. Other constraints included a lack of modern storage facilities and training facilities, lack of fishing inputs, transportation problems, epileptic electricity supply, difficulty accessing fishing grounds (because of invasion by aquatic plants), inadequate manpower, scarcity of potable water, and theft. Bonjoru, et al., (2019) also opined that difficulty in access to credit, lack of transportation facilities for harvested fish, and lack of modern storage facilities were the major constraints of the artisanal fishery.

Table 2: Constraints to adoption of innovation on artisanal fishing

Constraints	Factor 1 Social Problem	Factor 2 Environmental Problem	Factor 3 Contact Problem
Weather problems (hamattan, rain)	-0.160	**-0.743**	0.124
Domestic problems (extended family)-	**-0.560**	-0.273	0.280
Marketing problems (middle men)	0.668	0.643	-0.203
Diversion of income/profits (wives)	**-0.753**	-1.120	0.690
Illness/Sickness	-0.138	0.103	**-0.751**
Inadequate skills	-0.412	0.779	0.190
High cost of fuel	-0.255	-0.517	0.625
High cost of labour	-0.599	-0.287	-0.514
Poor educational background	-0.495	0.103	-0.693
Non delivery of inputs	-0.090	0.446	0.699
Lack of extension services	0.615	0.421	-0.272
Mobility to other jobs	**-0.620**	0.153	-0.213
Poor post-harvest practices	0.782	0.147	-0.188
Frequent boat accidents	0.286	**-0.498**	-0.188
Theft and loss of inputs	0.823	-0.790	0.170
Poverty of artisanal fisher folks	0.428	0.594	-0.107
Government policies	-0.206	0.654	0.516
Poor road network	-0.151	0.360	0.297
Limited fish resources	0.178	0.591	0.424
Poor extension contact with fishers	-0.275	0.339	**0.507**
Lack of cold storage & refrigerators	-0.329	-0.628	0.149

Source: Field Data: 2021

Conclusion and Recommendations

The study revealed a trend in adoption of artisanal fisheries innovations. The major constraints to adoption of innovations by artisanal fisherfolks were family problems, environmental problems and contact problems. Trainings should be done to guide, educate and improve the skills of artisanal fisherfolks. More extension education to increase the adoption of innovations and fish harvested by artisanal fisherfolks is encouraged in fishing communities for their wellbeing.

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