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Short Communication

Communication Tools for Effective Transfer of Aquaculture Technologies: The Case of Wonchi District, South West Shewa Zone, Ethiopia

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Abstract

The main purpose of this paper is to find out which communication tools are best suited for effective transfer of selected aquaculture technologies in Wonchi district of South west Shewa Zone. The study involves a sample of 30 farmers including adopter and non-adopters of aquaculture technologies. Data was collected using pairwise and matrix ranking techniques followed by focus group discussion. Meanwhile, a test of appropriateness of selected communication tools: video, oral lecture and demonstration were used to ultimately provide training on selected aquaculture technologies. An evaluation was then done based on feedback given from the participants. As a result, videos were found to be the most versatile tools for effective transfer of aquaculture technologies, followed by demonstration and lecture methods. By virtue of the fact that experiences on best practice of small-scale aquaculture are missing, videos recorded from better performing locations elsewhere outside Ethiopia are preferable in the short run. However, using a mix of videos followed by practical demonstration would improve effectiveness of aquaculture focused technology transfer programs.

Keywords: Demonstration; scoring; oral-lecture; ranking; video

Introduction

Communication is a process of gaining common understanding. It is a kind of social interaction through messages (Shannon and Weaver, 1949; Leagans, 1961; Fiske, 2002). Communication in extension process is an attempt to increase awareness of improved agricultural technologies among farmers. Communication tools are instruments facilitating agricultural development through technology transfer (Tegene *et al*. 2023).

There are some tools for communication to take place. The purpose of these tools is to make communication more effective. These are broadly grouped into two as print and non-print media (Getahun *et al.* 2011). Tools appropriate for dissemination of various crop and livestock technologies have been tested and recommended in the literature. Some of these tools are useful due to their

accessibility and ease in the use of information customized for the user (Surudhi *et al.* 2017). The tools help us define different levels of farmer participation in various processes of adult learning.

In the context of adult learning; Oral lectures, videos and demonstration are some of the tools used for knowledge and technology transfer (Cai, 2013; Laurillard, 2013). Among these, videos for instance are useful for advocacy, raise the awareness, knowledge level of farmers as well as facilitate social learning and motivate them for further experimentation (Lie and Mandler, 2009; Karubanga *et al.* 2017). Some videos are also designed to enhance interactivity of the learners (Vidya and Chinnaiyan, 2010). Videos help to customize contents to specific group of audience and ensure consistency of content delivery (Abate *et al.* 2018). In some cases, they can be used to reach a group of farmers at low cost (Asamoah and David, 2011). Sometimes, they can be used jointly with demonstrations to enhance learning, such as in *how to do* videos (Getahun *et al.* 2011). Videos are one of the most preferred tools in farmer based trainings (Al-Rimawi *et al.* 2016). The principle and reality of adult learning stated that farmers mainly prefer participatory ways for learning complex subjects such as aquaculture (Pamphilon, 2017). In case of subject wise complexity, demonstrations made in simple and understandable modes can help less educated farmers (Suvedi and Kaplowitz, 2016). In addition, they would also increase the efficiency of learning (Fox, 1990). Finally, lecture methods can be used to communicate large amount of information at a time. However, challenges of learner passivity and lack of engagement are some of the potential weaknesses (Landøy *et al.* 2020).

Form long years of experience in promoting aquaculture in intervention sites of the National Fisheries and Aquatic life research center, it is hypothesized that the nature of aquaculture subsector demands application of appropriate communication tools to effectively transfer associated technologies. Despite the use of various communication tools on target farmers so far, their effectiveness have not been studied in the context of National Fisheries and Aquatic Life Research Center's project sites. The current study was thus conducted to fill this gap.

Materials and Methods

Study area and Research design

The current study was conducted in Senqole Kebele, Wonchi district of South west Shewa zone, which is the main intervention area of National Fisheries and Aquatic Life Research Center with aquaculture. The study involved an action research with the principle of mixed methods design, where quantitative data is followed by the qualitative one sequentially. Participating farmers were subjected

to an experimental study to evaluate effectiveness of three communication tools namely: oral lecture, video and demonstration for the purpose of transferring selected aquaculture technologies. In the meantime, an oral lecture was first given followed by video and on-farm demonstration. The video shown to the farmers was that of NEFISCO aquaculture and fisheries consultants recorded as part of a project for the development of fish farming in rural Congo. The video viewing process was supported by translation into Amharic and further explanation of what was being shown in detail so that language barrier was avoided. The tools were applied to all farmers and feedback was gathered from each after they were assigned to three equal groups. The types of aquaculture technologies shown and discussed were associated with pond construction, fertilization, liming, fish feeding techniques, protection of fish ponds from predators and other management options applicable for small-scale aquaculture.

Sampling and sample size determination

The process of sampling farmers commenced with the selection of Wonchi district, where aquaculture activities are mainly concentrated and the fact that more number of aquaculture practicing farmers are found. The same logic was followed in selecting *Senqole Qaqe Kebele* among the 23 *Kebeles* in the district. Sampling was generally done using non-probability convenience sampling technique. The technique was used based on farmers' prior experience on aquaculture activities and their willingness to participate in the study. It also aligns with the favoring farmer selection based on certain criteria including but not limited to their willingness to participate for convenience sampling (Dörnyei, 2007; Sarantakos, 2012; Ilker *et al.* 2015). The sample size determination process also aligned with the one determined for relatively homogenous population, where a maximum of 30 in depth interviews are suggested (Boddy, 2016). It also conforms to the limited budget and time at the disposal of the data collectors.

Data types and method of data collection

First, three extension communication tools namely: oral lecture supported by written text, video and practical demonstrations were administered to sample farmers. Meanwhile, both quantitative and qualitative data were gathered after administrating the tools. A structured - questionnaire and focus group discussion were applied to understand the effectiveness, the pros and cons of using each tool for aquaculture technology transfer. Feedback on the clarity and effectiveness of using each tool was collected from the participants. To make comparison among the given tools, pairwise ranking technique was used. Before collecting data, the study participants were divided into 3 equal groups to fit the most ideal and maximum attainable size to undertake standardized focus group research. The assignment of farmers into groups is only done at random to suit the process of data collection (Krueger, 2015). The group formation is not bound to certain

criteria like age, sex, level of education or else. Then, one enumerator was assigned for each group to proceed with the data collection.

Method of data analysis

Data Analysis was done using SPSS Version 20. Meanwhile, descriptive statistics were used for the analysis of farmers' age, composition by sex household size and their level of education. Pair wise ranking followed by matrix ranking and scoring were applied to select and prioritize among the three communication tools as well as judge them based on a set of specific criteria for selection. In the analysis of ranks, the three communication tools were compared with each other and ranked accordingly along with the reasons for prioritizing them. The technique encompassed on spot analysis of data, where locally available materials like stones were used for ranking. The result is jotted down on a flip chart for further desk level quantification. Qualitative narration of feedback was used to summarize overall essence of the focus group discussion.

Results and Discussion

Socio-demographic characteristics of the farmers

Under this section, results of the analysis on the socio-demographic background of the respondents and the rank preference of selected communication tools are presented, followed by result of preference analysis for each tool administered to the samples.

Table 1. Age and household size of the respondents

S/No	Variable	Minimum	Maximum	Mean	Standard Deviation
1	Age	25	70	43.47	10.69
2	Household Size	1	14	6.1	2.89

By observing raw data set and looking at the standard deviation, there is some variation among farmers in terms of their household size. The variation in household size is close, but a bit higher than the one found earlier (Damtew, 2012). High variation in age was also observed in this study, even more than the one found by the same author. This study is not intended to show age and household size as variants of communication tool preference by farmers.

Table 2. Sex category of the respondents

S/No	Variable	Number	Percentage
1	Men	25	83.3%
2	Women	5	16.7%

Table 2 shows that more men participated in the survey as household heads than their women counterparts as the activity demands high physical labour, for its establishment and management, for which men are capable of adopting.

Table 3. Respondents' level of education by sex category

S/No	Level of Education	Number		Percent	
		Men	Wome	Men	Women
1	No Formal Education	1	2	3.3	6.6
2	Primary School (1-8)	19	1	63.3	3.3
3	Secondary School (9-12)	5	2	16.9	6.6

Nearly 76% of the participants attained primary schooling. Farmers' level education is analyzed as a proxy indicator of their ability to understand complex information in aquaculture. Though the purpose of analyzing farmers' level of education here is just to characterize them, given larger sample size, it is possible to further associate their level of education with their preference of communication tools as conducted in some indicative studies (Zossou *et al*. 2010).

Farmers' preference for communication tools

This result is a combined analysis of preference, where farmers' voted for the application of each communication tool of their choice as a group. Thus, it did not account for individual differences. Farmers' preference for communication tools was analyzed using both pair-wise and matrix ranking techniques. This technique helps to compare the preferences and priorities of different groups of people (Narayanasamy, 2009). In applying the techniques, a rectangular or square matrix was drawn on the ground and locally available materials like stones and sticks were used to spot the available tools with their intensity of preference. First, the selected tools were put together and compared against each other using a pair-wise ranking technique. Then, each of the tools were listed in their order of importance and ranked against a set of preference criteria. The criteria used for selection were: Practicality, clarity of information delivered, suitability for note taking, novelty of information and interactivity.

Table 4. Pair-wise ranking of communication tools

Communication Tools	Oral Lecture	Video	Demonstration	Score	Rank
Oral Lecture	xxx	V	D	0	3
Video	V	xxx	V	2	1
Demonstration	D	V	xxx	1	2

As shown in the table above, the pairwise analysis result shows that videos are the most preferred to the remaining tools. Based on result of the ranking exercise, preference of this tool was due to the fact that information delivered using it was clear and showed a hands on practice, which otherwise could have been difficult to understand. In addition, the tool helped them better understand the concept and application of pond liming and fertilization concisely. During an extensive FGD conducted with 10 farmers among the participants, it was confirmed that video like this one helped them learn complex subjects like aquaculture much better. Meanwhile, the very limited opportunity and experience in improved aquaculture practices elsewhere in Ethiopia makes video quite versatile.

To make the research activity more engaging for participants, five criteria were jointly selected and assigned to the study based on feedback generated from farmers, while the tools were being applied. Demonstration was preferred due to the multitude of criteria which favor adult learning, especially for farmers with low literacy (Pamphilon, 2017). Demonstration was selected as an adaptive tool as it fosters learning through interaction. This method allows for clarity, practicality and interactivity of information. The participants also suggested that demonstration can be more effective if it is combined with videos to deliver new information. Oral lecture was preferred mainly due to its suitability for taking notes by a total of 9.9% of the study participants, who had no formal education (Table 3). However, the tool was found unsuitable for the current state of farmers due to lack of interactivity and practicality. But the problem of information clarity is embedded with the communicator or the message being transmitted, which demands further study.

Table 5. Criteria for selecting the most appropriate communication tools

Selection Criteria	Communication Tools		
	Oral Lecture	Video	Demonstration
Practicality	3	2	1
Suited for notes	1	2	3
Information clarity	3	2	1
New Information	2	1	3
Interactivity	3	2	1

Individual level assessment of preference

An individual level preference of communication tools was assessed to confirm the results found from the pair wise and matrix ranking exercises taken as a group. The output partly offsets preference results of some group members who participated in the preference selection exercises, as individual views may not represent group decision. Since video is selected as the most important tool in group level voting of preference, the author found it necessary to evaluate it at individual level (Table 6).

Table 6. Individual level preference of extension communication tools

S/No	Tools used	First		Second		Third	
		Men	Women	Men	Women	Men	Women
1	Oral Lecture	4	0	7	2	14	3
2	Video	20	4	5	1	0	0
3	Demonstration	1	1	13	2	11	2

The individual level assessment of preference result could clearly highlight the presence of Condorcet Paradox (Gehrlein, 2006), where individual and collective preference could sometimes vary for some other criteria by which all evaluations are made. The author hypothesized that, this paradox might have resulted in missing the criteria: interactivity and suitability for taking notes among individual farmers, who voted for video as one of the tools for technology transfer (Table 7).

Table 7. Criteria for selecting video as a preferred tool

S/No	Criteria for selecting communication tools	Number	Percentage
1	New Information	20	66.7
2	Clarity of Information	7	23.3
3	Practicality	3	10.0

The above individual level preference result shows that videos are still the most preferred tools for transferring aquaculture technologies. This finding is in line with a dearth of literature stating that videos are the most effective tools for training complex fields such as aquaculture. This is because videos are able to wrap complex problems and processes into easily digestible pieces (Lie and Mandler, 2009). There is congruence between group level ranking exercise and an individual level assessment in assigning ranks as first to third in order of communication tools selected. When we evaluate video as a tool, its potential to transfer new information in a clear and concise manner dominates, as the tool makes ideas clearly demonstrable with visual means (Karubanga *et al*. 2017). The notion: 'New Information', which indicates its suitability to make new information clear and understandable, was marked as the most important criteria in selecting video. One of the participants narrated the benefits of using video as a tool:

> *'I have strictly noticed application of the three communication tools used to train aquaculture. We have been given oral lecture on the subject. But this method was not suitable for some of us who cannot read and write. In addition, the way of teaching may sometimes be fast and we may not be able to capture unless it is repeated. To enhance clarity, such oral methods should be supported by sketching and drawing to demonstrate and clarify what has been said. Among the three communication tools, video based methods are more suitable for us to understand. The techniques shown in the video were very applicable to our context and able to provide new information especially with respect to pond management techniques like liming and pond fertilization. These were crucial areas we don't give emphasis for. The overall pond environment and management shown on the video are very close to our condition and involves the real application of pond management. Hence, we were able to understand it easily. The demonstration method tried is the most practical one but could not provide us any new information apart from what we already know. In any case, the information added to what we already know is important to us in addition to the method itself.'*

In general, it can be stated that novel and practical information can be illustrated using recorded videos. The study also confirmed that videos are very important in teaching farmers complex practices. Several studies pointed out that videos can be effective complements to oral lecture and demonstrations under certain settings (Cai and Abbott, 2013). Oral lecture is less preferred for aquaculture technology transfer. This aligns with the findings of Njura *et al*. (2020), as information

retention was the main challenge by few of the participants who are unable to read and write (Bruce, 2006). Unlike the finding of Njura *et al.* (2020), Oral lecture was found to be the second preferred tool to demonstration in terms of transferring new information.

However, a mix of communication tools is still important for aquaculture technology transfer such as videos accompanied by practical demonstration. Clientele new for agricultural technologies, a mix of videos with lecture methods or demonstrations could be used (Cai and Abbott, 2013). Though videos are very crucial, their content also matters, in essence that simple, clear and practical yet new technologies applicable for similar settings have to be recorded and shown to farmers to enhance interest. In Addition to the content, production and context; conformity with local dialect, culture and practice generally make videos more effective tools for agricultural technology transfer (Lie and Mandler, 2009; Asamoah and David, 2011; Cai and Abbott, 2013; Mele *et al.* 2018; Paudi *et al.* 2022). According to the current study, video is found to be versatile tool for aquaculture technology transfer.

Conclusion and Recommendation

The relevance of video is evident for disseminating aquaculture technologies from more to less experienced areas. Without analyzing knowledge acquired by the users as a result of applying the tools, farmers' preference or selection can be taken as a means to generate evidence on appropriateness. However, it should not be conclusive that all video based technology transfer is preferable. Message content and its nature are vital in selecting video as a prominent tool for aquaculture technology transfer. In the absence of highly successful experience in Ethiopian aquaculture, the easiest method available for technology transfer is to use videos. However, novelty, clarity, demand of specific information, enhances the choice of communication tools by farmers. Thus, content of a particular message in the process of technology transfer is vital. In Ethiopian context, videos are ideal for technology transfer as they solve the challenge of lacking expertise in aquaculture for similar areas as the study site.

Finally, combining the result of farmers' preference at individual and group levels, it is understood that preference of a communication tool should not only encompass practicality and clarity of information but also novelty. New information presented in an understandable form brings interest among farmers to learn more and capture the information provided. This eventually leads to effective technology transfer. Whenever new updates are needed on aquaculture technologies such as on fish feed preparation, parent fish selection; pond management techniques etc. Videos with practical implications need to be

prepared and documented on station to help farmers easily conceptualize important steps needed to establish and maintain small-scale aquaculture farm.

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