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Agricultural Information Dissemination in Rural Areas of Developing Countries: A Proposed Model for Tanzania

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Abstract

This article is based on the findings of a study on access and use of poultry management information in rural Tanzania. It highlights the connection between the information system, rural farmers and information providers; and how those linkages can impact information access, usage and farmers' satisfaction. The study findings suggest that rural information dissemination in Tanzania is planned without consulting the rural farmers, resulting in limited access and underutilisation of information. Based on the study findings and drawing on the information systems success model and quadratic usage framework, a model for agricultural information dissemination in the context of rural Tanzania is proposed. The proposed model addresses the need to understand the target community before embarking on information dissemination. It places more emphasis on understanding farmers' community, rather than focusing on the information per se.

Keywords: Agriculture, Information Dissemination, Information Models, Developing Countries

Introduction

Agriculture has been described as the engine for economic growth and improved livelihoods in Africa (Diao, Hazell, Resnick and Thurlow, 2007; World Bank, 2006). More than 50 per cent of the population in Africa lives in rural areas or depends on rural activities for their livelihoods (Ballantyne, 2005). Agricultural production depends largely on the availability of and access to relevant information (Olajide, 2011). Effective dissemination of agricultural information plays a key role in supporting rural agricultural activities as it may improve farmers' knowledge and increase their agricultural productivity. Information helps to provide opportunities for rural farmers to improve their farming activities, while helping to improve their livelihoods (Ballantyne, 2005; Lwoga, Ngulube and Stilwell, 2012). Studies have revealed that an increased flow of information to farmers has a positive effect on agricultural development (Fawole, 2008; Lwoga, Stilwell, and Ngulube, 2011; Manda, 2002; Mchombu, 2001; 2003). Thus, improved systems for dissemination of agricultural information to the rural areas can improve farmers' access to information, which may assist them in making informed decisions about their farming activities. Farmers' decisions are greatly influenced by the amount of information that is available to them (Ali and Kumar, 2011; Siyao, 2012). Farmers, who are well informed, make wise decisions, which in turn, are responsible for improving agricultural productivity (Rutatora and Mattee, 2001). Thus, timely dissemination of appropriate information to farmers is a critical input for improving agricultural production (World Bank, 1994).

Information services in rural areas of developing countries have been provided through various channels such as radio, print, video, television, films, pictures, drama, dance, folklore, group discussions,

meetings, exhibitions and practical demonstrations (Mtega, 2012; Munyua, 2000). However, rural farming communities vary, thus require information services based on models that are context specific. Meyer (2005) asserts that information in digital or written format may be inaccessible to rural people due to their unfamiliarity with the source. In this case, they may prefer to access the information that is delivered through face-to-face communication because they are used to their oral tradition (Msoffe and Ngulube, 2016). Thus, a proper understanding of the farmers' situation in the rural community should be a prerequisite for information provision in rural areas. Information dissemination services should involve assessment of the target community before information provision takes place. Knowledge about the target communities assists the information providers to formulate the best approach for agricultural information delivery to such communities. The aim of this article is to propose a model which could be used for dissemination of agricultural information in the rural areas of developing countries with a focus on Tanzania. The proposed model is based on the study findings and theoretical framework that guided the study on access and use of poultry management information in selected rural areas of Tanzania. The study findings are presented along with the proposed model.

Statement of the Problem

Access to information is essential in agricultural production. Improved flow of information within the agricultural sector is an important element for agricultural production, and economic growth. Effective dissemination of agricultural information would lead to better and more efficient agricultural activities, which would in turn lead to increased agricultural production. However, most African countries have not managed to provide adequate supply of information to farmers in the rural areas (Aina, 2004). In Tanzania, information provision in the rural areas is mostly not determined by the farmers' needs (Lwoga, Stilwell and Ngulube, 2011). The information provided is inadequate, and accessibility of information is not reliable (Mtega, 2012). The study findings indicate that farmers are inadequately accessing and using the information disseminated to the rural areas. The findings from previous studies suggest that there is inadequate flow of information to the rural farmers. Effective information dissemination depends on the methods used and the framework that guides the process of information transfer.

Therefore, there is a need for developing a model dedicated to managing the information flow between information providers and farmers' communities in the rural areas. A number of models have been developed explaining human information behaviour (Wilson, 1999). However, the models have not focused specifically on agricultural information dissemination in rural areas of developing countries. The rural areas of the developing countries deserve special attention because of the low level of development (Kiplang'at and Ocholla, 2005). The proposed model fills the gap by focusing on agricultural information dissemination in the rural areas of the developing world, and putting emphasis on understanding of the farmers' community. The model may form the basis for improving the current information dissemination services in Tanzania and other developing countries with similar rural settings. The following research questions guided the study:

(i) What are the farmers' information seeking patterns?

(ii) Which are the sources of information preferred by farmers?

(iii) Which are the information sources preferred by the information providers?

(iv) Which information sources are effective in delivering information to farmers?

(v) Are farmers satisfied with information dissemination services?

(vi) What are the barriers for accessing information?

Conceptual Framework

The Information Systems Success Model (ISSM) (DeLone and McLean, 1992; 2003) and the Quadratic Usage Framework (QUF) (Mardis, Hoffman and Marshall, 2008) were used as the conceptual framework for the study. The ISSM represents the construct of information dissemination success. The QUF explains the factors that underlie the acceptance and use of information systems. The

two models provide valuable factors in relation to access and use of information. They were chosen due to their strength in validity and reliability through continuous validation in many studies.

The concepts of ISSM and QUF can be adapted in order to build a framework that can guide the dissemination of information in local communities. The framework provides a basis for understanding various aspects which contribute to effective information dissemination in the local context. The framework combines the ideas from the ISSM, QUF and the study findings, in order to develop a model that focuses on farmers in a rural setting. The proposed model builds on the existing body of knowledge on information dissemination, information needs and seeking behaviours and information usage in rural settings.

ISSM consists of six interrelated categories of success measurements (Figure 1) (DeLone and McLean, 1992; 2003). Each category defines a set of success measures related to a broad information systems concept. ISSM has three quality dimensions: information quality, systems quality, and service quality. These quality dimensions further impact on user satisfaction, intention to use and the use of the system. These use-related factors affect each other and have an impact on the net benefits. The realised and perceived net benefits then again impact on the use and user satisfaction of the system. The model therefore shows how the quality of a system has an impact on the use of the system and the perceived benefits, and that the use affects further use of the system through user satisfaction.

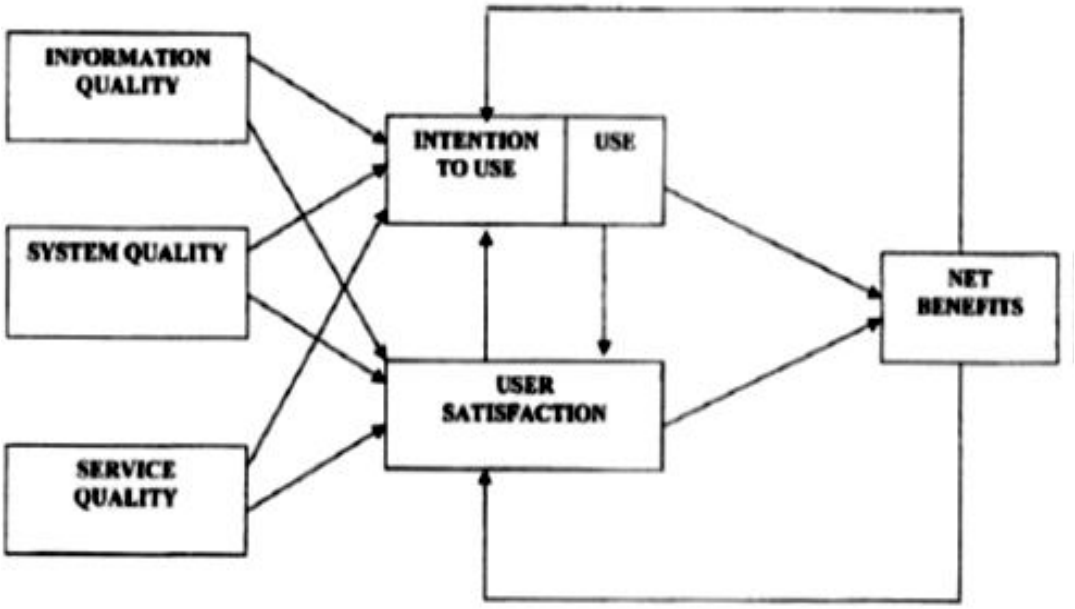

Figure 1: Updated DeLone and McLean Information Systems Success Model (Source: DeLone and McLean, 2003)

According to DeLone and McLean (2003), system quality includes accessibility, ease of use, ease of learning, intuitiveness, system reliability, system flexibility, sophistication, and response times. Information quality comprises accuracy, relevance, precision, reliability, completeness, usefulness, currency and preferred format. Service quality is the support users receive from the service provider. System use is measured as the amount, frequency, nature, extent, and purpose of the use. User satisfaction refers to how the user feels about the whole experience with the system. Net benefits cover how much the information system adds to the success of the individual, group, organisation, industry, or nation (DeLone and McLean, 1992; 2003; Petter, DeLone and McLean, 2008).

In operationalising DeLone and McLean's model of Information Systems Success, the six dimensions of the model are defined as follows. System quality refers to the desired characteristics of the system of information dissemination: usability, availability, reliability, adaptability, and response time. Information quality refers to the content offered, which should be complete, relevant, easy to understand, and current. Service quality is the support that the information provider offers to the farmers. Usage refers to any type of interaction that farmers have with the information providers. User satisfaction measures the farmers' opinions on the information dissemination system. Net benefits are the impacts of the information dissemination system on farmers and/or farming activity.

On the other hand, QUF seeks to explain the dynamics of usage, incorporating personal characteristics and environmental factors. The model (Figure 2) is explained as follows: (i) technology, which refers to factors based on access to or functionality of the artefact itself; (ii) competence, which consists of factors that affect the individual's skills, education, knowledge and experience, and which determine whether or not they know how to use the technology; (iii) culture-related values, which include historic practices, organisational settings, institutional policies, as well as cultural norms and values; and (iv) personal values, which include preferences, beliefs, traditions and trust, and are linked to the individual user's motivation and choices (Mardis, Hoffman and Marshall, 2008).

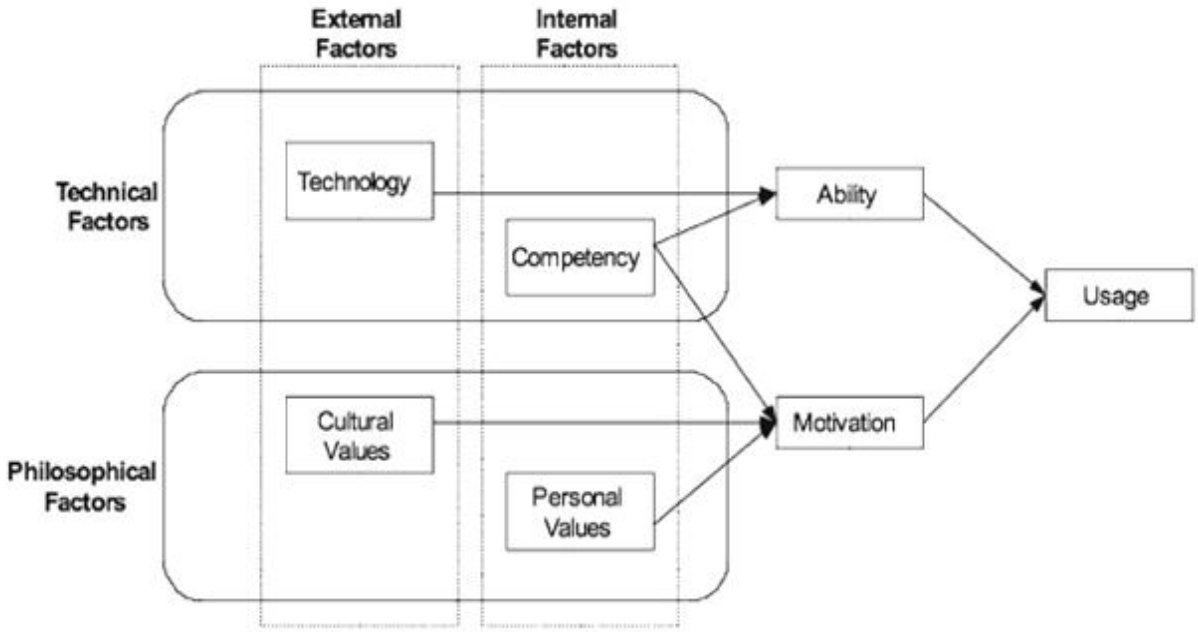

Figure 2: Quadratic Usage Framework (QUF) (Source: Mardis, Hoffman, and Marshall, 2008)

In this context, technology would be equivalent to agricultural information, and competence would involve skills to access the information. The information will be accessed and used if the culture-related values (cultural values of farmers) are put in place. Personal values involve making sure that farmers trust that accessing agricultural information will benefit them by improving their agricultural production. Once the farmers have the ability to access agricultural information, and they are motivated, then they will be able to use the information for improvement of farming activities. This means that once the farmers are competent with regard to information access, and have positive attitude and culture, then they will have the ability and motivation to use the information that is accessed.

The two models (the DeLone and Mclean Model of Information Systems Success and Quadratic Usage Framework) are related at the point of information usage. The former creates an information system which is user-friendly, thereby promoting information access and use. The latter looks at other factors (such as skills to access information) which may affect the user in the process of access and use of information. Therefore, a combination of both models leads to improved access and use of agricultural information, which will in turn improve agricultural production.

Methodology

This study was conducted in three rural districts between 2013 and 2014. They included Iringa rural, Morogoro rural and Mvomero. The study sites were selected for the reason that poultry health and management programmes have been extensively implemented in the areas. Three districts were purposively selected to include rural districts involved in the poultry management programmes. One ward was selected from each of the districts to include wards with higher poultry production; and from each ward, one village with well-established poultry production was selected.

The study population included smallholder farmers involved in poultry production, extension officers, poultry researchers, and village leaders. The respondents were categorised into two groups: poultry farmers and information providers (extension officers, researchers, and village leaders). Districts, wards and villages were selected using purposive sampling technique. Poultry farmers were selected using simple random sampling technique. The purposive sampling technique was used to select information providers. This study used multiple approaches to collect data in order to enhance the reliability and validity of the findings (Romm and Ngulube, 2015). A questionnaire was used to collect data from 360 poultry farmers. Focus group discussions were used to gather information from a purposively selected sample of 160 poultry farmers. Sixteen focus group discussions with ten participants per session were held in the nine selected villages. The selection of group participants considered the gender, age, economic and cultural characteristics of the participants. There were ten farmers in each focus group discussion. Interviews were conducted with twenty-two information providers in selected rural communities. They included nine village executive officers, six researchers, three extension officers, three district agricultural officers, and one ward executive officer. These were the people deemed to be suitable for providing the information required in the study.

The sampling frame for this study was a list of names of all farmers who were practising poultry farming in the selected villages. The researchers obtained the name lists of poultry farmers from the offices of the village executive officers (farmers' up-to-date list for the year 2013). The total number of poultry farmers in the three selected districts was 2,401. A table for determining sample size from a given population, as provided by Krejcie and Morgan (1970), was used to estimate the sample size required to be representative of 2,401 poultry farmers. The sample size that was representative of 2,401 farmers was found to be 331. This figure was rounded to 360 for convenience during sampling.

All the 360 farmers returned the questionnaire. Direct administration of questionnaire helped the study to achieve high response rates. The majority of the respondents had primary education; a few had secondary education; and only four respondents had post-secondary education. Forty three respondents (11.9%) were illiterate. The researchers read the questions to the respondents in order to obtain their responses, and the researchers then recorded the answers.

Findings of the Study

This section presents the findings of the study.

Characteristics of the Respondents

The majority of the poultry farmers (See Table 1) were between the ages of 18 and 57 years. Younger and older people were not actively involved in poultry farming. More men than women participated in the study. Most of the poultry farmers were literate, in the sense that they were able to read and write. Few farmers were illiterate; more men were literate than women. The majority of the poultry farmers were involved with mixed farming, practising both crop farming and livestock keeping. Few farmers practised livestock keeping and small business. All of the farming activities in the surveyed communities were carried out at subsistence level.

Table 1: Characteristics of Poultry Farmers (N=360)

		Frequency (n)	Percentage (%)
Gender	Men	189	52.5
	Women	171	47.5
Age	Below 18 years	2	0.6
	18 - 37	173	48
	38 - 57	130	36.1
	Above 57 years	-	-
Educational levels	Post-secondary education	4	1.1
	Secondary education	22	6.1
	Primary education	287	79.7
	Informal education	4	1.1
Occupation	Livestock keeping and crop farming	341	94.7
	Livestock keeping and small business	13	3.6
	Livestock keeping and skilled work	6	1.7

The majority of the information providers were between the ages of 35 and 55 years (See Table 2). Most of the respondents were village executive officers; few were researchers and district agricultural officers. There were more men than women information providers, and most of them had secondary education. The mean age of the respondents was 42 years.

Table 2: Characteristics of the Information Providers (N=22)

		Frequency (N)	Percentage (%)
Gender	Men	15	68.2
	Women	7	31.8
Age	35 - 55 years	18	81.8
	Above 55 years	4	18.2
Educational levels	Degree	6	27.3
	Secondary education	6	27.3
	Tertiary certificate	4	18.2
	Diploma	3	13.6
	Primary education	3	13.6
Work / Job	Village executive officers	9	40.9
	Researchers	6	27.3
	District agricultural officers	3	13.6
	Extension officers	3	13.6
	Ward executive officer	1	4.5

Information Seeking Patterns of Farmers

Farmers sought poultry management information mostly from families, friends, neighbours, extension officers, researchers and radio (See Table 3). Print sources of information (books, leaflets, posters and newspapers) were sparingly used, whereas modern information sources (cell phones, the Internet, and television) were least used. There were variations in terms of the information sources according to educational level. Farmers with primary education and beyond utilised printed sources, while farmers with limited education (informal education and illiterate) relied on interpersonal sources.

Table 3: Sources Used to Access Poultry Management Information by Educational Levels (N=360)

Information source	Illiterate		Informal education		Primary education		Secondary education		Post-secondary education		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Family/ friends/ neighbours	33	9.6	3	0.9	232	67.8	17	5	3	0.9	288	84.2
Extension officers	12	3.5	2	0.6	135	39.5	12	3.5	1	0.3	162	47.4
Researchers	3	0.9	1	0.3	48	14	1	0.3	-	-	53	15.5
Radio	1	0.3	-	-	23	6.7	1	0.3	1	0.3	26	7.6
Leaflets	-	-	-	-	10	2.9	-	-	-	-	10	2.9
Newspapers	-	-	-	-	8	2.3	1	0.3	1	0.3	10	2.9
Books	-	-	-	-	8	2.3	-	-	1	0.3	9	2.6
Poster	-	-	-	-	3	0.9	1	0.3	-	-	4	1.2
Songs	-	-	1	0.3	2	0.6	-	-	-	-	3	0.9
Veterinary drug seller	1	0.3	-	-	1	0.3	1	0.3	-	-	3	0.9
Films	-	-	1	0.3	1	0.3	-	-	-	-	2	0.6
NGOs/ CBOs	1	0.3	-	-	1	0.3	-	-	-	-	2	0.6
Cell phone	-	-	-	-	1	0.3	-	-	-	-	1	0.3
Drama	-	-	-	-	1	0.3	-	-	-	-	1	0.3
Internet	-	-	-	-	1	0.3	-	-	-	-	1	0.3
Television	-	-	-	-	1	0.3	-	-	-	-	1	0.3
Total responses	40	11.7	3	0.9	275	80.4	20	5.8	4	1.2	342	100

Note: NGOs: Non-Governmental Organisations; CBOs: Community Based Organisations. *(Multiple responses were possible.)*

Information Sources Preferred by Poultry Farmers

Most of the poultry farmers preferred interpersonal and informal sources of information (See Table 4). Extension officers, family, friends and neighbours were the most preferred sources of information. Radio and researchers were cited as second and third choices respectively. Internet, television, drama and films were not preferred. There was a very low preference for the modern ICTs as sources of poultry management information. Cell phones were least preferred, while the Internet and television were not preferred. There were variations in terms of the preference for print sources of information. Farmers indicated a greater preference for books, leaflets and posters, but a low preference for newspapers.

Table 4: Information Sources Preferred by Poultry Farmers (N=360)

Information source	Rank								
		Not preferred		Least preferred		Preferred		Most preferred	
	N	No	%	No	%	No	%	No	%
Radio	359	23	6.4	71	19.7	94	26.1	171	47.5
Poster	359	61	17.0	92	25.6	112	31.2	93	25.9
Cell phone	359	83	23.1	96	26.7	85	23.6	95	26.4
Leaflets	358	62	17.3	72	20.1	103	28.7	121	33.7
Television	353	200	56.5	80	22.6	43	12.1	30	8.5
Newspapers	359	124	34.4	126	35.0	72	20.0	37	10.3
Researchers	358	28	7.8	106	29.5	88	24.5	136	37.9
Internet	358	309	86.1	29	8.1	10	2.8	10	2.8
Films	356	189	52.8	108	30.2	31	30.2	29	8.1
Songs	356	129	36.1	140	39.2	62	17.4	25	7.0
Drama	357	132	36.9	130	36.3	60	16.8	35	9.8
Books	353	47	13.3	86	24.3	94	26.6	126	35.6
Family/ friends/ neighbours	355	8	2.2	44	12.4	62	17.4	241	67.7
Extension officers	356	16	4.5	22	6.2	62	17.4	256	71.7
NGOs/ CBOs	350	32	9.1	119	33.9	114	32.5	85	24.2

(Multiple responses were possible and preferences varied from one farmer to another.)

Sources Preferred by Information Providers to Disseminate Information

The information providers had different choices of information sources that they preferred to use for disseminating poultry management information. The most preferred sources were posters, leaflets, and meetings. The Internet, newspapers, songs and NGOs/CBOs were not preferred by any of the information providers. The findings detailing their preferences are presented in Table 5.

Table 5: Information Sources Preferred by Information Providers (N=22)

Source	Frequency (N)	Percentage (%)
Radio	7	31.8
Poster	21	95.5
Cell phone	2	9.1
Leaflets	18	81.8
Television	1	4.5
Films	2	9.1
Drama	4	18.2
Books	5	22.7
Family/friends/neighbours	6	27.3
Meetings	16	72.7

(Multiple responses were possible.)

The information providers pointed out the reasons for their preference of information sources. Surprisingly, none of their reasons were related to farmers' preferences. The reasons (Table 6), in descending order of importance, were: availability of the source, affordability, convenience of using the source, skills in using the source, and reliability of the source.

Table 6: Information Providers' Reasons for Information Source Preference (N=22)

Reasons	Frequency (N)	Percentage (%)
Availability of the source	18	81.8
Affordability of the source	15	68.2
Convenience of using the source	15	68.2
Skills in using the source	10	45.5
Reliability of the source	4	18.2

(Multiple responses were possible.)

The findings revealed further that all the information providers had never inquired about farmers' information source preferences. The majority of the respondents mentioned inadequate resources and difficult working conditions as their main reasons (Table 7). Other reasons were: a lack of knowledge about different information sources, and a lack of funds to support various dissemination channels.

Table 7: Reasons for not Inquiring about Farmers' Information Source Preferences (N=22)

Reasons	Frequency (N)	Percentage (%)
Inadequate resources	16	72.7
Difficult working conditions	13	59.1
Lack of knowledge about different information sources	9	40.9
Lack of funds to support various dissemination channels	7	31.8

(Multiple responses were possible.)

Effectiveness of Information Sources

The extension officers were considered to be the most effective information source, followed by family, friends, neighbours, radio and leaflets (See Table 8).

Table 8: Effectiveness of Sources for Poultry Management Information (N=360)

Information source		Rank							
		Not effective		Least effective		Effective		Very effective	
	N	No	%	No	%	No	%	No	%
Radio	357	7	2.0	78	21.8	98	27.5	174	48.7
Poster	355	28	7.9	92	25.9	119	33.5	116	32.7
Cell phone	355	38	10.7	108	30.4	94	26.5	115	32.4
Leaflets	357	28	7.8	71	19.9	95	26.6	163	45.7
Television	358	164	45.8	92	25.7	55	15.4	47	13.1
Newspapers	356	63	17.7	148	41.6	84	23.6	61	17.1
Researchers	356	26	7.3	110	30.9	106	29.8	114	32.0
Internet	350	261	74.6	51	14.6	17	4.9	21	6.0
Films	358	159	44.4	133	37.2	47	13.1	19	5.3
Songs	359	91	25.3	150	41.8	82	22.8	36	10.0
Drama	357	120	33.6	131	36.7	73	20.4	33	9.2
Books	355	26	7.3	81	22.8	131	36.9	117	33.0
Family/friends/ neighbours	355	7	2.0	43	12.1	67	18.9	238	67.0
Extension officers	357	5	1.4	25	7.0	59	16.5	268	75.1
NGOs/CBOs	353	17	4.8	135	38.2	117	33.1	84	23.8

(Multiple responses were possible.)

The extension officers, meetings, researchers, family, friends and neighbours were considered to be the most effective sources of information. Convenience, availability and reliability of an information source were the most important determinants of the effectiveness of information sources.

Farmers Satisfaction with Information Dissemination Services

Most of the farmers (60%) were not satisfied with the information dissemination services. Inadequate information services from extension officers, lack of reliable sources of information, lack of awareness of the availability of information, and unavailability of the extension officers were cited as the main reasons for dissatisfaction (See Table 9).

Table 9: Reasons for Farmers' Dissatisfaction: Data From Survey Questionnaire (N=216)

Reasons	Frequency (N)	Percentage (%)
Inadequate information services from extension officers	87	40.3
Lack of reliable sources of information	54	25
Lack of awareness of the availability of information	34	15.7
Unavailability of the extension officers	20	9.3
Availability of only a few sources of information	11	5.1
Unreliable information services	10	4.6

(Multiple responses were possible.)

On the other hand, majority of the information providers admitted that information dissemination services did not satisfy farmers' needs. Poor infrastructure, poor facilities, limited transport services, lack of funds, insufficient number of extension officers, and a difficult geographical infrastructure were pointed out the main constraints to effective dissemination of poultry management information in the surveyed communities (See Table 10).

Table 10: Reasons for Farmers' Dissatisfaction: Data from Interviews (N=22)

Reasons	Frequency (N)	Percentage (%)
Poor infrastructure	13	59.0
Poor facilities	12	54.5
Limited transport services	12	54.5
Lack of funds	10	45.5
Insufficient number of extension officers	8	36.4
Difficult geographical infrastructure	7	31.8

(Multiple responses were possible.)

Barriers to Information Access

Unavailability of extension officers, lack of awareness, unavailability of information, lack of electricity, lack of funds, and poor infrastructure were the major barriers that hindered farmers from accessing poultry management information. Other factors were limited literacy levels, long distances, a lack of cooperation among farmers, limited transport services, unreliable information sources, and poor economic status. The findings from the survey questionnaire and interviews are presented in Tables 11 and 12.

Table 11: Barriers to Information Access by Farmers (N=216)

Barrier	Frequency (N)	Percentage (%)
Unavailability of extension workers	173	87.4
Unavailability of information	167	84.3
Lack of awareness on the availability of information	106	53.5
Lack of funds to buy printed information materials	97	49.0
Lack of electric power	74	37.4
Poor infrastructure	71	35.9
Limited literacy levels	47	23.7

(Multiple responses were possible)

Table 12: Barriers to Information Access: Data from Interviews (N=22)

Barrier	Frequency (N)	Percentage (%)
Few choices of information sources	6	27.3
Lack of electricity	14	63.6
Lack of cooperation among farmers	9	40.9
Lack of reading culture	14	63.6
Limited literacy level	14	63.6
Poor economic status	15	68.2
Poor infrastructure	17	77.3
Lack of self-motivation	5	22.7
Limited number of extension officers	22	100

The Proposed Model

The proposed model (Figure 3) has six interrelated components for effective information dissemination: farmers in the rural community, information providers, the information system, farmers' satisfaction, information usage, and benefits. Each component requires important elements for successful information dissemination. The key elements to be considered are farmers' information needs; appropriate information sources; farmers' competence; cultural and personal values; farmers' characteristics; and information seeking patterns.

In order for the information providers to accomplish their work effectively, several factors need to be taken into consideration. These include adequate resources, an enabling environment, support from the government, and proper understanding of the target community. The information system should be designed with the target rural community in mind.

The elements to be taken into account in designing the information system include: information quality, system quality, and service quality. The three elements of the information system may result in information usage and farmers' satisfaction. After using the information and being satisfied with the benefits, farmers may consult the information system again, in order to access more information to improve their farming activities. This will only happen if the information disseminated is relevant to farmers' needs, and if its usage thus improves their farming activities and results in noticeable benefits.

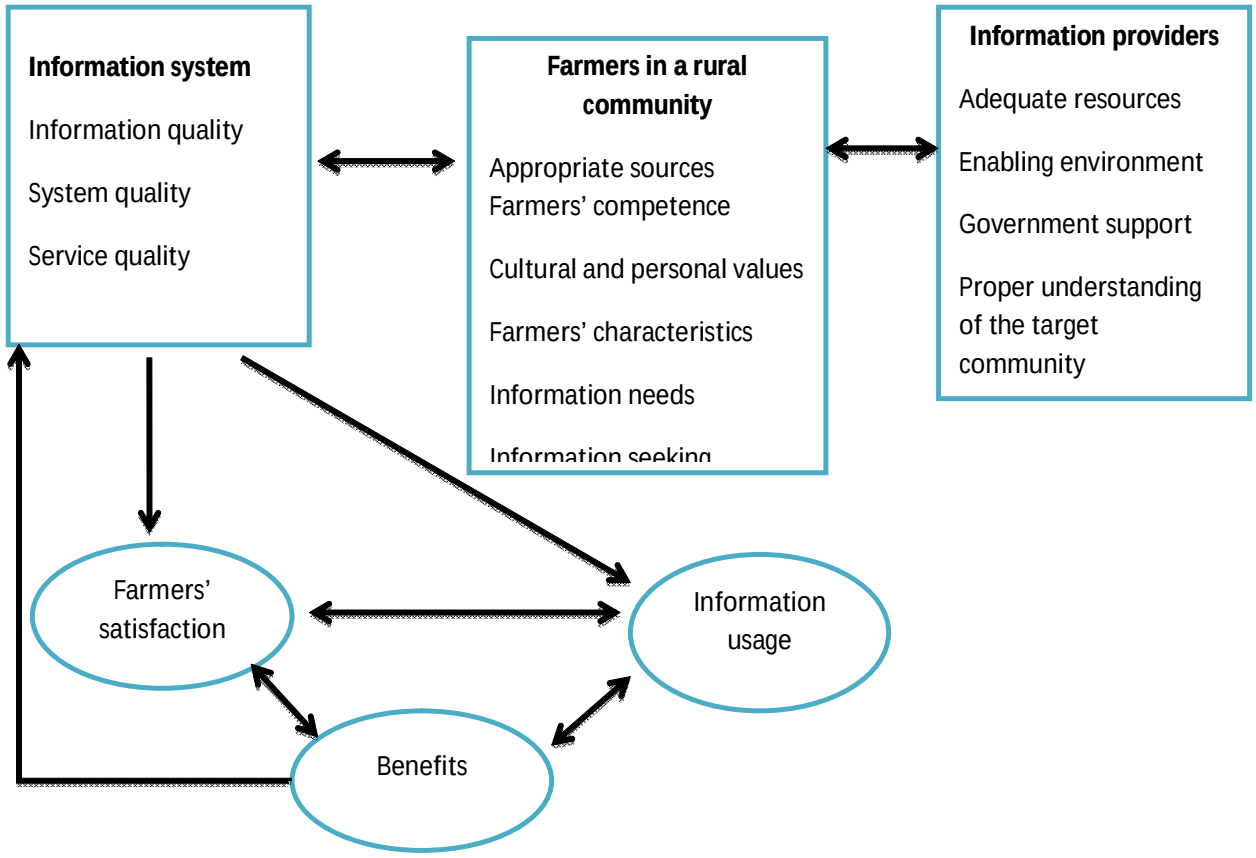

Figure 3: A proposed model for dissemination of agricultural information in Tanzania

Explanation for Components of the Proposed Model

There are six components that guide the proposed model, namely: information system, farmers in the rural communities, information providers, farmers' satisfaction, information usage, and benefits. The proposed model presents the important elements that the information system depends on for effective information dissemination. These are information quality, system quality, and service quality. Understanding the farmers in the rural communities is a prerequisite for successful information services. Various issues need to be taken into consideration in order to gain adequate knowledge about the target community. These include farmers' information needs, appropriate sources, preferred sources, cultural and personal values, farmers' characteristics, and farmers' competence. Information providers are the ones responsible for planning and disseminating information to the rural communities. In order to perform their duties effectively, they need adequate facilities, adequate resources, enabling environment, government support, and a proper understanding of the target community. The positive outcomes of the three components are farmers' satisfaction, information usage, and benefits to the farmers. The six components of the proposed model are explained in detail in the following sections.

Information System

The success of an information system in the rural communities is dependent on three variables, that is, information quality, system quality, and service quality (Msoffe, 2015). Information provision should consider these variables during the planning and dissemination of information in the rural areas. Information quality refers to the information content. The content should be relevant, context specific, easy to understand, and up to date. The study findings revealed that farmers were not motivated to access information that was

general, since it was not relevant for their local circumstances. Similarly, they failed to use the information that was delivered in formats they could not comprehend. Thus, the information providers should ensure that they understand farmers' needs and characteristics as well as their local environment so that they are in a position to deliver relevant content to the farmers.

System quality is concerned with the general organisation of the information dissemination: availability, usability, adaptability, reliability, and response time. The study findings showed that availability, convenience and reliability of an information source were the key factors for farmers in accessing information. Thus, it is important for information providers to ensure that the channels used for disseminating information are continuously available, convenient and reliable. Service quality is the support that the information providers offer to the farmers. This may be in form of awareness creation, follow-ups, assistance to use information, and being receptive and responsive to farmers. The study findings indicated that farmers were unable to use information because of lack of support from the information providers. It is thus imperative to ensure that information providers offer support to farmers so that they can be able to access and use information.

Farmers in the Rural Community

Farmers in the rural communities interact with the information system in an effort to satisfy their information needs (Msoffe, 2015). The information system that is designed with a proper understanding of the target community will be in a position to offer appropriate information to satisfy farmers' needs. It is thus proposed that assessment and understanding of the rural community could be based on, but not limited to the following: information needs, information seeking patterns, farmers' characteristics, preferred information sources, appropriate sources, cultural and personal values, and farmers' competence. Information providers should therefore make it a priority to have adequate knowledge about the target community as a prerequisite for planning and dissemination of information to the rural communities. The study findings showed that information needs of farmers were location specific. Also, farmers accessed information that had significance in their farming activities. This implied that farmers tend to value information that has a local focus and positive impacts in their farming activities. Thus, it is imperative to understand the information needs and seeking patterns of the target community in order to design an information service that is context specific and relevant to the farmers.

The study findings established that farmers had preferences for information sources, and also had choices for sources they considered effective. The study findings indicated that rural farmers preferred interpersonal sources. However, it was recommended that the use of multiple sources of information would provide a wider opportunity for all categories of farmers to access information. In order to understand the sources of information that are suitable for the target community, the information providers have to assess farmers' preferences and their choices for effective sources of information. This knowledge will assist in using information sources that are preferred by the rural community. In this regard, the proposed model is likely to assist in providing appropriate information packages to the farmers.

It is also prudent to assess and understand the cultural and personal values of farmers in the target community. The study findings revealed that cultural and personal values had effects on the way farmers were seeking information and sharing information among them. For this reason, it is important to understand the culture of the community in order to find ways of nurturing the positive cultural norms for the improvement of information access. For instance, the oral culture could be encouraged by organising discussion groups, storytelling, and narratives.

The farmers' demographic and socio-economic characteristics have influence on their information seeking patterns, as well as their ability to comprehend and use information. The findings showed that educational level of farmers had influence on the way farmers accessed and used information. It was also found that economic status of farmers influenced their information seeking patterns and information use. This model suggests a need to understand the demographic and socio-economic characteristics of farmers before disseminating information to the rural communities.

With such knowledge, the information providers will be able to design information packages that are relevant to a particular group of farmers. This fact will enable information services offered to the rural communities to reach farmers of different status.

Information Providers

The information providers are responsible for delivering agricultural information to the farmers in the rural areas. They can only perform their work successfully if the requirements for accomplishing their responsibilities are in place. The basic requirements for planning and dissemination of information to the rural communities are: adequate resources, enabling environment, government/ institutional support, and proper understanding of the target community (Msoffe, 2015). In order to plan and deliver information to farmers, various resources are required to enable the information providers to assess the target community, design the information resources and disseminate the information. The study findings established that information providers were unable to identify and prioritise farmers' information needs mainly because of lack of resources to facilitate the undertakings. The proposed model addresses the issue of providing adequate resources to enable smooth planning and dissemination of information to the rural communities. These may include physical and financial resources such as reliable transport, reliable communication facilities, funds, and other resources vital for information dissemination.

Enabling environment refers to appropriate policies, favourable working environment, basic infrastructure, as well as necessary social services. If all these aspects are taken into consideration, the information providers will have a comfortable working environment which may enable them to work efficiently. Such an environment is conducive for proper planning and dissemination of information. Likewise, proper understanding of the target community can assist the information providers in planning and disseminating appropriate information to the local communities. This involves assessment of the target community in terms of farmers' characteristics, information needs, preferred information sources, information seeking patterns, and appropriate sources. Similarly, government support is very important for the information providers to perform their responsibilities. The findings indicated that one of the obstacles that information providers faced was lack of support from the government. This model can assist the government in implementing information services to ensure that the information providers are given full support. In view of this, the proposed model is likely to facilitate the effective dissemination of agricultural information in the rural areas.

Farmers' Satisfaction and Information Use

The information system has impact on farmers' satisfaction with the information, as well as information usage. A well-designed information system has a positive impact on farmers' satisfaction, that is, the information needs of farmers will be satisfied. Satisfaction of farmers has impact on information usage, for the reason that farmers who are satisfied with the information are likely to use it. Similarly, use of relevant information brings satisfaction (Msoffe, 2015). Therefore, farmers' satisfaction and information usage have impact on each other and have impact on the benefits. In order to arrive at farmers' satisfaction and information usage, there should be a proper planning for information dissemination which starts with assessment of the target rural community. After the assessment, the information providers have to use the knowledge gained to plan for information dissemination taking into account all the attributes of the target community. A well-designed information system with focus on farmers provides relevant information to the farmers. Finally, farmers receive appropriate information which may result in farmers' satisfaction and information usage.

The Benefits

The benefits are the results of using relevant information. Farmers who use relevant information by applying the recommended farming practices should benefit by improvements in the various aspects of agricultural production. For instance, farmers who use information on poultry disease control get the benefits of healthy poultry. Likewise, those who use information on poultry production gain by increasing the number of poultry. The benefits can only be realised if the information used was appropriate (Msoffe, 2015). It is therefore important for

information providers to ensure that they disseminate information that satisfies farmers' needs and is appropriate to their farming practices. After realising the benefits of using information, farmers may further consult the information system to access more information for use. Thus, the benefits impact further information usage, which may result in improvement of farming activities in the rural areas. It is therefore hoped that the proposed model will be useful in effective planning and dissemination of agricultural information in the rural communities.

Discussion

The model proposes that information dissemination initiatives focus on the target community or intended beneficiaries. The focus should be on the community of beneficiaries, rather than on the information alone. Thus, the information providers should make it a priority to understand the target community before embarking on information dissemination activities. This may entail assessing their information needs, how they seek information, information sources that they prefer, and other factors which may contribute to information access and usage. The study findings showed that it is important to understand the target community in advance, in order to have successful information services. Adequate understanding of the local community provides guidance on the information source to use, and the formats and type of information to disseminate, depending on farmers' requirements (Das, 2012; Mtega, Dulle and Benard, 2013). This may necessitate the repackaging of information messages in order to reach the intended group. It is therefore important for responsible institutions to understand the culture, traditions and local situations before planning for information dissemination in the rural areas.

The study findings revealed that farmers in rural areas have limited education and lack various basic services. Thus, they may not be able to use print media, electronic resources and other formal sources of information. The level of education of an individual determines his or her knowledge and capability, and may influence the individual's ability to access and use information (Chen, Liu and Yang, 2011). Opara (2010) asserts that information may be accessible physically, but may possibly be inaccessible intellectually. The educational level of farmers has a great influence on the way in which farmers access and use information (Waller, Hoy, Henderson, Stinner and Welty, 1998). According to Sheba (1997), exposure to education gives an individual the ability to control information input, and store and retrieve information for future use. The proposed model is designed to accommodate the demographic and socio-economic factors that may influence the process of information seeking. For instance, the illiteracy or limited education of the rural farmers has a significant influence on farmers' information seeking habits, as revealed by the study findings. In the review of information seeking models, Aina (2004) noted that these models did not take the education of users into account. The failure to take these factors into account during information dissemination may affect farmers' information access, which means that information will not reach the target beneficiaries. The need to have a model that addresses the educational background of farmers is thus important for effective dissemination of information in semi-literate rural communities.

Furthermore, a decision regarding which information sources to consult depends on demographic and socioeconomic factors. The study findings showed that farmers preferred to access information through face-to-face communication. They preferred consulting family, friends, neighbours and information providers. In such a situation, individual and collective interactions within the local community would be the appropriate means to reach the majority of the target beneficiaries. However, the use of other media to complement the messages communicated orally would increase the reach to other members of the community, who may not be interested in face-to-face communication. Availability of other sources of information, apart from the oral sources, will also serve as a validation mechanism for orally delivered information. Thus, the proposed model suggests that the focus should not only bet on interpersonal sources, but also on other sources that are deemed to be appropriate by the target community. For instance, radio was found to be among the most appropriate sources for the rural community, and it could therefore serve as a supplementary source to oral communication.

In order for the information to be used, the content should be relevant to the farmers' needs and the formats should be easy to understand. The study

findings established that farmers tended to use information that had a direct impact on their farming activities, and preferred to use fellow farmers as sources, because of the convenience of engaging in two-way communication which is easier to understand than reading or watching. The proposed model suggests that the information disseminated to the rural areas should comprise local content and be context-specific. Farmers in the local communities may be motivated to use information that has a local content and fits within their prevailing circumstances. The usage of such types of information can easily result in the satisfaction of farmers' needs, which is the ultimate goal of disseminating information to the rural communities. Since farmers are likely to use information that has immediate benefits, the outcome of information usage may result in further usage because of the realised benefits. Thus, if relevant information is disseminated to the rural communities, farmers will be motivated to use the information because of the benefits that they achieve after information usage.

Conclusion

The proposed model is unique in its emphasis on farmers as the central focus of information dissemination in the rural areas. This model considers all aspects of effective information delivery to the semi-literate communities of developing countries. The proposed model creates an opportunity for all agencies responsible for information provision in the rural areas to develop and design guidelines for information dissemination. It also provides an initial framework for understanding farmers in the rural communities of the developing world. This model may be useful in planning for information dissemination services in the rural areas or during the assessment of the existing information services in rural areas. Furthermore, the model contributes to the understanding of information dissemination in rural settings of the developing world.

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