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Effectiveness of Digital Communication Technologies in Reaching Fish Farmers with Innovations in Yenagoa Agricultural Zone, Bayelsa State, Nigeria

Okringbo, I. J. and Chukuigwe, O.

Department of Agricultural Economics, Extension and Rural Development, Niger Delta University, Bayelsa State, Nigeria

Department of Agricultural Extension and Rural Development. Rivers State University. Port Harcourt, Nigeria : **Corresponding Author's E-mail: inemookringbo@ndu.edu.ng**

ABSTRACT

The study analyzed the effectiveness of digital communication technologies in reaching fish farmers with innovations in Yenagoa Agricultural Zone, Bayelsa State, Nigeria. Purposive sampling technique was used in the selection of Yenagoa Agricultural Zone. A sample of 120 fish farmers were randomly selected from six sub-circles. Data were collected using structured questionnaire, and was analyzed with descriptive statistics, such as mean, while multiple regression and analysis of variance was used to test the hypotheses. The results showed that Mobile phone ($\bar{x}$ =3.2), radio and television ($\bar{x}$ =3.5), Facebook ($\bar{x}$ =3.3), WhatsApp ($\bar{x}$ =3.5), Instagram ($\bar{x}$ =3.3), Telegram ($\bar{x}$ =2.6) and Messenger ($\bar{x}$ =3.1) were digital communication technologies in reaching fish farmers. Source of fingerling ($\bar{x}$ =3.6), fish harvesting time/ technique ($\bar{x}$ =3.6), fish processing/preservation ($\bar{x}$ =3.6), water quality monitoring and maintenance ($\bar{x}$ =3.4), pond construction ($\bar{x}$ =3.4) and bioremediation (degradation of hazardous waste) ($\bar{x}$ =3.2) were innovations reached out to fish farmers. The regression result indicated that the coefficient of digital communication technologies (4.250) was positive and statistically significant at 1%. The study concluded that digital communication technologies was effective in reaching fish farmer with new innovations. Hence, the study recommended that effort should be made to encourage fish farmers on the frequent use of Gmail, Twitter, Telegram and yahoo mail have access to new fishing innovations.

***Keywords**: Digital Communication, Technologies, Fish Farmers, Innovations*

INTRODUCTION: Through efficient transfers of agricultural technical innovation, digital communication technologies have helped fish farmers increase their motivation for productivity (Nwachukwu, 2013). According to Ironkwe and Mbanaso (2012), the goal of bringing digital communication technology to farmers is to enhance living conditions and, as a result, create chances for rural farmers to earn a living and raise their standard of living. Still, to enable and assist fish farmers in responding to the concerns of food security, market growth, climate change, and disease outbreak, the implementation of digital communication technology in our farming activities is crucial (Grote *et al.,* 2021). Our economy, society, and lives are changing as a result of digital communication technologies. Particularly significantly, technology has affected the information and communications sectors.

Our economy, society, and lives are changing as a result of digital communication technologies. The information and communication activities that have always been essential to sustainable development have been particularly impacted by technology (Gangadhar, 2011). Due to their lack of information about prices, market conditions, regulations, and new opportunities, farmers are a socioeconomic group that is particularly vulnerable to the costs

associated with information asymmetries (Greenwald and Stiglitz, 1986 quoted in Ejiogu-Okereke, et al. 2016). Since most of these farmers are in isolated areas, crucial information is frequently transmitted slowly.

The power of smaller or otherwise disadvantaged groups can be increased while lowering the volatility of fish prices and fish wastage if information about prices and availability is shared along value chains. Access to and exchange of key information can help fishing communities make decisions on a variety of issues, from whether to engage in specific fishing operations to whether to trade at a local market to whether to participate in a meeting - decisions that can help reduce their vulnerability and improve their opportunities (Food and Agricultural Organization, 2007).

Fishermen are shown to have a variety of financial and economic issues when using digital communication tools, according to Hosseini *et al*. (2009). Digital communication tools like Facebook, Twitter, WhatsApp, Zoom, Instagram, and massagers might theoretically bring about radical changes in fishing communities. Networks for sharing knowledge about agriculture are underdeveloped. It is not due to a lack of effort on the part of the corporation or the government to promote the product, but rather to the users' poor technological awareness (Xiaowei, 2018 cited in Muhammad and Roy Sembel, 2021). Fishermen needed to be made aware of the need for infrastructure and access to it in order to receive relevant and useful information as well as instruction on the use of the infrastructure (Joshi and Ayyangar, 2010). Determine how fish farmers are reached by digital communication technologies, identify innovations that have reached fish farmers, and assess how successful digital communication technologies are.

METHODOLOGY: This study was conducted in Yenagoa Local Government area of Bayelsa state, Nigeria. It is located at the southern part of the country with coordinates 4°55'29" N 6° 15'51'E. The Local government area has an area of 706 kilometer square and a population of 352,285 at the 2006 Census (National Population commission of Nigeria). Yenagoa Local Government area lies within the rain forest zone with a humid equatorial climate and mean annual rainfall ranging from 2000 to 4000mm alternating rainy (March to November) and dry (December to February) seasons. English language is the official language, but Epie-Atissa language is one of the local languages spoken in Yenagoa, others such as Ekpetiama, Gbarain, Biseni and Zarama are Ijaw dialect in Yenagoa local government area. (Yenagoa Physical Setting, 2003). Purposive sampling technique was used in the selection of Yenagoa Local Government area, which is the host to Bayelsa State Agriculture and the aquaculture village. Stratified sampling technique was used in the selection of the sample of 120 fish famers. In the first stage, wo extension blocks were randomly selected from the Zone, while in the second stage, 2 sub-circles were selected from each block, giving a total of 6 sub-circles. In the third stage, twenty fish farmers were randomly selected from each sub-circle, giving a sample size of one hundred and twenty (120) fish farmers. Data collected through well-structured questionnaire were analyzed with descriptive statistic, simple linear regression was used to test the hypotheses. The questionnaire was a 4-point likert type of strongly agree, Agree, Disagree and Strongly disagree to which numerical values 4, 3, 2 and 1 were assigned respectively. Hence, the cut-off point of 2.55 as the upper limit was used to determine a positive response (i.e., 2.5 + 0.005 = 2.55).

Result and Discussions : Table 1 shows digital communication technologies in reaching fish farmers. The result showed digital communication technologies in reaching fish farmers are; mobile phone ($\bar{x}$=3.2), radio and television ($\bar{x}$=3.5), Facebook ($\bar{x}$=3.3), twitter ($\bar{x}$=2.4), zoom ($\bar{x}$=2.5), WhatsApp ($\bar{x}$=3.5), Instagram ($\bar{x}$=3.3), telegram ($\bar{x}$=2.6), messenger ($\bar{x}$=3.1), Gmail ($\bar{x}$=2.3), and Yahoo mail ($\bar{x}$=2.8) which were ranked 1st, 2nd , 3rd, 4th and 5th respectively. This implies that digital communication technologies had significant effect on reaching fish farmers with new fishing innovation and also enable fish farmers to market their catch. This finding is in tandem with the submission of (Muhammad and Roy Sembel, 2021), agricultural organizations that invest in digital communication solutions are expecting to deliver

annual growth and cost efficiencies around 5-10% or more in the next 3-5 years. According to Yasmin (2015) asserted that most of the information used by the firm for its digital marketing program is still related to farmer's engagement. If the firm focus to deliver direct information such as product knowledge and a special program to the specific targeted audience at the right time, it can influence positively the sales.

Table 1 Digital Communication Technologies in Reaching Fish Farmers

Variable	SA	A	D	SD	Sum	Mean	Rank
Mobile phone	60	35	10	15	380	3.2	3rd
Radio and television	70	40	10		420	3.5	1st
Facebook	55	45	15	5	390	3.3	2nd
Twitter	30	20	40	30	290	2.4	8th
WhatsApp	70	40	5	5	415	3.5	1st
Zoom	30	25	40	25	300	2.5	7th
Instagram	56	44	15	5	391	3.3	2nd
Telegram	25	45	30	20	315	2.6	6th
Messenger	50	45	15	10	375	3.1	4th
Gmail	10	30	60	20	270	2.3	9th
Yahoo mail	30	40	40	10	330	2.8	5th
Decision cut-off point						**2.5**	

Source: Field survey data, 2023

Note: SA=strongly agree, A= agree, D= disagree and SD= strongly disagree.

Table 2 shows the innovation reached out to fish farmers. The result showed innovations reached out to fish farmers; source of fingerling ($\bar{x}$=3.6), fish harvesting time/ technique ($\bar{x}$=3.6), fish processing/preservation ($\bar{x}$=3.6), water quality monitoring and maintenance ($\bar{x}$=3.4), pond construction ($\bar{x}$=3.4), plant protein (reduce pressure on wild fish stock) ($\bar{x}$=3.4), sanitation ($\bar{x}$=3.4), brewer yeast and plant lipid ($\bar{x}$=3.4), bioremediation (degradation of hazardous waste) ($\bar{x}$=3.2) and application transgenic technology to enhance growth rate and market size ($\bar{x}$=1.9) which ranked 1st, 2nd, 3rd, 4th and 7th respectively. This implies that the innovations reached out to fish farmers had significant and positive effect on their farms. This find is line with Ejiou-Okereke, Chikaire, Ogueri and Chikezie (2016) who submitted that valuable information that can be made available through ICTs includes fishing and processing techniques and equipment, sales and marketing advice, financial advice and services and legal issues. Access to and exchange of key information can assist fishing communities in making informed decisions on a variety of matters from whether to engage in specific fishing operations to trading at a local market to participating in a meeting – decisions that can help reduce their vulnerability and improve their opportunities.

Table 2: Innovations reached out to fish farmers

Variables	SA	A	D	SD	Sum	Mean	Rank
Water quality monitoring and maintenance	70	30	15	5	405	3.4	2nd
Pond construction	67	33	15	5	402	3.4	2nd
Source of fingerling	75	35	10		435	3.6	1st
The use of phytase enzyme (optimal use phosphorous available in plant –protein based feed)	30	25	45	20	305	2.5	5th
Plant protein (reduce pressure on wild fish stock)	65	35	18	2	403	3.4	2nd

Brewer yeast and plant lipid	65	35	12	8	397	3.3	3rd
Bioencapsulation (oral delivery of vaccines and vitamins)	55	38	17	10	378	3.2	4th
Bioremediation (degradation of hazardous waste)	69	21	20	10	389	3.2	4th
Underwater closed circuit television	12	26	40	22	228	1.9	7th
Application transgenic technology to enhance growth rate and market size	20	10	50	40	230	1.9	7th
Genetic sequencing and markers (sex determination)	19	31	50	20	289	2.4	6th
Disease prevention	65	25	20	10	385	3.2	4th
Sanitation	77	23	15	5	412	3.4	2nd
Fish harvesting time/ technique	76	34	10		436	3.6	1st
Fish processing/ preservation	69	41	10		429	3.6	1st
Water quality/management	59	40	19	2	396	3.3	3rd
Feed storage	70	30	12	8	402	3.4	2nd
Decision cut-off point						2.5	

Source: Field survey data, 2023

Note: SA=strongly agree, A= agree, D= disagree and SD= strongly disagree.

Effectiveness of digital communication technologies in reaching fish farmers : Table 3 shows the effectiveness of digital communication technologies in reaching fish farmers. The result showed that the digital communication technologies in reaching fish farmers was effective; disseminate and share fisheries related information services, business opportunity ($\bar{x}$=3.4), marking the spots of the fish location ($\bar{x}$=3.4), enhancing the security aspects of the fishermen ($\bar{x}$=3.4), for record purposes (ex: profit and loss, species caught, weather condition, markets ($\bar{x}$=3.2) and capturing, storage, processing, transmission and display of information ($\bar{x}$=3.3). This implies that agricultural research institutes and agricultural development programme were effective with their routine activities with fish farmers and digital communication technologies are valuable tools to aid fish farmers. This study corroborates findings of information communication is very crucial in agricultural and rural development.

Table 3: Effectiveness of digital communication technologies in reaching fish farmers

Variables	FT	M	A	Q	Sum	Mean
Disseminate and share fisheries related information services, business opportunity	70	30	15	5	405	3.4
Marking the spots of the fish location	58	50	10	2	404	3.4
Enhancing the security aspects of the fishermen	59	49	7	5	402	3.4
For record purposes (ex: profit and loss, species caught, weather condition, markets	60	37	15	8	389	3.2
capturing, storage, processing, transmission and display of information	49	55	10	6	397	3.3
Decision cut-off point					2.5	

Source: Field survey data, 2023

Note: M= Monthly, Q= quarterly, A= annually and FN= Fortnightly.

Result in Table 4. Show the Based on the magnitude of the coefficient of simple determinations (r^2), the significance of the regression coefficient, and the sign of the significant variable as they conform to *a priori* expectations as well as the significant of the entire model as shown by the F- statistic, linear model was chosen as the lead equation. The value of the coefficient of simple determinations (r^2) was 0.426, implying that about 42.6% of the variations in reaching fish farmers with

innovations in the Yenagoa Agricultural Zone was explained by the digital communication technologies. The regression result indicated that the coefficient of digital communication technologies (4.250) was positive and statistically significant at 1%. This implied that effectiveness of digital communication technologies was positively related to effectiveness in reaching fish farmers with innovations in Yenagoa Agricultural Zone, Bayelsa State. This result is in line with the findings of Ejiogu-Okereke *et al.* (2016) whose result showed that information communication technologies play the following roles in fish farming: information exchange, knowledge sharing, promotion of education, monitoring illegal fishing and price information provisioning in Rivers State.

The above means that good and timely knowledge is essential for fish production competing in local and global markets. Also information about new innovations in fish production, markets and financial provisions can be shared across farmers along value chains, increasing the power of smaller or otherwise disadvantaged groups while reducing the volatility of fish prices and wastage of fish. Access to and exchange of key information can assist fishing communities in making informed decisions on a variety of matters from whether to engage in specific fishing operations to trading at a local market to participating in a meeting – decisions that can help reduce their vulnerability and improve their opportunities (Ejiogu-Okereke *et al.*, 2016).

Table 4. **Effectiveness of digital communication technologies in reaching fish farmers with innovations.**

Variables	Linear^{+}	Exponential	Semi-log	Double log
Constant	14.265 (12.304)***	1.165 (48.239)***	17.823 (20.195)***	1.233 (67.754)***
Digital communication technologies	4.250 (9.458)***	0.083 (8.884)***	20.432 (8.878)***	0.404 (8.520)***
r^2	**0.431**	**0.401**	**0.400**	**0.381**
Adj r^2	**0.426**	**0.396**	**0.395**	**0.376**
F-statistic	**89.455*** **	**78.921*** **	**78.826*** **	**72.585*** **

Note: *** indicates statistically significant at 1% level. + stand for the lead equation. Figures in parentheses are t-values.

With a computed value of F-test (ANOVA) greater than the tabulated F-value of at 5% levels significance, the reject null hypothesis is rejected and the alternative accepted. Hence, there is significant difference on digital communication technologies usage amongst fish farmers in the study area. Digital communication technologies usage fortnightly or monthly will help in addressing food and livelihoods security issues and the lack of extension support for fishers and fish farmers through information networks. New opportunities can emerge from combining mobile and newer networking technologies which can enable access to a range of government services (e-government) to remote fishing communities. For example, as reported by FAO (2007), the pilot Fishnet set up by the Ilaje Local Government in Ondo State, Nigeria, used meetings, television, leaflets, radio, posters and other methods, supervised by fisher cooperative groups, to share user-driven content on fish production techniques. The success of the project's listening groups also showed the value of targeting such projects and programmes using digital communications to groups rather than individuals

Table 5: Effectiveness of digital communication technologies in reaching fish farmers.

	Sum of squares	Df	Mean square	F-statistic	p-value
Between groups	7.643	4	1.911	2.848***	0.023
Within groups	399.150	595	0.671		

Df: Degree of freedom.

Conclusion and Recommendation: The study concluded that digital communication technologies was effective in reaching fish farmer with new innovations. Digital communication technologies in reaching fish farmers are; disseminate and share fisheries related information services, business opportunity, marking the spots of the fish location, enhancing the security aspects of the fishermen, for record purposes (ex: profit and loss, species caught, weather condition, markets and capturing, storage, processing, transmission and display of information. Digital communication technologies had significant effect on reaching fish farmers with new fishing innovation. Based on the findings of the study, the following recommendations were **:**There is need to provide fish farmers within the age range of 31-40 years with radio and television and android phones with active WhatsApp application for effective dissemination of new fishing innovations.**:**Effort should be made to encourage fish farmers on the frequent use of Gmail, Twitter, Telegram and yahoo mail have access to new fishing innovations**:** There is need to educate fish farmers on water quality monitoring and maintenance, harvesting time/technique, processing and preservation.**:** There is need for telecommunication companies to extension their network courage to fishing camps that within rural areas because sixty percent of fish consumed in the urban areas are exported from fishing ports in the rural areas.**:** Effort should be made by cooperative societies, State Ministry of Agriculture and Non-governmental organizations to establish storage and processing facilities and fortnight meeting should be conducted regularly without any interruption.

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