Examining fishermen's use of information and communication technologies for information sharing and dissemination at Mindu Dam in Morogoro, Tanzania

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ABSTRACT

This paper aimed to examine the use of digital technology for disseminating information among fishermen around the Mindu Dam in Morogoro, Tanzania. Informed by the Innovation (DOI) Theory and Wilson's model of information-seeking behavior, the study used a mixed research approach, involving both quantitative and qualitative methods. While simple random sampling techniques were used, the data collection tools used were questionnaires and key informants' interviews. Data was collected from 82 fishermen who were randomly selected from the fishing community in Mindu Dam. Data analysis used the Statistical Package for the Social Sciences (SPSS), while content analysis was used for qualitative data. The study found that the most frequently used ICTs by fish farmers in sharing agricultural information were mobile phones, radio, and television. Furthermore, the study revealed that major challenges facing fish farmers in sharing information include unfavorable radio or television broadcast times, high costs of acquiring and maintaining ICT facilities, lack of ICT training, poor network connectivity, and low literacy levels. The research emphasizes the critical role of mobile phones, internet services, and other digital technologies in improving communication, obtaining market information, and executing financial transactions. The study demonstrates notable enhancements in decision-making and general management efficiency by examining how these communities and managers utilize digital technologies. It also delineates obstacles to successful technology adoption, such as resistance to change and a lack of training, and offers strategies to overcome them, including targeted training programs and community engagement initiatives. The findings highlight the capacity of digital technology to enhance sustainable livelihoods and economic development in the fishing sector, hence, cultivating a more resilient and informed community. While the study indicated that fishermen in the Mindu Dam regularly used mobile phones, radios, and televisions to exchange and disseminate information, fishermen encountered multiple challenges in utilizing ICTs for the sharing and dissemination of fishing information. Therefore, the study recommends that the challenges encountered by fishermen in utilizing ICTs be addressed through the pertinent ministry; via its extension personnel, it should incentivize and conduct regular training sessions for these communities on the use of ICTs (mobile phones, radios, and television) to enhance their proficiency and skills in accessing and disseminating fishing information.

Keywords: Digital Technologies, Fish Farming, Fishermen, ICTs, Information Dissemination, Mobile Phones, Mindu Dam, Radio and Television

I. INTRODUCTION

Agriculture is crucial to social and economic development in most African nations (Benard et al., 2020; Bhalekar et al., 2015). It drives economic growth and stability (Bhalekar et al., 2015). In Tanzania, about 70% of the population works in agriculture. United Republic of Tanzania [URT] (2016a) and URT (2016b) report that the sector contributes 24% of Gross Domestic Product [GDP], down from 30% a decade ago, and 24% of exports, down from 45%, mostly due to the development of alternative foreign-exchange-earning opportunities from minerals and tourism services. Many Africans, particularly Tanzanians, depend on fisheries, aquaculture, and agriculture for income and livelihoods. Tanzania ranks among the top 10 African countries by total catch and output (URT, 2015). Tanzania's fisheries and aquaculture sector contributed 2.4% to GDP in 2014 and is expanding 5.5% (Bernad et al., 2020). This sector contributes less to GDP than livestock rearing. Tanzanian smallholders dominate extensive and semi-intensive fishing (Bernad et al., 2020). Aquaculture, or fish farming, is usually done on small plots of land with gardening, livestock, and poultry. In addition, most fish farmers sell their produce to neighbors at farm gates and local marketplaces, and few sell at secondary or external markets. Tanzania fishes in seas, lakes, dams, rivers, and other bodies of water.

As of 2023, fishing accounts for 1.8% of Tanzania's GDP, supplies up to 30% of animal protein, and supports over 6 million jobs. Over 95% of the catch is from small-scale artisanal fishermen. Nile perch, Victoria, Tanganyika, Nyasa Lake sardines, and marine species are the industry's main products. Mindu Dam and other small dams may help local populations. Mindu Dam, one of Morogoro's main freshwater dams, supplies 80% of the city's water

(Mpomwenda et al., 2022). The Mindu Dam, on the Ngerengere River 6 km southwest of Morogoro Town on the Tanzania–Zambia highway, receives water from the Mindu watershed northwest of the Uluguru Mountains. The main Ngerengere River tributaries are Mzinga, Mgeta, Mlali, and Lukuleni. The reservoir is 500 m above sea level, between Northings 9240000 and 9242000 and Eastings 346000 and 348000. The Mindu Dam is around 303 km². Since 1978, the dam has caused controversy despite its vital purpose. Around 200 km west of Dar es Salaam, Tanzania, the Morogoro urban and peri-urban districts had a population of 300,000 (URT, 2012). Mindu Dam and its rivers supply water to almost 75% of the population for residential, agricultural, fisheries, and industrial usage.

Fishing sustains some residents of the Mindu Dam (Mpomwenda et al., 2022). About 60% of Morogoro's catch fisheries are based on the Mindu dam, which has been thoroughly examined for contamination, but digital tools have not been used. The fishing settlements around Mindu Dam depend on the dam for their livelihoods. Nonetheless, these communities face various barriers that limit their ability to effectively exploit the dam's resources. Aura et al. (2019) observed that transaction fees, high data plan costs, and expensive digital device maintenance hinder fishermen's access to digital technology across several geographies. One issue is the availability and use of digital technology, which is essential for modern communication, market participation, and financial transactions. Digital technology, notably mobile phones and internet services, has improved information distribution, connection, and economic potential in many areas. Digital technology has transformed practically every aspect of modern life (Mpomwenda et al., 2022). An electrical item without digital technology is rare. These tools can help fishermen quickly access market data, weather forecasts, and regulatory updates to support informed decision-making.

Fishing at Mindu Dam remains difficult despite technological advances in other fields (Bernad et al., 2020). Insufficient knowledge and skills in pond management and species selection, inadequate aquaculture extension services, a lack of reliable agricultural information, distance from information sources, and the lack of necessary information for farmers to cultivate their preferred aquaculture products [United Republic of Tanzania (URT), 2015]. Fishers also face challenges due to insufficient investment in aquaculture infrastructure and facilities for processing and marketing fish and fishery products, limited access to financial resources and credit, inadequate aquaculture inputs, and improper feeding and pond fertilization. Aquaculture productivity depends on how well accurate information is communicated to target groups (Musa et al., 2013).

The rapid expansion of aquaculture at Mindu Dam requires adequate information dissemination to fishermen. Any nation's aquaculture productivity depends on information, according to Aina et al. (1995) and Benard et al. (2014). Eucharia et al. (2016) state that information is a production factor that boosts fish farming productivity. Farmers succeed or fail based on timely, accurate, and credible information (Opara, 2008). Thus, farmers with current, relevant information are more likely to make informed decisions. Farmers lack access to vital fishing information from the Mindu Dam (Benard et al., 2020). Mobile phones, radios, and television can help fish farmers share timely, relevant information, increasing their output. According to Musa et al. (2013), timely and relevant agricultural information is essential for good agricultural productivity. The validity and efficacy of distribution channels greatly impact knowledge sharing and communication. ICTs are more effective and efficient than field demonstrations, seminars, written materials, group gatherings, and face-to-face interactions that fishery officers use to disseminate technology. Similarly, the approaches adopted by extension officers have been hampered by poor extension capabilities. Only 436 of the 16,000 fisheries extension personnel needed to address fish farmers' informational and educational needs are accessible (URT, 2015), hindering the distribution of information and knowledge (Yaseen et al., 2015).

According to the existing body of research, the majority of Tanzanian studies on the use of information and communication technologies by farmers have concentrated on either the dissemination of information (Lwoga et al., 2010; Mwakaje, 2010; Mtega & Msungu, 2013), the delivery of agricultural extension services (Sanga et al., 2013; Sanga et al., 2016; Tarimo & Sanga, 2017; Lwesyal & Kibambila, 2017), or the impact of ICTs on the relationship between The use of information and communication technology (ICT) by farmers for the purpose of information distribution and its link with usage has not been the subject of any of the research, particularly with regard to fishermen at Mindu Dam in Morogoro, Tanzania. Temba et al. (2016) state that there is a paucity of studies on the utilization of information and communication technology (ICT) to discuss agricultural matters with farmers. There is a possibility that fish farmers will not receive timely and relevant information due to a lack of understanding, which could reduce agricultural productivity. The purpose of this study was to investigate the problems fish farmers face when attempting to use information and communication technologies (ICTs) for information sharing, as well as the relationship between these challenges and their ICT use. The inability of farmers to use information and communication technologies (ICTs) to disseminate agricultural information negatively affects their productivity, economic performance, and food security, as stated by Musa et al. (2013). Aquaculturists are unable to obtain timely information from reputable sources when it is not provided. As a result, they lack technological knowledge, leading to decreased production.

1.1 Research Objectives

i. To identify the Means of ICT usage in information Dissemination and sharing by fishermen
ii. The extent of ICTs usage in information Dissemination and sharing by fishermen in Mindu Dam
iii. To identify the type of Information Sought by Fishermen at Mindu Dam in Morogoro
iv. To examine the challenges facing fish farmers in the use of information and communication technology (ICT) in information sharing on fish farming.

II. LITERATURE REVIEW

2.1 Theoretical Review

This study was informed by Diffusion of Innovation (DOI) theory and Wilson's macro model of information-seeking behaviour. It integrates key processes, identifying information needs, seeking relevant information, exchanging insights, and applying knowledge. The diffusion theory was used to understand how personalized interventions and community participation may foster the widespread adoption of digital technologies for information dissemination, as a precondition for enhancing access to and consumption of information in fishing communities (for more information, see section 2.1.1 below). Wilson's theory was applied to understanding information exchange and dissemination among communities, and how fishing communities access and use information to address their specific needs (see section 2.1.2).

2.1.1 Diffusion of Innovation (DOI) Theory

The DOI theory analyses the temporal acceptance of novel ideas, practices, and technologies within cultures (Rogers, 1962). The 1962 Everett Rogers model highlights the role of innovative communication and transformation within social systems. Knowledge, persuasion, decision, implementation, and confirmation delineate the mechanisms by which individuals accept or reject ideas in the Diffusion of Innovations process. Acceptance is influenced by perceived benefits, alignment with current demands, complexity, and the possibility of testing and observation (Emily & Calvert, 2012; Rogers, 1962). Rogers categorizes adopters based on their willingness to embrace change, ranging from innovators and early adopters to the more hesitant late majority and laggards. These dynamics elucidate the social interactions and communication pathways that disseminate new ideas, rendering them crucial for technology integration and other fields (Emily & Calvert, 2012; Rogers, 2003). The DOI theory facilitates the examination of adoption and various elements influencing individual and societal development.

The DOI theory elucidates the reasons and the rapidity of changes in the fish communities of Mindu Dam. Everett Rogers' seminal 1962 work, Diffusion of Innovations, characterizes innovations as novel concepts, behaviours, or objects introduced to individuals or societies. Diffusion is the incremental dissemination of an innovation within a social system, leading to alterations in individuals or society. The diffusion of innovations emphasizes technology integration and facilitates the exploration of adoption in various domains. The DOI has been developed and continues to be used empirically across various disciplines to address emerging technological and societal concerns. DOI is utilized in agriculture, medicine, education, communication, and marketing. Emily and Calvert (2012) analyzed the use of DOIs in implementing online software to monitor university students' screens during COVID-19 online assessments. Researchers investigated physicians' acceptability and utilization of pharmaceuticals in healthcare. In healthcare, the Diffusion of Innovations (DOI) was examined in intervention development and the acceptability and dissemination of laparoscopic colectomy in England.

The DOI has been used in energy research, including studies on the adoption of renewable heating systems Furthermore, DOI has been employed in information systems research. Prior research has investigated the five characteristics of innovation concerning the adoption and dissemination of Internet-based technologies. The DOI has been employed in research concerning cloud computing adoption and in various studies on mobile applications, such as mobile banking adoption and transportation

2.1.2 Wilson's 1996 Information-Seeking Behavior Model

The model was founded by Wilson (1981) in 1981. This model experienced several refinement by the founder (Wilson, 1999; Wilson, 1996; Wilson, 2000) As well known that Wilson's later development concentrates on describing general information behaviour, as opposed to only information seeking behaviour (Wilson 1997). This model specifically borrowed from other disciplines such as psychology, decision making, innovation and health communication and consumer research. Using specific theories, Wilson explains how needs prompt people's information seeking behaviour, source preference, and why some pursue a goal more successfully than others.

As shown in figure 1 below, this model also seeks to explain the role played by various activating mechanisms or motivators influencing the 'what', 'how' and extent of a search. He identifies variables such as psychological,

demographic, and social/environmental factors, and the characteristics of information sources in determining information seeking behaviour that affect motivation (Wilson, 2000).

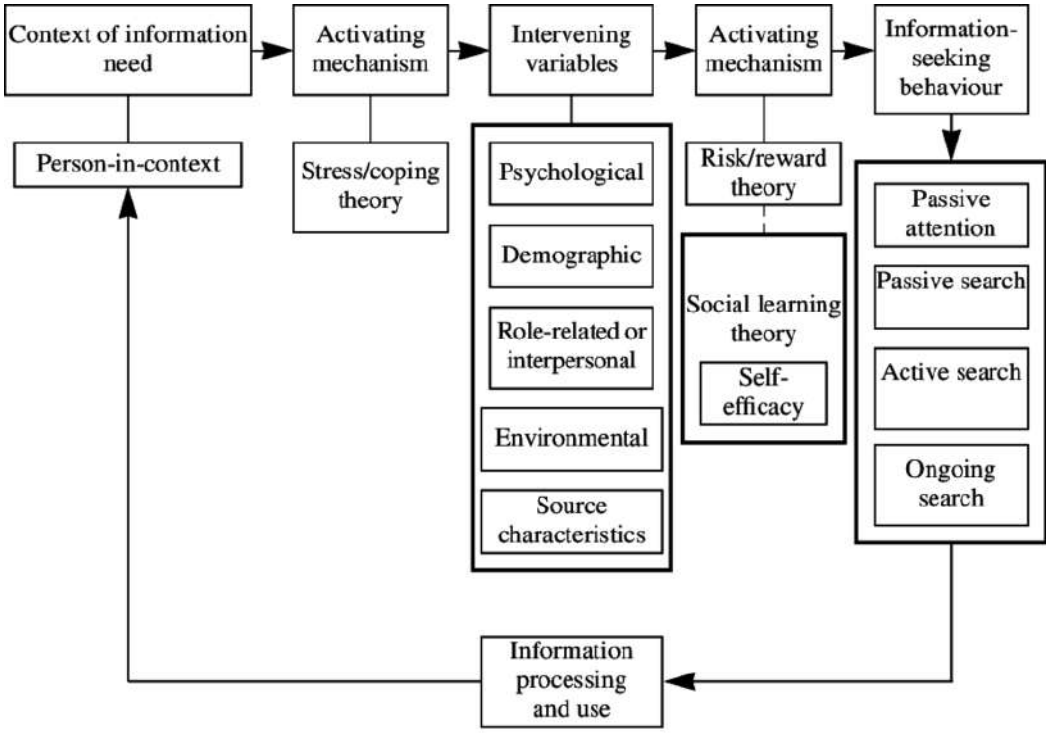

Figure 1
Wilson's 1996 Information-Seeking Behavior Model

The model also expanded on different types of information-seeking behaviour, including 'passive' methods of seeking information, i.e. 'passive search', where unintentional searching leads to the acquisition of relevant information, and 'passive attention' where no intentional information seeking takes place, but information is still unconsciously acquired through listening to the radio or watching television (McKenzie, 2002; Mostert 2005). The choice of this model is highly due to the way fishermen search for information.

2.2 Empirical Review

2.2.1 ICTs Usage in Information Dissemination and Sharing by Fishermen

Information and Communication Technologies (ICTs) are significantly contributing to the socio-economic development of fishermen. The use of information and communication technologies (ICTs) by fishermen to disseminate fishing information and knowledge has been extensively examined in numerous studies. In India, Abraham (2007) conducted a study on mobile phone use in the fishing industry. The study's findings indicated that artisanal fishermen might negotiate the value of their catches with dealers in advance using cell phones. Consequently, they gained access to better pricing options and mitigated wasteful catch. In recent decades, fishermen in Asian nations have experienced a considerable increase in their salaries and living conditions. The utilization of sonar has enabled artisanal fishermen to increase their catch, while the implementation of GPS technology has facilitated time-efficient site location (Walsham, 2010).

Ibeun and Mdaihli (1994) performed research on the application of information and communication technology in the Kainji region of Nigeria. This study found that 56 percent of local fishermen possessed radios, and 50 percent of respondents listened to the radio while fishing. Approximately 11% of the fisherman reported that they gained from the radio programs by enhancing their knowledge and obtaining the latest market price information. Research conducted in Ghana by Jensen (2007) revealed that over half of the 71% of fishermen indicated that mobile phones facilitated communication with their customers and clients and provided information about fisheries from alternative marketplaces. No studies exist proving how information and communication technologies (ICTs) enhance the dissemination of information and expertise among artisanal fishermen in Tanzania, particularly in Zanzibar. The predominant research conducted in Tanzania about the utilization of information and communication technologies has been on demographics, excluding artisanal fishers, such as crop farmers, livestock herders, and students. The objective

of this study was to assess the utilization of information and communication technologies (ICTs) by artisanal fishermen to spread information and expertise within the fishing community, thereby improving their livelihoods.

2.2.2The type of Information Sought by Fishermen

According to Taylor (1962), the concept of information need refers to the desire of an individual or group to actively seek and acquire knowledge to satisfy a need, whether conscious or unconscious. Endra et al. (2025) provided the information that the fishing community in Uganda was seeking. The following types of content were included in this collection: fish catch statistics, health information, legal and illegal gear, government programs, marketing material, and other sources. A similar line of reasoning was advanced by Devadason (1996), who argued that information requirements are gaps in the client's existing knowledge. According to the findings of Uzezi (2015) and Kaduskar et al (2010), the information needs of the fishing community are diverse and include a variety of topics. Some examples of these diverse topics include where to obtain fishing gear, how to control water hyacinths, where to sell fish and fish products, how to use improved modern fishing techniques, and information about fish prices in the market.

2.2.3 Challenges facing fish farmers in the use of information and communication technology (ICT) in information sharing on fish farming.

A number of challenges have been highlighted by this community of fishermen regarding the transmission of information and expertise through various information and communication technologies. One example is the research conducted by Marciniak (2010), which found that fishermen face numerous challenges in using information and communication technologies (ICT). These challenges include high expenses, particularly for computers and sonars. According to a study by Hosseini and colleagues (2009), the following factors were identified: a lack of expertise, a negative attitude towards modern technology, a low number of service centers in rural areas, poor bandwidth, a lack of hardware, and inadequate infrastructure. According to Hosseini et al. (2009), the obstacles that prohibit fishermen communities from using information and communication technology include a low number of websites, inadequate telecommunication networks, antiquated telephone lines, and a bad quality of service supplied by service centers. There are also a few websites that are referenced, which is another point of interest. A further finding of Abraham's (2007) research was that the majority of fishermen did not have a formal education and had a limited understanding of how to use information and communication technologies (ICTs) in the ocean, such as mobile phones, as well as other emerging technologies, such as GPS and Sonar. This was one of the findings that Abraham discovered. In a similar vein, Haambiya et al. (2020) observed that the principal constraints preventing fishermen from using information and communication technologies (ICTs) are a lack of financial resources and a lack of understanding among most fishermen regarding their use for information exchange. According to Omar et al (2011), one of the obstacles preventing fishermen from using information and communication technology is a negative attitude toward its use. This is one of the issues that fishermen face.

2.2.4 Use of ICTs in Information Dissemination and Its Impact on the Fishermen

Information has moved from radio and TV to mobile and the internet (Chenyambuga et al. (2011). Online apps and platforms store and distribute knowledge with digital communities. Digitalization affects low- and middle-income agriculture and fisheries (Omar et al., 2011). Digital channels use ICT to target diverse audiences. Lord and Johnson (2023) claim that digitization benefits all stakeholders, including small-scale fishers, thereby promoting inclusivity and sustainability. He characterized fisheries digitalization as the use of digital technologies, innovations, and data to transform business models and practices across the value chain and to overcome biological, social, and economic constraints. Bharath et al. (2020) discovered that several ICT platforms improved information accessibility. In fishing and other industries, digital technologies increase information delivery. Fishing and seafood production lack a supply chain and industry trust, as do many global industries. Consumers rarely know where their products come from, regulators can only partially oversee fishing and commerce, and producers may face lower market prices and competition. Net-to-plate information, made more transparent and accessible through emerging data technologies, may boost fishing stakeholders' confidence. Communicating and learning are fast and revolutionary with technology. To help fishermen manage risk and make decisions, communities worldwide use mobile apps and online platforms to report on weather, market prices, and regulatory changes. Kelly et al. (2022) say Fish Guider, a web-based decision-support program, promotes sustainable fishing and shares research and fishing-practice knowledge by combining fishers' experience with data.

Data is collected, saved, disseminated, and used for local or extensive assessment, planning, and decision-making on digital platforms (Noor et al., 2021). Frost et al. (2021) observed that governments worldwide were using digital infrastructure to engage households and informal laborers. Fishermen need skills (Tripathi et al., 2017). Digital platforms share data (Pulsifer et al., 2012; Eicken et al, 2014). Digital platforms analyze and deliver pertinent data.

Digital platforms connect multiple user groups and scale (Frost et al., 2021). Tanzania's fisheries subsector uses digital platforms to educate and market fish. According to the Lake Victoria Fisheries Organization (Tripathi et al., 2017), knowledge and information affect fisheries and aquaculture operations, development, and economic valuation. Many online agricultural product marketing solutions remove meetings (Payne & Willis, 2021). Omar et al (2011) report that fishermen are adopting ICT which affects their revenue.

Fishers' scientific understanding improved their local knowledge, relationships with fisheries scientists and managers, and management of their knowledge and values, according to Eicken et al, (2014). Chandra (2010) claimed that the efficient distribution of information and services among fishermen will boost fisheries. Physical and digital fisheries data are available. Lake Victoria Fisheries Management Plan (FMP III) proposed ICT and an information network for fisheries management. According to Haambiya et al. (2020), ICT empowers communities to govern their development, supports 'best practices', and gives fishermen equal services and advantages. Haambiya et al. (2020) reported that digital and electronic technologies were changing economies, cultures, and lifestyles, affecting the information and communications sectors of sustainable development. Barkatullah et al. (2014) observed that ICT helps fishermen share essential knowledge and skills, which promotes local market decision-making. Marciniak (2010) asserts that the wise use of ICT may enhance fishing village revenues and reduce poverty.

Use ICTs to access and share vital information for informed fishing decisions. Information access and sharing help fishermen choose specialist fishing, local market trading, and meetings, according to Marciniak (2010). What options lower risk and boost chances? Effective information distribution and services for fishermen improve fisheries, according to Chandra (2010). Ngonyani and Nkotagu (2007) found that ICTs can improve informal, small-scale fishing data collection, improving food and nutrition security. Barkatullah et al. (2014) recommend spreading scientific information to support evidence-based decision-making and fisheries and aquaculture research. It improves East African fisheries knowledge management, distribution, awareness, and involvement. Barkatullah et al. (2014) found that fishermen sell to peers, communities, and markets via mobile phones. Adejoh et al. (2017) encouraged the government to improve mobile reception in rural areas after researching information transfer among Nigerian fish sellers. Kapange (2010) said ICT can quickly and cheaply teach rural and diverse populations about fishing. Bharath et al. (2020) reported that it sends PFZ audio messages to mobile phones and WhatsApp. WhatsApp improved information sharing by uniting fishermen.

2.2.5 Approaches to Improve the Dissemination of Information to Fishermen

To effectively disseminate information within communities, various on-the-ground stakeholders must implement strategies, as outlined in Table 1 below.

Table 1

Approaches to Improve the Information Dissemination and Sharing to Fishermen

Strategy	**Explanation(s)**
Communication via numerous media	Information dissemination across numerous channels to the target audience. Communication channels should be tailored for a certain audience, such as the community Baraza/Meeting.
Utilise Technology	This includes the utilisation of mobile applications, specifically SMS alert systems.
Community Information Centres	Open community information centres where fishermen can get tools, workshops, and help understanding legislation and market dynamics. Digital kiosks should be established to enable fishermen to access online fisheries and livelihood information and databases.
Training and Capacity Building	Regular workshops and training on sustainable fishing, financial literacy, and market access should be tailored to community needs and knowledge levels. Community fishermen should be educated as peer educators to share information and best practices.
Community Engagement and Participation	Fishers should help plan and implement information distribution initiatives by providing feedback on communication techniques and information needs.
Collaborate with Local Organizations	Information dissemination and training should be conducted in collaboration with local NGOs that are familiar with fishermen. Fisheries cooperatives should serve as information hubs, providing members with updates and training.
Utilise Visual and Audiovisual Resources	Short videos or documentaries on sustainable fishing, success stories, and market information should be shared with the community. Create infographics and visual tools for easy summarisation and comprehension.
Improve Online Presence	A centralised online platform or Web portal should give fishing legislation, market trends, and fisher resources.
Feedback and Evaluation	Allow fishermen to rate the usefulness and effectiveness of the information. This aids dissemination strategy adjustments.
Policy Support Advocacy	Policy dialogues should advocate for government policies that prioritize fishermen's knowledge and support, especially safety and funding.

III. METHODOLOGY

3.1 Research Design

This study employed a mixed-methods approach, integrating qualitative and quantitative research methods. The rationale for using a mixed-methods approach is its main advantage: neutralizing or cancelling biases inherent in a single method (Creswell, 2003; Glazier & Powell, 1992). This method aimed to facilitate a thorough understanding of the digital technologies used to distribute information among fishermen. Data were gathered through structured questionnaires distributed to a sample of participants from the fishing community. The surveys comprised both closed- and open-ended questions to collect data on the digital tools used by fishermen for information distribution. Comprehensive interviews were performed with principal informants, encompassing community leaders, representatives from local institutions, and government authorities. The interviews provide comprehensive insights into the digital technologies employed in information dissemination operations. Focus Group Discussions (FGDs) were conducted with various segments of the fishermen, including men, women, and youth, to determine which digital tools they use to access and disseminate information. This approach facilitated the validation and triangulation of data obtained from surveys and interviews. Direct observation was employed to gain a comprehensive understanding of the fishermen's daily activities. This involved monitoring interactions at community meetings and other pertinent environments.

3.2 Study Area Location

The Mindu Dam is situated on the Ngerengere River, approximately 6 km southwest of Morogoro Town along the Tanzania–Zambia highway, receiving water from the Mindu Dam located northwest of the Uluguru Mountains (Figure 1 and Figure 2(a)). The principal tributaries that supply water to the Ngerengere River are Mzinga, Mgeta, Mlali, and Lukuleni. The reservoir is situated at an altitude of 500 m above mean sea level, positioned between 9240000 and 9242000 Northings and between 346000 and 348000 Eastings. The Mindu Dam covers an area of approximately 303 km² (Ngonyani & Nkotagu, 2007).

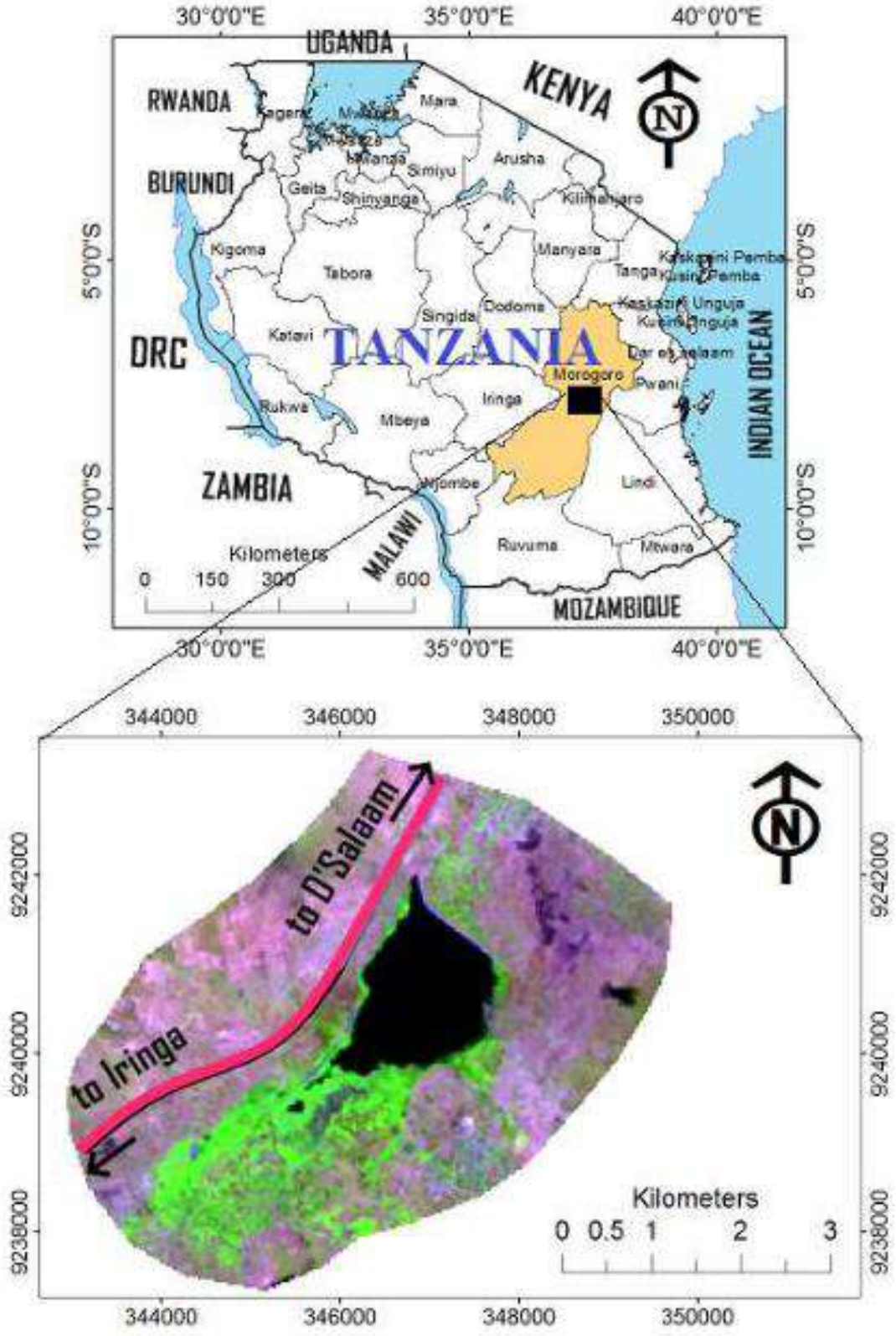

Figure 1
Map Showing the Study Area, Mindu Dam, and Mindu Dam Locations

This image was created by the author through digitization and extraction from the satellite imagery.

3.3 Target Population

As shown in Figure 1 above, as part of the research project, this study included fishermen from the three areas: Kauzeni, Mindu, and Kasanga. These individuals were selected from the study population. The study population

was selected from indigenous fishermen located around the Mindu Dam in the Morogoro region. Both males and females were included in the sample. These individuals were involved in fishing activities.

3.4 Sampling Criteria

The study used simple random sampling to obtain the required sample. The inclusion and exclusion criteria stipulated for simple random sampling were used to select the sample population. Inclusion criteria helped identify the community of interest by using the age, gender, and education levels of the participants to be included in the study (Noor et al., 2021). The inclusion criteria included fishermen who had acquired adequate information on the study topic. Exclusion criteria included fishermen under 18 and those fishing at the time of data collection.

3.5 Data Collection

Questionnaires and key informants' interviews were used as methods of data collection. This study used both closed- and open-ended questionnaires. The interviews also included biographical and open-ended inquiries. The level of literacy was accommodated through interviews with the fishermen.

3.6 Data Analysis

Both descriptive statistics and content analysis were used to analyze quantitative and qualitative data, respectively. The study used the Statistical Package for the Social Sciences (SPSS) Version 20. Descriptive statistics (such as mean) were used. Interview and focused group discussion (FGD) transcripts were analyzed using thematic analysis.

3.7 Ethical Considerations

The researchers did not collect any information related to behaviour, but the respondents were asked to decide on what information to share or not to share. The questionnaire and interviews were voluntary; respondents could choose to participate or not. The respondents were informed of the study's purpose and assured that confidentiality would be maintained, participation was voluntary, the information collected would be anonymous, and it would be used only for academic purposes.

IV. FINDINGS & DISCUSSION

4.1 Demographic and Socio-Economic Characteristics of the Respondents

Table 2 summarizes fish community demographics and socioeconomics. It also includes additional information. Mindu produces 50% of the world's fish communities and coordinators. This suggests that most anglers are from the area around the dam. The statistics showed that 96.3% of fish farmers in the investigated area were male and 3.7% were female. This implies that more men than women fished. The findings are congruent with the Tanzanian study by Chenyambuga et al. (2011) and Mwaijande and Lugendo (2015). These studies indicated that few women kept fish ponds, and that those who did were mostly widowed, divorced, or single. This may be because Tanzanian women are frequently barred from owning land, making it harder for them to fish and invest while also caring for their families. According to Chenyambuga et al. (2011) and Mwaijande and Lugendo (2015), local norms and cultural practices in Tanzanian farming systems make it hard for women to hold land and assets. Most ownership is inherited, which favours men. As shown in Table 2, previous research found that 67.1% of fish farmers were aged 18–35 and 28.1% were aged 36–46. This suggests that most fish farmers in the studied region were economically active. Arfan et al. (2015) report that 40- to 50-year-olds are highly productive and engage in physically intensive fishing. According to the statistics, 45.1% of participants finished primary school. This suggests that most fish farmers in the region under investigation have completed primary school. Voh (2002) found a positive correlation between formal education and the utilisation of modern technology.

Table 2

Demographic and Socio-Economic Characteristics of the Respondents (N=82)

Categories/Factors		N	%
Ward/Landing Site	Mindu	41	50.0
	Kasanga	23	28.0
	Kauzeni	18	22.0
	Total	**82**	100.0
Gender			0.0
	Female	3	3.7
	Male	79	96.3
	Total	**82**	100.0
Level of Education			0.0
	None	18	22.0
	Primary	37	45.1
	Primary School dropout	11	13.4
	Secondary	3	3.7
	Secondary school dropout	12	14.6
	University	0	0.0
	Total	**82**	100.0
Age (years)			0.0
	18-35	55	67.1
	36-46	23	28.0
	47-56	3	3.7
	57 years & Above	1	1.2
	Total	**82**	100.0
Fishing Experience(years)			0.0
	Up to 5	23	28.0
	6-10	47	57.3
	More than 10	12	14.6
	Total	**82**	100.0
Marital Status			0.0
	Single	19	23.2
	Married	42	51.2
	Divorced	13	15.9
	Separated	8	9.8
	Total	**82**	100.0
Household income (Tshs)			0.0
	Less than 500,000	23	28.0
	500,001-1,000,000	21	25.6
	1,000,001-1,500,000	33	40.2
	More than 1,500,001	5	6.1
	Total	**82**	100.0

Table 2 also revealed that 51.2% of the fish farmers were married. This was another observation that was made. It may be deduced from this that married people constitute the majority of those who work in fishing activities in the region. In addition, 57.3% of survey participants had 6 to 10 years of fish farming experience (Table 2). Barguma and Ndaghu (2014) in Nigeria came to similar conclusions, which are supported by these findings. This experience may affect fishing productivity as well as the use of information and communication technologies. Research findings indicated that 42% of respondents reported an annual income exceeding 1 million Tanzanian Shillings. According to Benard et al. (2020), the annual income from fish farming in the Southern Highlands of Tanzania ranges from 1,100,000 to 1,500,000. According to the Abraham (2007), the yearly revenue of fish farmers in the research region was lower than the Tanzanian per capita income of TShs 2,100,000. There is a possibility that the use of information and communication technologies (ICTs) is influenced by fish farmers' income levels in the research area. Arfan et al. (2015) highlight that income shows the strongest positive association with the use of information and communication technologies (ICTs) to strengthen the agricultural community's knowledge base. According to a study by Barguma and Ndaghu (2014), the number of women involved in fishing in Africa is low because it is considered a cultural practice. They believe women are not for fishing, but are for housekeeping. Therefore, in the Mindu dam, the only females practicing fishing are only 3(3.7%) compared to 79 (96.3%) males

4.1.1 The Means and extent of ICTs usage in information Dissemination and sharing by fishermen and coordinators

The findings in Table 3 show the extent of ICT use for information sharing among fish farmers in the study area. The results reveal that the most widely used ICTs for sharing information among fish farmers in the study area were mobile phones (92 per cent), followed by radio (86 per cent) and, finally, television (60 per cent). The extent of ICT usage was measured using Never, Rarely, Occasionally, Frequently, Very Frequently, as shown in Table 3 below. These adverbs of frequency indicate how often an action occurs, ranging from 0% to nearly 100%. The study ranked as: Never (0%), Rarely (~10%), Occasionally (30-40%), Frequently (70%), and Very Frequently (~90-100%).

Table 3

The Means and extent of ICTs usage in information Dissemination and sharing by fishermen and coordinators

Means of Receiving Information	Extent of ICT usage										
	Never		Rarely		Occasionally		Frequently		Very Frequently		Total
	N	%	N	%	N	%	N	%	N	%	N
Mobile Phone	3	3.7	5	6.1	7	8.5	18	22.0	49	59.8	82
Radio	4	4.9	26	31.7	9	11.0	21	25.6	22	26.8	82
Television (TV)	31	37.8	12	14.6	14	17.1	14	17.1	11	13.4	82
Village Pre-Recorded Voice Announcement	6	7.3	5	6.1	5	6.1	19	23.2	48	58.5	82
Computer/Laptop	78	95.1	3	3.7	1	1.2	0	0.0	0	0.0	82
Camera	73	89.0	5	6.1	2	2.4	2	2.4	0	0.0	82
Other means (WhatsApp, etc.)	5	6.1	3	3.7	16	19.5	7	8.5	51	62.2	82

4.1.2 Type of Information Sought by Fishermen

A significant portion (29, 35.4%) indicated that fish catch statistics were frequently cited, suggesting that the utilization of ICTs for accessing information on monitoring and reporting fishing activities is a crucial aspect. Access to data on fish capture, including quantitative metrics such as meteorological conditions and fish catch quantities, highlights the significance of comprehending trends in fishing activity among communities next to Mindu Dam. Furthermore, it was shown that 6 respondents (7.3%) highlighted the necessity of employing ICTs to acquire information regarding both legal and illegal fishing gear, emphasizing a concentration on regulatory issues and the enforcement of fishing legislation. This category encompasses details regarding the equipment, tools, or tactics employed in fishing, differentiating between legally sanctioned gear and that which may be forbidden or utilized in unlawful fishing practices. Seven individuals (8.5%) reported access to health information, indicating recognition of the importance of understanding the health implications of fishing activities. In this context, health information likely pertains to data regarding marine ecosystem health, fish population dynamics, and potential human health issues related to fishing activities, including consumption advisories and occupational health risks for fishermen. In the research sites, recorded Voice Announcements (58.5%) were the primary means of communication and information dissemination to the populace. Almost weekly, once or twice, a selected person from the village may be seen walking around each street while transmitting a recorded announcement over a speaker. In the event of flooding at the dam during the rainy season, an announcement will be issued to warn fisherman from fishing. They have utilized this strategy for several years. They occasionally employ this strategy to notify fishermen about meetings or other fishing-related events. This finding is corroborated by Ibeun and Mdaihli (1994), who conducted study on the utilization of information and communication technology in the Kainji region of Nigeria, identifying the primary information sought by fishermen, including fishing and health information, among others. Ibeun and Mdaihli (1994) discovered that 56 percent of local fishermen owned radios, and 50 percent of respondents engaged in radio listening while fishing. Approximately 11% of the fishermen indicated that they benefited from the radio programs by augmenting their knowledge and acquiring the most recent market price information. Research in Ghana by Jensen (2007) suggested that more than half of the 71% of fisherman reported that mobile phones enhanced contact with their customers and clients, as well as supplied information about fisheries from alternative markets.

Table 4
Information Sought by Fishermen at Mindu Dam

Information Sought	Frequency(f)	Percent (%)	Cumulative Frequency
Fishing Information	29	35.4	29
Health information	7	8.5	36
Politics & government programs	18	22.0	54
Legal and illegal gears	6	7.3	60
Marketing information	9	11.0	69
Weather information	11	13.4	80
Other information	2	2.4	82
Total	**82**	**100**	

The survey findings revealed that 9 (11%) employ digital technologies to get marketing information, underscoring the economic facets of fishing operations and the importance of market dynamics in shaping fisheries management decisions. The participants utilize ICTs to get information regarding the marketing and distribution of fish products, encompassing market trends, consumer preferences, pricing, and promotional strategies. The study findings revealed that 11 individuals (13.4%) employ ICTs to acquire meteorological information, indicating that the fishing community is reluctant to compromise their safety during hazardous seasons. The statistics reveal that respondents employ ICTs to acquire weather information at Mindu Dam, encompassing precipitation amounts and related specifics. Among the respondents, 18 individuals (22%) employed digital technology to solicit government initiatives and policies, underscoring a notable aspect of information services. This indicates the impact of governance on fishing practices in the villages surrounding Lake Victoria. Government programs are initiatives, policies, regulations, and interventions implemented by governmental authorities. Merely 2 individuals (2.4%) affirmed their utilization of ICTs to acquire more information relevant to diverse facets of their lives, including the deaths of family and community members, which they consider vital for participants in the fish value chain. While this proportion represents a lesser segment of the sample population compared to more distinctly defined categories, the additional information may include diverse aspects of fishing activities enabled by digital technologies, such as weather forecasts, security protocols, fish licensing, social media, and water temperature. The study indicated that 36% (7 respondents) utilize ICT to acquire health information. These encompass disease outbreaks and additional occurrences. 7.3% (6 respondents) indicated utilizing digital means to acquire both legal and illicit equipment. This encompasses acquiring information regarding tax, legal, and registration matters, among others. This finding is corroborated by Taylor (1962), who posits that the notion of information need pertains to the individual's or group's inclination to actively pursue and get knowledge to fulfill a requirement, whether it is conscious or unconscious. Endra et al. (2025) disclosed that the fishing community in Uganda sought specific information, which encompassed fish catch statistics, health data, legal and illegal gear, government initiatives, marketing materials, and additional resources. Devadason (1996) proposed a comparable argument, asserting that information requests represent deficiencies in the client's current knowledge. The research conducted by Uzezi (2015) and Kaduskar et al. (2010) indicates that the information requirements of the fishing community are varied and encompass multiple subjects. Examples of these varied subjects encompass sources for fishing equipment, methods for managing water hyacinths, venues for selling fish and fish products, utilization of advanced fishing techniques, and data regarding market fish prices. Also Endra et al. (2025) in their study on Access and Application of Digital Technologies in Information Dissemination within the Fishing Communities and Managers of Lake Victoria in Uganda, supports these results.

4.1.3 The challenges facing fish farmers in the use of information and communication technologies for information sharing

In the following table, Table 5, we highlight the difficulties that fisherman encounter when it comes to the process of sharing and disseminating information through the use of information and communication technology. According to the findings, the most significant challenges that fishermen face when it comes to disseminating information are inadequate training in information and communication technologies (M=4.49), inadequate internet connectivity (M=4.54), language barriers (M=3.94), exorbitant costs associated with acquiring information and communication technology facilities (M=4.26), a lack of awareness regarding the utilization of ICTs for information access (M=4.45), unfavorable radio/television broadcasting schedules (M=4.32), and limited access to information and communication technologies (M=4.33). There are a number of additional problems that have been brought to light through interviews. These problems include limited access to information and communication technologies (ICTs), intermittent power supply, inadequate awareness of how to use ICTs for agricultural information, irrelevant material, and a lack of internet connectivity, as shown in Table 5. It was discovered through the utilization of focus groups,

interviews with key informants, and observations that the broadcasting times for television and radio regarding fish farming were not appropriate, that there was a lack of knowledge regarding certain information and communication technologies (ICTs), such as television operation, that television programs were irrelevant, and that there were financial constraints. All of these findings were discovered. Fishing was a challenging activity for fishermen because of their need to seek information and creativity. The majority of fisherman are male, and just three women were identified as fishermen out of the total number of fishermen. This indicates that there was no gender imbalance. These findings have been supported by a number of authors. Abraham (2007) found that the majority of fishermen did not have a formal education and had a limited grasp of how to use information and communication technologies (ICTs) in the ocean, such as mobile phones, as well as other new technologies, such as GPS and Sonar. This was the conclusion reached by Abraham's research. One of the discoveries that Abraham made was this particular insight. In a similar vein, Haambiya et al. (2020) made the observation that the primary obstacles that impede fishermen from utilizing information and communication technologies (ICTs) are a lack of financial resources and a lack of awareness among the majority of fishermen regarding the usage of these technologies for information sharing. It has been suggested by Omar et al. (2011) that a negative attitude towards the utilization of information and communication technology is one of the impediments that prohibit fisherman from making use of these technologies.

Table 5

The Challenges Facing Fishermen in the use of ICTs in Sharing Information at Mindu Dam

Challenges	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree		M
	n	%	n	%	n	%	n	%	n	%	
Lack of Training on ICTs	2	2%	5	6%	4	5%	11	13%	60	73%	4.49
Poor Internet Connectivity	3	4%	1	1%	1	1%	21	26%	56	68%	4.54
Language Barriers	3	4%	5	6%	6	7%	48	59%	20	24%	3.94
High Cost of acquiring ICT facilities	2	2%	8	10%	9	11%	11	13%	52	63%	4.26
Lack of awareness on the use of ICTs for assessing information	1	1%	1	1%	1	1%	36	44%	43	52%	4.45
Unfavourable radio/television broadcasting time	2	2%	2	2%	9	11%	24	29%	45	55%	4.32
Lack of Access to ICTs	2	2%	2	2%	5	6%	31	38%	42	51%	4.33

Using the mean (M) column in table 5, the following are the averages of the challenges: a lack of training on information and communication technologies (ICTs) (M=4.49), poor internet connectivity (M=4.54), language barriers (M=3.94), high cost of acquiring ICT facilities (M=4.26), lack of awareness on the use of ICTs for assessing information (M=4.45), and unfavourable radio/television broadcasting time (M=4.32). Those that have the higher mean suggest that there is a shortage of connectivity to the internet. Abraham (2007), in his article titled "Mobile phones and economic development," offers evidence that supports the notion that this is the case. Evidence from the fishing industry in India reveals that fishermen have difficulties as a result of limited internet connectivity. This evidence is supported by the fact that Internet connectivity is inadequate. Additionally, a number of authors supported conclusions that were comparable to those. According to the findings of Marciniak (2010), fishermen suffer a huge amount of difficulty when it comes to employing information and communication technology (ICT). There are many challenges, one of which is the high expense of products, particularly in relation to computers and sonar stations. According to the findings of a study that was carried out by Hosseini and colleagues (2009), the following issues were identified: a lack of competence, a negative attitude towards contemporary technology, a low number of service centers in remote areas, limited bandwidth, a lack of hardware, and inadequate infrastructure. All of these issues were identified as problems. According to Hosseini et al. (2009), some of the challenges that prevent fishermen communities from utilizing information and communication technology include a limited number of websites, inadequate telecommunication networks, ancient telephone lines, and a poor quality of service offered by service centers. These are just some of the challenges that are faced. These are the challenges that prohibit societies dedicated to fishing from embracing technological advancements. Additionally, a few websites are referenced, which is another point of interest that is highlighted. There are a few websites that are specified in this sentence.

V. CONCLUSION & RECOMMENDATION

5.1 Conclusion

The research indicated that fishermen in the Mindu Dam regularly used mobile phones, radios, and televisions to exchange and disseminate information. These innovations enhance market access, communication, and community participation for fishermen surrounding Mindu Dam. Integrating ICTs into daily operations enables fishermen to expand networks, increase production, and adopt safer, more sustainable methods, thereby improving their access to and distribution of information. Ultimately, these technologies will facilitate economic empowerment and the sustained development of Tanzania's fishing sector. The findings indicated that fishermen encountered multiple challenges in utilizing ICTs for the sharing and dissemination of fishing information, including insufficient training on ICTs, inadequate internet connectivity, language barriers, high costs associated with acquiring ICT facilities, lack of awareness regarding the use of ICTs for information access, unfavorable broadcasting times for radio and television, and limited access to ICTs.

5.2 Recommendations

Consequently, to address the challenges encountered by fishermen in utilizing ICTs, the study advocates that the pertinent ministry, via its extension personnel, should incentivize and conduct regular training sessions for these communities on the use of ICTs (mobile phones, radios, and television) to enhance their proficiency and skills in accessing and disseminating fishing information. Digital training is required for fishermen to use applications and digital technologies. Targeted training in digital literacy should be provided for fishers, alongside guaranteeing their access to essential information on health, safety, fish breeding areas, accounting, and marketing of their catch. The study advises the government, NGOs, and relevant private organizations to enhance information-sharing methods among fishers by delivering timely information through appropriate dissemination channels. It also highlights the need to address barriers to information dissemination, including inadequate connectivity, affordability concerns, and low digital literacy. The report ultimately advocates coordinated efforts to develop digital infrastructure that facilitates technological advancements and provides affordable internet access, thereby improving accessibility. To ensure effective access to and dissemination of information, it is imperative to enhance digital access and strengthen digital literacy initiatives among fishermen. This will significantly enhance the effective access to and dissemination of information. It is essential to develop additional ICT infrastructure to improve connectivity for mobile phones, radios, and television networks, and to increase investment in rural regions to encourage their utilization. Furthermore, the government ought to provide subsidized ICT equipment to improve farmers' access. The government should encourage media proprietors to disseminate more fishing information via radio and television, ensuring that programs are aired at suitable, convenient times for farmers, particularly at night, as most farmers suggest.

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