

USE OF ICTS IN SHARING AGRICULTURAL INFORMATION AMONG FISH FARMERS IN THE SOUTHERN HIGHLANDS IN TANZANIA

Ronald Benard

Lecturer,
Sokoine University of Agriculture, Tanzania

Frankwell Dulle

Professor and Head of Department of Knowledge Management
Sokoine University of Agriculture, Tanzania

H. Lamtane

Senior Lecturer
Department of Animal, Aquaculture and Range Sciences, Sokoine University of
Agriculture, Tanzania

Abstract

This paper assesses the use of ICTs in sharing agricultural information among fish farmers in the Southern Highlands of Tanzania. The main objective of the study was to assess the use of ICTs among fish farmers in sharing agricultural information. Specifically, the study focused on: assessing types of ICTs preferred by fish farmers in sharing agricultural information; determining the degree of ICTs usage among fish farmers in sharing agricultural information; and examining the influence of socioeconomic characteristics on fish farmer's ICTs preferences.

The study was carried out in twelve purposeful selected divisions in six districts of the three regions of Southern Highland of Tanzania namely Ruvuma, Mbeya and Iringa. It involved 240 fish farmers who were randomly selected. The study employed a cross section research design and used quantitative and qualitative research approaches in collecting data. The employed questionnaire, Focus Group Discussion, observation and key informants interview in data collection. Quantitative data were analyzed by using both descriptive and inferential statistics with the aid of SPSS version 20 while qualitative data were analyzed using content analysis.

The study found that mobile phones, radio and television were most used by the fish farmers in sharing agricultural information while the internet was least used. Likewise, results showed that television was the most preferred ICT tool by fish farmers in information sharing. Further results showed that ownership of television had a positive significant relationship with the farmers' preferences toward its usage at probability level of 0.005. Moreover, the paper concluded

and recommended that since ICT tools play an important role in communicating and sharing relevant and current agricultural knowledge and information to farmer's communities, the Government should support fish farmers by subsidizing some costs that more fish farmers can acquire and use them.

Introduction

In fish farming, information is key a determinant of fish farming production as farmers' need to be updated with various fish farming technologies necessary for higher yield. Ijatuyi *et al.*, (2016), Oladele, (2006) point out that information is vital for increasing fish farming production and improving the marketing and distribution strategies of fish products. Information also opens windows of sharing experiences, best practices in fish farming production, sources of financial aids and new markets. In addition, Soyemi and Haliso (2015) mention the potentials of information use in aquaculture to include; awareness on various improved fish farming technologies; awareness on improved fish breeds, fish feeds and fish feeding; and increased productivity. Hence, fish farmers need to be updated with current information in order to improve their fish farming management practices thus improving fish productivity.

For fish farmers to be productive in fish farming they need to be informed and updated with information in breeds and spawning, storing and preservation, fish processing, stocking operations, feed formulation techniques, feeding operation and record keeping (, Ijatuyi *et al.*, 2016; Adefalu *et al.*, 2013; Ofuoku, *et al.*, 2008). All these types of information need to reach farmers through appropriate communication channels and in right time. In view of that Barguma and Ndaghu , (2014) and Joel, and Adigun (2013), state that one of the ways to bring about enhancement in fish farming production is the provision of right information through appropriate source that is accessible to fish farmers whose such information are meant for. This calls for use of ICTs in sharing information among fish farmers in Tanzania.

ICTs facilitate the availability and accessibility of information to fish farmers and reduce the cost of sharing and disseminating information to fish farmers. Okello *et al.*, (2014), Barguma and Ndaghu (2014), argue that unlike the traditional agricultural information dissemination methods, ICT tools have the benefit of offering a cheaper way of communicating and sharing knowledge and information to fish farmers in the fastest way; delivering training and education modules to farmers; and improving farmers' access to markets and aquaculture credit. Moreover, ICT tool empower fish farmers to negotiate better prices and facilitate and strengthen networking among fish farmers (Barghuma and Ndaghu, 2014), .In addition, Richad *et al.*. (2010) Matuha (2015), argue that

fish farmers can apply ICTs to increase farm productivity by matching cropping practices to climatic trends, use inputs and resources optimally, and ensure good fish farming practices through improved breeds, feeds and pond management. Likewise, Akinbile and Alabi (2010) point out that the enhancement of fish farming production can be achieved by improving the capacity in terms of enhancing access to information which can be achieved through enhanced information seeking behavior by the use of Information Communication Technologies.

However, the extent to which ICTs have been used in provision of fish farming information to fish farmers in Tanzania is not known. This is confirmed by Chilimo (2009) Benard and Dulle, (2017) who reported that despite the strong belief in the role of ICTs for social economic development, clear evidence on how ICTs can be used to achieve this purpose in the Tanzanian context is still lacking. Thus, this study specifically, intended to: assess the types of ICTs preferred by fish farmers in sharing agricultural information; determine the degree of ICTs usage by fish farmers in sharing agricultural information and examine the influence of socioeconomic characteristics on fish farmer's ICTs preferences

Methodology

This study was conducted in the Southern Highlands of Tanzania namely Iringa, Mbeya and Ruvuma. These Southern Highlands regions (Ruvuma, Iringa and Mbeya) were selected because they are among the areas in Tanzania where fish farming production is in large amount and also have high development in ICT infrastructure compared to another regions in the country (FAO, 2017). . The study districts were chosen basing on the higher production of fish farming and presence well-established ICT infrastructure. Basing on the mentioned criteria two districts from each region namely Mbinga and Songea districts of Ruvuma Region, Mbeya and Mbarali districts of Mbeya Region, and Iringa and Mufindi districts of Iringa Region were chosen for this study. From each district, two divisions with at least twenty (20) fish farmers and good ICTs infrastructure were selected purposefully. Twenty fish farmers were randomly selected from each division basing on ownership of at least one type of ICT tool. This made a sample size of 240 respondents. Saunders *et al.* (2007) argued that a sample size of 30 or more can usually result in a sampling distribution that is very close to the normal distribution and the larger the absolute size of a sample, the closer its distribution will be the normal distribution.

To attain the main objectives and the purpose of the study, a cross-sectional research design was adopted. The design allowed a researcher to collect data at once in a single point. The study used both quantitative and qualitative

approaches. Both primary and secondary data were collected. Quantitative data were mainly collected using a structured questionnaire while qualitative data were collected from key informant interview and Focus Group Discussions. An interview guide was used for the interview with 6 key informants (one fishery officer in each of the six districts were selected purposefully); an observation guide was used for collecting data through observation while a Focus Group Discussion guide was used during discussions with 48 fish farmers who have been practicing fish farming for at least five years. One Focus Group Discussion with eight participants was held in each of the selected districts. Barbour (2011) recommends that eight participants per session is an adequate number for Focus Group Discussions (FGDs).

Data Analysis

Collected and coded data were analyzed using Statistical Package for Social Sciences (SPSS) Version 20. Descriptive and inferential statistics such as frequency distribution, percentage analysis, and binary logistic regression analysis was used to test the strength of association among variables. On the other hands, Omnibus test and Hosmer and Lemeshow was used to test the fitness of the binary logistic regression model that was used. Content analysis was used for analyzing qualitative data and presenting it through summaries and explanations.

Results and Discussion

Social economic characteristic of the respondents

The socio-economic characteristics of the interviewed fish farmers were analyzed and presented in Table 1. From Table 1, 48 (20%) of the respondents were females while 192 (80%) were males. This infers that more males are involved in fish farming than females. These findings are in line with Uzezi (2015) from Nigeria who reported that males engage more in fish farming than females. This may be due to the fact that in Tanzania women are sometimes not entitled to own land, this make it hard for some women to invest in fish farming. Chenyambuga et al., (2014) and Mwaijande and Lugendo (2015) insist further that local customs and cultural practices in many farming systems in Tanzania make it impossible for a woman to own assets and land as these are attained mainly through inheritance which favours men to own assets.

Furthermore, findings report that 47.1% of the respondents were in the 47 to 56 age group (Table 1). This implies that most of the fish farmers in the study area were within the economically active age group. According to Olaoye *et al* (2014) ages between 40 and 50 are considered highly productive and active to undergo energetic task associated with fish farming activities. Also from Table

01 it indicates that majority of the fish farmers in the study area, had at most, primary school education. It has been claimed that level of education may affects information accessibility, comprehension and adoption of modern agricultural practices (Kughur et al., 2015).

Furthermore, it was found that large percentages of the respondents were married couples (Table 1). Likewise, research findings show that 72.9% of the respondents had fish farming experience of up to five years (Table 1). This experience in fish farming is similar to that reported by Barguma and Ndaghu (2014) from Nigeria. This implies that majority of the respondents had experience in practicing fish farming activities at the study area. It was found that 45.4% of respondents had an income level of more than Tsh. 1,500,000/= per year. This implies that the income level of the fish farmers in the study area was below the per capital income of Tanzanian citizen which is Tsh. 2,100,000/= per year (TNBS, 2016). The low income of the fish farmers in the study area could be due to low information accessibility. According to Fadoyin *et al.* (2015) the level of income may influence farmer's information accessibility and use.

Table 1: Social economic characteristic of the respondents (N= 240)

Factors	N	%
Sex		
Male	192	80.0
Female	48	20.0
Education level		
No formal education	15	6.3
Primary education	163	67.9
Secondary education	39	16.3
Tertiary education	23	9.6
Age (years)		
18 – 35	40	16.7
36 – 46	71	29.6
47 – 56	113	47.1
57 – 66	16	6.7
Marital status		
Single	18	7.5
Married	211	87.9
Divorced	3	1.2
Separated	1	0.4
Household income (Tsh.)		
Less than 500,0000	38	15.8

500,001- 1000 000	60	25.0
1000 001 – 1500,000	33	13.8
More than 1500,000	109	45.4
Farming experience(years)		
Up to 5	175	72.9
6 – 10	51	21.2
More than 10	14	5.8

The extent of ICTs use in sharing agricultural information by fish farmers

This study investigated the most common ICT tools used by fish farmers for sharing agricultural information. The most often used ICTs by fish farmers in sharing agricultural information were mobile phones, radio and television respectively (Table 2).

The results revealed that, mobile phones were mostly used. This could be explained by fact that mobile phones are easily accessible, available, cheap and facilitate a two-way communication for fish farmers to seek for some more clarification and get instantly feedback. This was evidenced during Focus Group Discussions and Key informant interviews where it was reported out that most fish farmers preferred to use of mobile phones than other ICT tools because they are more convenient.. For example, during FGD one farmers from Sadani Village in District pointed out that *“With a mobile phone I can communicate with fishery officers and ask for some information related to weather, market, credits, fish pond construction, fish feeding, source of fingerings and other information without necessarily traveling a long distance to meet them”*. Likewise, some fishery officers pointed out that they use mobile phones more frequently because they help them to overcome problems of transport. With mobile phones, they don’t need to travel to visit farmers located far away. They can just call them when there is new knowledge or information. The findings of this study are in line with those of Chavula (2014) and Eucharia et al., (2016) which also found that mobile phones are the most used ICT tools among fish farmers because of their availability, wide coverage, and being accessed at a modest cost.

Furthermore, findings revealed that radio was the other ICT tool used by fish farmers in sharing agricultural information. The high usage level of radio is explained by its affordability, flexibility, ease language comprehension and its credibility in communicating timely, and relevant agricultural information to farmers. During focus group discussion it was reported that radio programmes aired to farmers were useful and enriched them with relevant and credible information on how to improve their fish farming management practices. For instance, during FGDs in Kigonsera Village in Mbinga Dstrict one farmer pointed out that *‘listening to radio programmes related to fish farming has*

helped me to construct a fish pond with acceptable dimensions'. The use of radio in sharing information to fish farmers is also supported by Njoku (2016) who describe that radio is very effective and credible medium in agricultural technology transfer to rural farmers.

Findings indicate that even though television programmes are credible and key sources of information to farmers, few fish farmers mentioned to access information through these ICT tool as compared to radio and mobile phones (Table 3). This observation contradicts with results of Aphunu and Atoma (2011) and Eucharia *et al.* (2016) who reported that majority of the fish farmers used television more frequently in sharing fish farming information. Based on findings accessed through FGDs, this disparity is explained by the high cost of purchasing television sets, lack of electricity in most rural areas and in appropriate time for broadcasting agricultural programmes related to fish farming.

Table 2: The extent of ICTs usage in accessing agricultural information by fish farmers

ICTs	Mobile phone		Radio		TV	
	n	%	N	%	n	%
Never	19	7.9	32	13.3	95	39.6
Rarely	70	29.2	135	56.2	71	29.6
Occasionally	56	23.3	45	18.8	25	10.4
Frequently	86	35.8	27	11.2	46	19.2
Very frequently	9	3.8	1	.4	3	1.2
Total	240	100.0	240	100.0	240	100.0

Types of ICTs preferred by fish farmers in sharing agricultural information

Table 3 summarizes the preferences of ICT tools among fish farmers. The findings reported that television was the most ICT tool preferred by fish farmers in information sharing followed by radio and mobile phones while the least preferred ICT tool was internet. This is probably because with television farmers can see and learn what others practice, it is also a credible source of information which can communicate various fish farming technologies to farmers within a short time of period. According to Sharma *et al.*, (2008) and Benard *et al.* (2014), television and radio play main part in transferring current and relevant agricultural technology to educated and uneducated farmers within a short time.

Likewise, radio was another preferred ICT tool among fish farmers after television. This can be explained by the fact that with radio farmers can access relevant and currently information from anywhere and during any time at

reasonable cost. According to Sharma et al., (2008) radio is preferred by farmers because it is an effective medium that can be used to reach masses of rural farmers irrespective of age and the level of literacy (Tire, 2006). In relation to cost, it is an extremely cost effective medium as compared to other extension media and methods involving individual and group contacts (Kakade, 2013).

Another ICT tool mentioned to be preferred by fish farmers in information sharing is mobile phone. Preference to mobile phone is explained by its easily availability, affordability, ability to facilitate a two-way communication. Moreover, with mobile phone it is easy to get immediate or instantly answers or feedback. In supporting this Freeman and Mubichi (2017) argued that information from mobile call-up is cheap, reliable and easy to use oppositely to information from radio program and television. This was justified during Focus Group Discussions and Key Informant Interviews where it was found that most fish farmers preferred to use mobile phones because they are affordable and convenient to use. For instance, during FGD a farmer from Kigonsera Village from Mbinga District pointed out that *“with mobile phones, I can communicate with my fellow farmers asking for some important information regarding to fish feeding, acceptable fish ponds dimensions, how to deal with fish predators, source of fingerlings and other information with less effort and time”*.

Findings indicate that internet was the least preferred ICT tool among fish farmers in information sharing. This is probably due to lack of ICT infrastructure in rural areas, illiteracy among fish farmers, lack of skills on how to use internet, lack of awareness of the role of the Internet as an important source of agricultural information, and most of the fish farmers cannot afford to invest in computers or smart phones. This observation is not surprising because Malhan and Rao, (2007) also reported that the Internet is less used in developing countries due to poor information infrastructure and high poverty levels among rural communities.

Table 3: Types of ICTs preferred by fish farmers in sharing agricultural information

ICTs	Mobile phone		Radio		TV		Internet	
	n	%	N	%	n	%	n	%
Most preferred	94	38.1	137	57.3	192	80.3	48	20.1
Preferred	102	42.7	42	17.6	14	5.9	6	2.5
Slightly	40	16.7	50	20.9	25	10.5	52	21.8

preferred								
Not preferred								55.6
at all	6	2.5	10	4.2	8	3.3	133	
Total	240	100.0	240	100.0	240	100.0	240	100

The influence of socio-economic characteristics on fish farmer's ICTs preferences

Before running the regression model, Omnibus test and Hosmer and Lemeshow was done in order to detect whether the data fit in the model. The model fits very well as indicated by Hosmer and Lemeshow test model coefficients which are above 0.05 (Table 4). Results from the binary logistic equation indicate that the variables influencing ICTs preference contributed by 5.2% and 9.2% as explained by Cox and Snell R square and Nagelkerke R square values.

Table 6 shows that Wald statistics are non-zero values, which implies that there is interaction between the dependent and independent variables. According to Norusis (1990) and Powers and Xie (2000), the non-zero Wald statistic values indicate the presence of relationships between the dependent and explanatory variables. Thus, on the basis of the results of this study the null hypothesis was rejected in favour of the alternative hypothesis that socio-economic factors significantly influence the preferences of ICTs at 5% level of significance.

Out of the 10 socio-economic characteristics that were regressed on fish farmers' ICTs preferences, only television ownership had positively relationship and statistically significant at 0.05 level of probability (Table 6). This implies that ownership of television set increases the likelihood of preferring it in sharing and accessing agricultural information. The same relationship was observed by Nyamba and Mlozi (2012) who reported that farmers who owned mobile phones were more likely to use them for communicating agricultural information. The reasons could be explained by the fact that farmers will prefer to use something which belong to them rather than borrowing it from someone else.

Table 4: Test statistics

Tests	χ^2	df	P-value
Model evaluation (overall):			
Likelihood ratio test (Omnibus Tests of Model Coefficients)	10.045	8	.262
Goodness-of-fit test:			
H-L test	2.867	8	.942

Cox & Snell $R^2 = .052$			
Nagelkerke $R^2 = .092$			

Table 5: Variables used in the binary regression equation

<i>Variable</i>	<i>Description</i>
Y	Preference of ICTs use (0 = No, 1 = Yes)
X ₁	Sex (0=female, 1=male)
X ₂	Age (years)
X ₃	Education level (0=no formal education, 1=formal education)
X ₄	Household size
X ₅	Total income earning per annum (Tshs)
X ₆	Farm size (hectars)
X ₇	Power source
X ₈	Quantity harvested
X ₉	Access to extension
X ₁₀	The number of televisions owned
X ₁₁	The number of Radio owned
X ₁₂	The number of mobile phones owned
X ₁₃	The number of computer owned

Table 6: Logistic Regression on the influence of socio-economic characteristics on fish farmer's ICTs preferences

Variables in the Equation	B	S.E.	Wald	df	Sig.	Exp(B)
X ₁	-.584	.547	1.137	1	.286	.558
X ₂	.000	.018	.000	1	.999	1.000

X3	-.077	.085	.819	1	.366	.926
X4	.452	.738	.375	1	.540	1.571
X5	.000	.000	1.175	1	.278	1.000
X6	-.364	.491	.549	1	.459	.695
X7	.000	.002	.081	1	.775	1.000
X8	-.022	.478	.002	1	.963	.978
X9	.474	.553	.735	1	.391	1.606
X10	.009	.275	.001	1	.974	1.009
X11	1.122	.542	4.276	1	.039*	3.069
X12	19.518	1.176E4	.000	1	.999	2.997E8
X13	1.677	1.238	1.836	1	.175	5.351

Conclusion and Recommendations

ICT tools are becoming more and more important in communicating and sharing relevant and timely agricultural knowledge and information to farming communities. However, access to ICT and supporting infrastructure is important for increased accessibility and sharing of agricultural information among fish farmers. Moreover, enhancing access agricultural information through the most preferred ICT tools is important. However, ownership of preferred tools strongly influences usage of preferred ICT tools for sharing and accessing agricultural information among fish farmers. It is therefore recommended that the government should promote private and community provision engagement in broadcasting agricultural information, widening access to internet services and establishing telecenters equipped with ICT tools so as to increase the sharing and accessibility of agricultural information among fish farmers. Also, the government should subsidize the cost of some ICT tools that more fish farmers can afford them and use them for accessing and sharing agricultural information.

References

- Akinbile, I. A. and Alabi, O.F. (2010). Use of ICTs among fish farmers of Oyo State. *Journal of Agricultural Extension* 14 (1) : 25-35.
- Barguma KA, Ndaghu AA 2014. Information accessibility among fish farmers in Girei, Yola-North and Yola-South local government areas, Adamawa State, Nigeria ARPN. *Journal of Science and Technology*, 4(8): 503-507

- Benard, R, Dulle, F, Nagalapa, H. (2014). Assessment of Information Needs of Rice Farmers in Tanzania; A Case Study of Kilombero District, Morogoro, *Library Philosophy and Practice* (e-journal). Paper 1071: 1-34.
- Benard,R and Dulle, F. (2017), Application of ICT tools in communicating information and Knowledge to artisanal fishermen communities in Zanzibar, *Knowledge Management & Learning*, 9(2)
- Chenyambuga, S W., Mwandya, A., Lamtane, H A and Madalla, N .A. (2014). Productivity and marketing of Nile tilapia (*Oreochromis niloticus*) cultured in ponds of small-scale farmers in Mvomero and Mbarali districts, Tanzania, *Livestock Research for Rural Development*. 26(43)
- Eucharia, Ejiogu-Okereke, Ngozi Dr; Ubochioma, Chikaire, Jonadab Dr; Ifeanyi, Ogueri, Emmanuel Dr; and Patience, Chikezie, Ngozi Dr, (2016). "Roles of Information and Communications Technologies in Improving fish farming and production in Rivers State, Nigeria." *Library Philosophy and Practice* (e-journal). 1445.<http://digitalcommons.unl.edu/libphilprac/1445>
- Freeman ,K and Mubichi, F., (2017). ICTs use by smallholder farmers in rural Mozambique: A case study of two villages in central Mozambique, *Journal of Rural Social Sciences*, 32(2)
- Ijatuyi, E,J., Abiou ,O, A., and Olaniyi, O,A.,(2016). Information Needs of Fish Farmers in Osun-State. *Nigeria Journal of Human Ecology* 56(3): 309-317
- Joel, A.S, and Adigun, G.O. (2013). Use of Information and Communication Technologies (ICTs) by Yam Farmers in Boluwaduro Local Government Area of Osun State, Nigeria. *Library Philosophy and Practice (e-journal)*. 1018
- Kughur PG, Ortindi PI, Katikpo G (2015). Factors affecting farmers' accessibility to agricultural information in Gwer-East local government area of Benue State, Nigeria, *International journal of information and communication technology research*, 5(10).
- Malhan, I.V. and Rao, S (2007) "Agricultural knowledge transfer in India: A study of prevailing communication channels" *Journal of Library Philosophy and Practice* Vol.9 (2)

<http://www.webpages.uidaho.edu/~mbolin/malhan-rao.pdf> retrieved on 27 December, 2017.

- Moagi, T. M., and Oladele, O. I. (2012). Analysis of Information Needs among Land Redistribution for Agricultural Development Beneficiaries in Waterberg District, Limpopo Province, South Africa. *Journal of Human Ecology* 39(2): 95-101
- Nyamba, S. Y. and Mlozi, M. R. S. (2012). Factors Influencing the Use of Mobile Phones in Communicating Agricultural Information: A Case of Kilolo District, Iringa, Tanzania. *International Journal of Information and Communication Technology* 29 (7): 838 – 845.
- Ofuoku, A.U. Emah, G.N. and Itedjere, B.E. (2008), Information utilization among rural fish farmers in central agricultural zone of delta state, Nigeria *World Journal of Agricultural Sciences* 4 (5), 558-564.
- Olaoye, O. J, Ashley-Dejo, S. S, Fakoya, E. O, Ikeweinwe, N. B, Alegbeleye, W. O., Ashaolu, F. O., & Adelaja, O. A. (2013). Assessment of Socio-Economic Analysis of Fish Farming in Oyo State, Nigeria. *Global Journal of Science Frontier Research Agriculture and Veterinary* 13(9): 1-12.
- Saunders, M., Lewis, P. and Thornhill, D (2007). Research Methods for Business Students. 4th ed. Prentice Hall, London. Pearson Education Limited Pg. 226.
- Sharma, A.K. Jha, S.K. Kumar. Sachana, R.C and Kumar, A (2008). Critical analysis of information sources and channels preferred by rapeseed Mustard farmers, *Indian Res. J. Ext.Ed.*, Vol.8 (2&3) <http://www.seea.org.in/vol8-2-2008/11.pdf> retrieved on 15 November, 2017.
- Tire, M (2006), An evaluation of the information dissemination mechanisms for small scale farmers subsistence farmers. Dissertation for award of M.A Philosophy University of Stellenbosch in Cape Town.
- Uzezi, O.P (2015). Agricultural and information needs and utilization among migrant fishermen by gender: A study of Isoko reverie community, Delta State, Nigeria. *Journal of Emerging Trends in Computing and Information Sciences*, 6(5): 265.