

## **Exploring the use of ICTs in learning and disseminating livestock husbandry knowledge to urban and peri-urban communities in Tanzania**

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### **ABSTRACT**

This paper discusses the importance of various Information and Communication Technologies (ICTs) in learning and disseminating relevant information on livestock husbandry in Tanzania. The paper is part of a study that investigated the extent of use of ICTs by urban and peri-urban livestock keepers and how access and dissemination of livestock information could be improved through use of ICTs. Mixed method approach was the methodology used in the study whereby quantitative and qualitative data were gathered. The findings of this study revealed that different types of ICTs were used by urban livestock keepers to learn and disseminate livestock information though some ICTs e.g. mobile phones were used more (92.1%) than other ICTs e.g. radio (21.7%) and television (24.6%). Internet was used by very few livestock keepers (2.4%) due computer illiteracy. It was concluded that ICTs are important tools for learning and dissemination livestock husbandry knowledge, but their use is hindered by several factors including unawareness of the radio and television programmes and lack of computer skills. Policy implications of the study include improvement of the telecommunications services and ICT infrastructure by the government through relevant bodies in order to facilitate more access and dissemination of information through mobile phones, radio, television and the Internet.

**Keywords:** *ICTs; Information access; Information dissemination; Livestock husbandry; Developing countries; Tanzania*

### **INTRODUCTION**

In nearly all developing countries, urban livestock keeping is becoming increasingly important, as urban demand for animal products rises. An effective and profitable livestock production cannot be achieved if information is neither available nor accessible to the livestock keepers. Information is very important because it will enable the livestock keepers to domesticate their animals in the most profitable way. This is emphasized by Brodnig and Mayer-Schönberger (2000) who report that accurate and reliable information is a key element for sustainable development. Livestock keepers need information on livestock diseases, nutrition, treatment and control of diseases, breeding techniques and markets for their products, among many other information needs. All this information has to be made available, accessed and used by the livestock keepers in order to increase productivity and hence improve their livelihoods. There are various ICTs that can be used by urban livestock keepers in accessing information and disseminating information as opposed to rural livestock keepers. Examples of these technologies include; telephones/mobile phones, television, radio and the Internet. These technologies can be very useful in providing various types of information to the livestock keepers depending on their information needs.

According to CIRAD (2009), lack of access to information is one of the serious obstacles to development, including agricultural development. Livestock husbandry faces lack of research and services provision: information access and adoption of improved technologies is limited for small scale urban livestock keepers. This is made worse by the fact that existing services are not tailored towards their needs and circumstances. Guendel (2002) opines that one of the coping

strategies of this problem is the organization and networking among small scale urban livestock keepers to improve access to information and other services: urban livestock keepers should become more aware of the potential benefits of organization and networking as a means to access information and services and improve marketing strategies. According to Munyua (2008), emerging technologies and new materials are key success factors in addressing the challenges of small-scale farmers. Information and knowledge are considered prime productive resources and play a key role in ensuring food security and sustainable development. Ramkumar (2005) reported that, dissemination of knowledge through appropriate delivery methods is important.

Although modern telecommunication systems have made rapid progress, the benefits have yet to penetrate to small scale livestock owners. Research has shown that urban livestock keepers still lack adequate information on livestock keeping practices despite the relatively well developed ICT infrastructure in urban areas (CIRAD, 2009). This is because they mostly rely on advice services as sources of information which are usually insufficient (Gakuru et al., 2009). According to Souter et al., (2005), lack of timely information is well known to be the largest constraint on small-scale agricultural production, a sector that provides livelihood for 70-80% of Africa's population. The lack of information leads to poor husbandry practices, which in turn leads to poor production. This situation could probably be improved by making use of ICTs to get the required information on time. However so far, the potential for ICTs to impact this sector has not yet received much attention. There is little scientific evidence in specific urban communities about the ways in which individuals and communities exploit access to ICTs and the impact they have on livelihoods in urban communities (Souter et al., 2005). A study by Chilimo (2009) reported that, despite the strong belief in the role of ICTs for socio-economic development, clear evidence on how ICTs can be used to achieve this purpose in the Tanzanian context is still lacking. This paper therefore discusses the extent of use of ICTs and their effectiveness in accessing and disseminating information among urban livestock keepers. The paper also gives recommendations to various stakeholders on how access and dissemination of livestock information could be improved, thus improving the livestock keeping practices in urban and peri-urban areas of Tanzania.

## **BACKGROUND TO THE STUDY**

### **The ICT environment in Tanzania**

In this study, a useful working definition of ICTs is the electronic means of capturing, processing, storing and disseminating information (Greenberg, 2005). The term generally refers to electronic and computer based technologies that are used in communication e.g. mobile phones, radio, television and the Internet.

Tanzania has made a remarkable progress in deploying ICT; access of technologies such as Internet, computers, satellite, radios and mobile phone has been growing fast in the past 10 years in Tanzania (URT, 2003). Despite the rapid improvements, Tanzania's ICT environment is still somewhat challenged. According to Swarts and Wachira (2010), Tanzania accounts for 5% of the mobile phone users in Africa and is ranked fourth after Nigeria, South Africa and Kenya. The domestic fixed-line telephone network is less than one connection per 100 persons while the mobile-cellular service, aided by multiple providers, is increasing. Like most of the African countries, Tanzania has recorded exponential growth in mobile phones while the growth in fixed lines has been minimal in comparison. According to Ngalinda and Mutagahywa (2005), access to the Internet and computers is extremely limited. Only 2% of people in Tanzania have email addresses, and most of these live in Dar es Salaam. More than three-quarters of those who have email addresses use free public accounts. Only 2% of all households in Tanzania have a computer, all in urban areas. Even then, a mere 15% of these are connected to Internet, and they almost exclusively live in Dar es Salaam.

Shoki (2010) reported that, there are more than 300 Internet cafes in Dar es Salaam alone and at least 20 in Zanzibar. This can be evidenced by the increase in the number of Internet cafes especially in Dar es Salaam as well as other urban areas like Mwanza, Mbeya, Arusha, Tanga and Dodoma. Business process re-engineering is also picking up whereby many organizations have computerized their financial information systems, human resources information systems, academic information systems, and library information systems just a few to mention (TCRA, 2010). Majira newspaper (2011) emphasizes that today ICTs are powerhouses of the global economy and offer real solutions towards generating sustainable economic growth and prosperity. ICTs also act as catalysts in accelerating progress towards meeting the Millennium Development Goals). In addition, the advent of the information society offers increased scope for ICTs to be used to uplifting the agricultural sector and thus address and enhance livelihoods (Stienen et al., 2007).

### **Objectives and research questions**

The main objective of this study was to investigate the extent to which ICTs were used among urban and peri-urban livestock keepers in Kinondoni and Morogoro urban Districts and the factors that influenced the use of ICTs, in order to improve their use in accessing and disseminating livestock information. Some of the specific objectives that will be discussed in this paper are to identify different ICTs used by urban livestock keepers, to assess the usefulness of each of the ICTs in providing education and the limitations of using each of the ICTs in order to suggest ways to improve their use in accessing and disseminating livestock information. The research questions answered by this research paper are:

1. What ICTs are used in disseminating and accessing livestock information and to what extent are they used?
2. How important are the ICTs in providing relevant information on livestock husbandry?
3. What are the limitations of using ICTs in disseminating and accessing information and what can be done to improve their use?

## **LITERATURE REVIEW**

### **Potential of ICTs in promoting agriculture in Africa**

ICTs can be effective means of disseminating to communities huge amounts of relevant information on markets, technology, prices, successful experiences, credit facilities, government services and policies, weather, crop, livestock and natural resource protection. The acquired knowledge and information can greatly impact on agricultural production and food security (Girard, 2003). Modern ICTs could play a major role in communicating knowledge and information to agricultural communities, delivering education modules, accessing inputs, markets and market prices, credit, conducting business, facilitating networking and strengthening partnerships, scaling up inter-linkages of development interventions and increasing agricultural productivity. Media such as the Internet, web-based means, mobile telephony and computer-mediated networks among others are being used in a number of initiatives in Africa to provide development solutions (Munyua, 2008).

Agricultural extension, which depends to a large extent on information exchange between and among farmers on the one hand, and a broad range of other actors on the other hand, has been identified as one area in which ICTs can have a particularly significant impact. Extension agents as intermediaries between farmers and other actors in the agricultural knowledge and information

system are especially well-placed to make use of ICTs to access expert knowledge or other types of information (CTA, 2003).

According to Gakuru et al., (2009), ICTs have become increasingly integrated into the dissemination of agricultural information throughout Africa. Traditional forms of ICTs such as radio and television have become more prevalent in advisory service provision by producing programmes that feature agricultural information. National ministries of agriculture have attempted to integrate ICTs into the delivery of information and have established district information centres providing agricultural information. Many NGOs and research organizations have also attempted to facilitate technology transfer in the agricultural sector. Ratna (2008) states that the diffusion of ICTs in the agricultural sector provides the necessary digital opportunities for productivity increase, income generation, decrease in regional disparity, and improving their linkages with the market.

There are several initiatives in Africa that employ ICTs in offering extension services and training to small-scale farmers. Munyua (2008) cites several examples of such initiatives that have employed ICTs to restructure extension services in Africa include; the Machobane Farming System (MFS) in Lesotho, the Agricultural Technology and Information Response Initiative (ATIRI), and the Linking Local Learners (LLL) initiative in Kenya, the Virtual Extension Research and Communication Network (VERCON) in Egypt, the National Agricultural Advisory Services Programme (NAADS) in Uganda, the Agricultural Research and Extension Network (ARENET) in Uganda and the District Agricultural Training and Information Centres (DATICS) in Uganda. Gakuru et al., (2009) opines that although several ICT projects in Africa have been established to fill the gap, most of these initiatives are web-based. Seeking information from these and other platforms becomes a difficult task for the illiterate farmers as it entails going through many publications or surfing a large number of web-pages. Web-based solutions also bring challenges because Internet infrastructure in Africa is still very sparse. Nevertheless, these are very useful resources and all that is needed is to provide an easy way for the farmers to navigate them. The use of mobile phones and SMS are examples of solutions that should find more use as they offer easy accessibility. However, SMS carries only a limited amount of information and requires a basic level of literacy.

## **RESEARCH METHODOLOGY**

### **Description of the Study area**

The study was confined to the urban areas of Morogoro and Dar es Salaam regions. Morogoro Region is located on the eastern side of Tanzania Mainland. The Region lies between latitudes 5°58' and 10°00' South of the Equator and between longitudes 35°25' and 38°30' East of Greenwich. It is divided into six (6) districts, namely Kilosa, Kilombero, Ulanga, Mvomero, Morogoro Urban and Morogoro Rural Districts, (URT, 2008). Dar es Salaam is the commercial city of Tanzania. The City is located between latitudes 6°36' and 7°0' to the South of Equator and longitudes 39°0' and 33°33' to the East of Greenwich. It is bounded by the Indian Ocean on the east and by the Coast Region on the other sides. Administratively, Dar es Salaam is broken into 3 districts: Ilala, Kinondoni, and Temeke, (URT, 2004). The study was conducted in urban and peri-urban areas of Morogoro urban and Kinondoni districts. These two districts were selected purposively. Kinondoni was selected because of the relatively well developed ICT infrastructure and the many livestock keepers (3,513) compared to Ilala (2,156) and Temeke (2,587), (URT, 2003a; URT, 2003b; URT, 2003c). Morogoro urban was selected because it is more urbanized, hence more developed in terms of ICT infrastructure compared to other districts in Morogoro region.

### **Research design, sampling techniques and sample size**

To meet the main aim and objectives of the study, a mixed method research design was adopted whereby a combination of quantitative and qualitative research methods was used. In this study, quantitative data was gathered using questionnaires in order to quantify the findings in terms of frequencies and percentages. Qualitative data on the other hand, was gathered using interviews and observations in order to confirm the findings obtained from quantitative data. The rationale for using a mixed method approach, (also referred to as multi-method, convergence or integrated method) is based on its major advantage of neutralizing or cancelling the biases of a single method (Creswell, 2003; Glazier and Powel, 1992). A combination of two non-probability sampling techniques was used in selecting the sample; purposive and snowball sampling techniques. The purposive (judgmental) method of non-probability sampling was used because it enabled the researcher to select cases that were most likely to yield data which would answer the research questions in order to meet the objectives of the research. The extension officers helped the researcher to identify the respondents who were more informative. Another reason why the researcher adopted to use purposive sampling technique was because purposive sampling enabled the researcher to select the livestock keepers who had at least one of the ICTs in their households. Purposive sampling was also used to select the wards that were included in this study. The researcher considered selecting wards with many livestock keepers. This was done to increase the response rate since some wards had very few livestock keepers because of limited space to keep livestock and the strict laws and regulations of keeping livestock in urban areas. Apart from purposive sampling technique, snowball sampling technique was also used to select the respondents that were used in the study. According to Saunders et al., (2007), this is a method of non-probability sampling design commonly used when it is difficult to identify members of the desired population. Snowball sampling requires one to make contact with one or two cases to identify further cases. The new cases are asked to identify further new cases (and so on) until the required sample size is obtained. In this case, one extension officer was selected from each of the selected wards. The extension officers then directed the researcher to the first few livestock keepers who in turn led the researcher to identify the rest of the livestock keepers. The researcher used this method due to the unavailability of the list of all the livestock keepers in the study areas.

In this study 272 respondents were engaged out of 300 respondents who had been selected. This was because some of the respondents were not present in the field at the time of data collection. Tabachnick and Fidell (2007) suggest a sample size of  $N > 50 + 8m$  for multivariate data analysis (where  $N$  is the sample size and  $m$  is the number of independent variables) and  $N > 104 + m$  for testing individual predictors. This study had a total of 10 independent variables including; age, sex, education, occupation, experience, information needs, effectiveness of information sources, perceptions of ICT use, gaps in ICT use and strategies for improvement (i.e., each specific objective stands for one independent variable in addition to the respondents' characteristics). Therefore, the minimal sample size would be 114 (obtained from the formula;  $N > 104 + m$ , where  $N = 300$  and  $m = 10$ ). Thus a sample size of 300 respondents was deemed sufficient for this study. All the above mentioned variables were used in the study but for the sake of this paper, only some selected variables have been discussed.

### **Data collection techniques and analysis**

Survey is the method that was used for data collection. Both primary and secondary data was collected using various methods of data collection. Primary data was collected using questionnaires (for livestock keepers), in-depth interviews (for extension officers) and observations while secondary data was gathered from various sources including; government

websites, government surveys (e.g. population censuses), media (e.g. television and radio), various publications (e.g. books, journals and CD-ROMS) and the Internet. The extension officers were the only key informants in this study and they were interviewed in order to confirm the answers that were given by the livestock keepers concerning their use of ICTs in communication with the extension officers. The extension officers were asked among other things the information that they disseminated to their livestock keepers, other information sources that they used, the ICTs that they used, the limitations that they faced in using the ICTs to access and disseminate livestock information and their opinions for improvement of ICT use. The participation of both genders during primary data collection was put into consideration by the researcher to avoid gender biasness. A combination of various data collection instruments was used in order to increase the reliability of the data including questionnaire schedules, interviews guide and observations check list. The collected data was systematically organized, coded, recorded and analyzed. Statistical Package for Social Sciences (SPSS) was used to analyze quantitative data while content analysis was used to analyze qualitative data. In analyzing the quantitative data, both univariate and bivariate analyses were done. Tests of statistical significance (inferential analysis) were not done in this study because these tests are usually used to establish how confident the researcher can be that the results derived from a study based on a randomly selected sample are generalized to the population (Bryman, 2004). In this case, samples were drawn using non-probability sampling thus the reason why significance tests were not done. Inferential statistics are also used to test hypotheses, which was not the case in this study. In analyzing qualitative data, content analysis was used in which data that was collected from the interviews and observations were studied and interpreted in order to establish meaningful patterns, trends and relationships from the information gathered. Data analysis intended to show the frequency of using various ICTs, the ICTs known, which ones were being used and for what purposes and the reasons why ICTs were not being used.

## RESULTS AND DISCUSSION

### Use of ICTs in accessing livestock information

The respondents were asked whether they used any of the ICTs to access livestock information. Most of the respondents 239 (94.1%) admitted having used at least one of the ICTs to access livestock information as opposed to 15 respondents (5.9%) who did not use any of the ICTs to access livestock information. The results further indicate that 144 of the respondents in Kinondoni (94.7%) and 95 (93.1%) in Morogoro urban district used ICTs. This shows that there is no significant difference on the use of ICTs between the two districts; most of the livestock keepers from both the districts use ICTs to access livestock information. Only 15 (5.9%) respondents did not use any of the ICTs and 7 (6.9%) of these were from Morogoro urban while 8 (6.1%) were from Kinondoni district. The results of this study are presented in Table 1.

**Table 1:** *Use of ICTs in accessing livestock information*

N=152 (Kinondoni), N=102 (Morogoro urban), N=254 (Overall)

ICT use	Kinondoni		Morogoro urban		Overall	
	Freq.	%	Freq.	%	Freq.	%
Yes	144	94.7	95	93.1	239	94.1
No	8	5.3	7	6.9	15	5.9

Source: *Field survey, 2011*

These findings have revealed that ICTs are being accessed and used by many livestock keepers in urban areas, which is an indication that urban livestock keepers can now be more informed if they make proper use of ICTs to get advice or help from veterinarians and/or extension officers and this may lead to quick solving of problems and improvement of the urban livestock keeping practice. The respondents were then asked to mention the types of ICTs that they used in accessing livestock information. Different types of ICTs were mentioned by the livestock keepers including; radio and television (for accessing information and learning), mobile phone (for communicating with extension officers, fellow livestock keepers and buyers) and the Internet (for accessing information, learning and communication). Most livestock keepers used at least one of the ICTs while some used more than one type of ICT and very few livestock keepers used all types of ICTs to access livestock information. The results presented in Table 2 indicate that mobile phone were used by most (234) of the livestock keepers (92.1%) for communication. It shows that respondents in Kinondoni (92.8%) and in Morogoro urban (91.2%) used mobile phones more or less the same. Another type of ICT that was mentioned by the respondents was television 67 (24.4%). This also was watched more or less the same by respondents in Morogoro urban (29.4%) and in Kinondoni (24.3%). Radio was also mentioned slightly more by respondents in Morogoro urban (35.3%) compared to the respondents in Kinondoni (12.5%). Internet was used by the least number of respondents (2.4%). Respondents who used the Internet were slightly more in Kinondoni 5 (3.3%) than in Morogoro urban district 1 (1.0%).

**Table 2:** Types of ICTs used by urban livestock keepers

N=152 (Kinondoni), N=102 (Morogoro urban), N=254 (Overall)

Type of ICT used	Kinondoni		Morogoro urban		Overall	
	Freq.	%	Freq.	%	Freq.	%
Radio	19	12.5	36	35.3	55	21.7
Television	37	24.3	30	29.4	67	24.6
Mobile phone	141	92.8	93	91.2	234	92.1
Internet	5	3.3	1	1.0	6	2.4

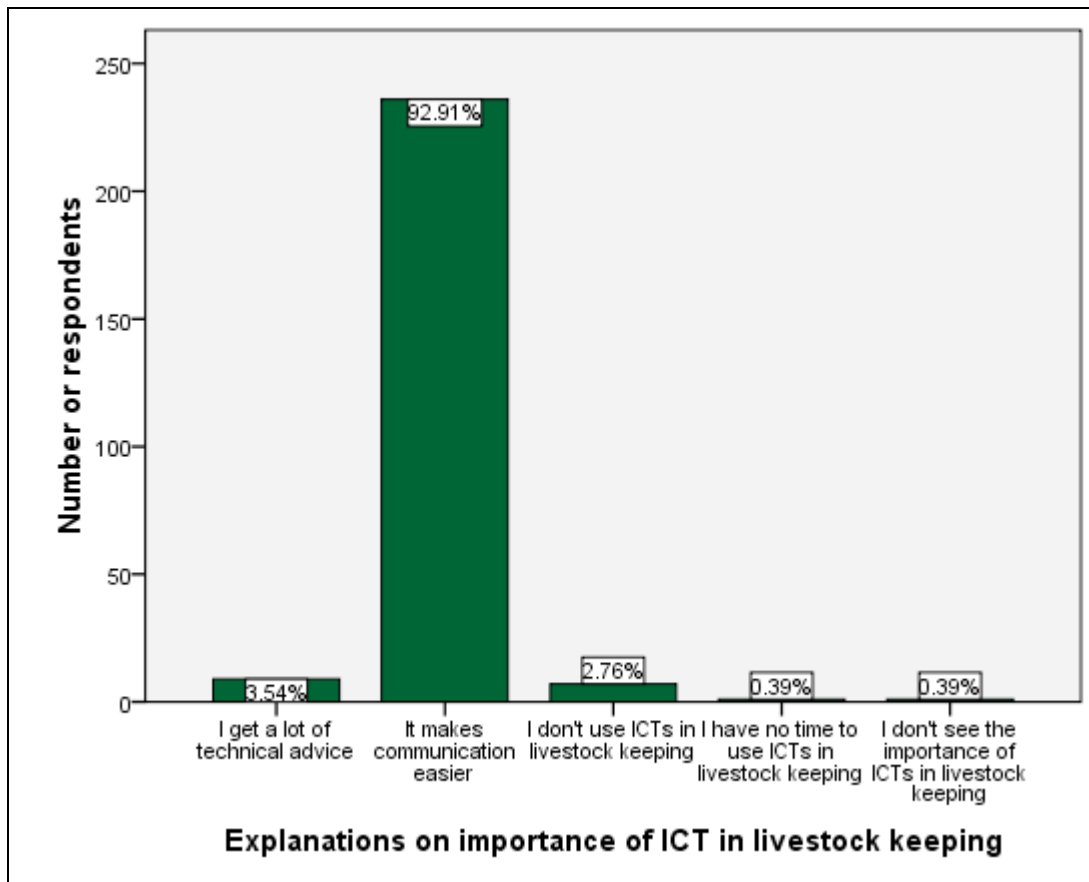
Source: Field survey, 2011

These results mean that mobile phones and the Internet were used slightly more by respondents in Kinondoni compared to radio and television which were used slightly more by respondents in Morogoro urban districts. The well developed ICT infrastructure in Kinondoni may be the reason as to why mobile phones and the Internet are used more by respondents in Kinondoni. The livestock keepers in Kinondoni District may also be ignorant on the importance of the livestock programs or they may not have been aware of the livestock programs in the radio and television.

### Importance of ICTs in accessing livestock information

The respondents were asked whether the ICTs were important tools to them in accessing livestock information. 246 (96.5%) respondents admitted that ICTs were important tools for accessing livestock information and a few respondents (3.5%) said that the ICTs were not important to them. The respondents were then asked to give explanations for their answers. The results presented in Figure 1 show most of the respondents (92.9%) explaining that the ICTs were important because they made communication easier. Most of these respondents were

mobile phone users and they admitted that mobile phones made communication easier because it enabled them to call veterinary doctors, hence their animals could be attended on time. Some of these respondents said that mobile phones made communication with feed suppliers and chicks suppliers easier because the feeds and chicks could be brought to them just from a mere phone call, without having to waste time by going all the way to the suppliers. It was noted that mobile phones were not used to access the Internet because the phones were not connected to the Internet. Only 3.45% of the respondents said that ICTs were important because they enabled them get a lot of technical advice. These were the respondents who used radio, television and the Internet (Computers); these respondents said that through these ICTs, they could get a lot of technical advice which they could use to improve their livestock keeping practices.



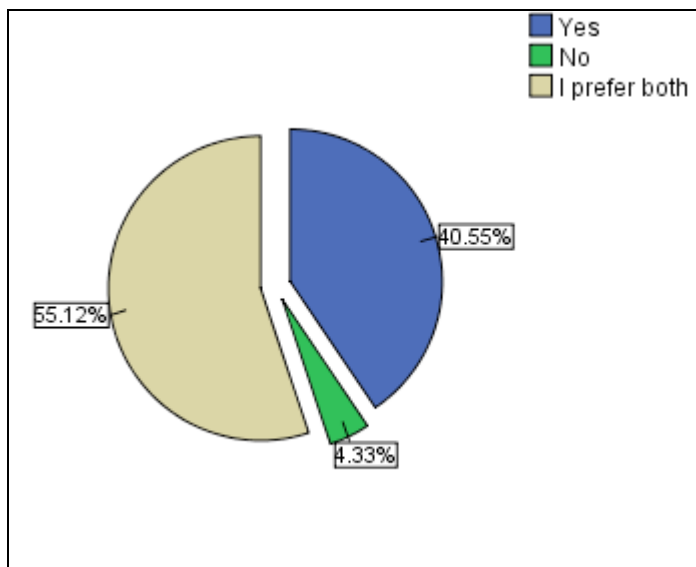
**Figure 1:** Importance of ICTs in livestock keeping  
Source: Field survey, 2011

### Preferences of using ICTs to access livestock information

The respondents were asked whether they preferred use of ICTs than other information sources in accessing livestock information. Figure 2 show that 140 out of 254 respondents (55.12%) preferred the use of both ICTs and other sources of information. Other 103 out of 254 (40.55%) of the respondents replied that they preferred use of ICTs than other information sources while 11



out of 254 (4.33%) of the respondents said they did not prefer use of ICTs in accessing livestock information.



**Figure 2:** Preference of ICTs over other information sources  
Source: Field survey, 2011

These results mean that livestock keepers prefer to use a combination of both ICTs and other sources of information in order to access more information. The other (non- ICT) sources of information include: veterinary shops, extension officers, fellow livestock keepers, seminars/meetings, agricultural exhibitions and print sources. ICTs alone cannot help the farmers solve their problems; the farmers also prefer to use other information sources especially extension and/or veterinary services more than any other sources of information but these should be integrated with ICTs so that the livestock keepers can benefit more from the services. ICTs alone can just act as tools to facilitate access and dissemination of livestock information but they cannot be sufficient enough to solve all the problems of the livestock keepers if used alone. Through the use of ICTs, extension officers can do their work more easily. Munyua (2008) states that an appropriate blend of ICTs could be used to free time for extension workers and cut down the number of change agents required and the associated costs, thereby freeing resources to implement activities that directly impact on production, productivity and marketing agricultural produce by small-scale farmers. This is also supported by Ahuja (2011) who reports that the use of ICTs can make agricultural extension a more diversified, knowledge driven system for meeting on demand farmers' information needs.

The respondents were then asked to give reasons for their preferences on ICTs over other information sources. The results presented in Table 3 show that the reason given by 139 out of 140 (99.3%) respondents for preference of both ICTs and other information sources was that they are both important hence they are both needed in accessing livestock information. These respondents further explained that ICTs alone were not enough because not everything could be accomplished through use of ICTs, hence other information sources are also needed. This answer was confirmed in interviews where most of the extension officers suggested the use of both ICTs and extension officers in order to enhance access to livestock information.

**Table 3:** *Reasons for preferences of ICTs over other information sources*

<b>Reason for preference</b>		<b>Freq.</b>	<b>%</b>
Both ICTs and other sources are important	N=140	139	99.3
ICTs ease communication	N=103	81	78.6
ICTs save time	N=103	40	38.8
ICTs save costs	N=103	18	17.5
ICTs are not useful	N=11	6	54.5
Exchange of ideas in face to face dialogues	N=11	3	27.3

*Source: Field survey, 2011*

Another explanation that was given by 81 out of 103 (78.6%) of the respondents for preference of ICTs was that ICTs ease communication. These respondents said that through use of ICTs, it was very easy for them to communicate with extension and veterinary officers, clients and suppliers of feeds and chicks. These respondents admitted that ICTs enabled them get quick extension/veterinary services and markets for their goods. Other respondents preferred ICTs because they saved time (38.8%) and because they saved costs (17.5%). These respondents argued that the ICTs enabled them save a lot of their time and costs because they could easily communicate and get what they wanted without having to go for long distances and wasting their time searching for information or services. The results further revealed that 3 out of 11 (27.3%) of the respondents said that they did not prefer ICTs but rather they preferred the use of face to face dialogues because these enabled them exchange ideas. These respondents explained that through use of face to face dialogues, they could exchange ideas with their extension/veterinary officers and their fellow livestock keepers. Most of the extension officers also preferred use of face to face dialogues over use of ICTs during the interviews. The reasons given by the extension officers for their preference were as follows;

“We are able to teach the farmers through demonstrations in the field.” –Extension officer from Morogoro Urban District (Kihonda Ward)

“We are able to get instant feedback from the farmers.”- Extension officer from Kinondoni District (Kibamba Ward)

“We can teach many farmers at the same time in the field.”- Extension officer from Kinondoni District (Mbwani Ward)

The results further showed that 6 out of 11 (54.5%) of the respondents who did not prefer using ICTs explained their reason as not finding the ICTs useful in accessing livestock information.

In conducting in-depth interviews, several gaps in terms of ICT use were also identified by the researcher from the responses that were given by the extension officers. It was revealed that mobile phones were used frequently by extension officers compared to other types of ICTs. But the use of mobile phones was hampered by some factors like; high costs of communication, lack of communication allowances and poor mobile phone networks in some few areas. Responses from extension officers also revealed gaps in the use of radio and television. Radio and television were used less frequently by extension officers compared to mobile phones. This was due to some factors including; lack of awareness on the radio and television livestock programs, lack of time to watch or listen to the livestock programs, poor television signals for some channels and biasness in some programs showing only some livestock. There was also a big gap in the use of the Internet by the extension officers. The interviews revealed that almost all the extension officers had never used the Internet in their extension services. This was because most of the extension officers had no computer and Internet skills. A few extension officers with computer skills only used the Internet occasionally to communicate with their friends through the e-mail or

to search other information not related to livestock keeping; only a few extension officers used the Internet for livestock related issues. Results from observations revealed that there were no computers in almost all extension officers' offices and even in a few offices with computers; it was revealed that there was no connection to the Internet. Observations also revealed that the respondents used (cheap) mobile phones which had no connection to the internet.

From these responses it may be concluded that many livestock keepers consider ICTs (especially mobile phones) as important tools for accessing information because of their advantages which include; making communication easier, saving time and costs and exchanging of ideas. Effective use of ICTs in accessing livestock information by some of the livestock keepers is hindered by lack of time to use these ICTs (e.g. radio, television and the Internet). Lack of awareness or ignorance on the importance of these ICTs in accessing livestock information and limited relevant content are also stated by Dossani *et al*, (2005) as reasons for low usage of ICTs. These livestock keepers need to be sensitized to use ICTs such as radio and television to access livestock information through relevant programs. This can be made possible through advertising these programs through radio, television brochures, leaflets and extension services; so that the livestock keepers can be aware on the importance of the programs. ICTs should also be integrated in extension services and this can be possible if the extension officers are facilitated by the government through provision of communication allowances for enhancing communication with the livestock keepers by using mobile phones and in-service training of the extension officers on computer knowledge. This will improve accessibility of information in a much easier and cost effective way.

#### **Limitations of using ICTs in accessing and disseminating livestock information**

Findings from this study revealed that use of ICTs in accessing and disseminating information was deterred by several limitations, most of which were mentioned in the questionnaires by the livestock keepers and some by the extension officers in in-depth interviews. This paper will discuss only the limitations that were mentioned by the majority of the respondents. Table 4 gives a presentation of the findings obtained from questionnaires, followed by a discussion on each of the limitations.

**Table 41:** *Limitations of using ICTs to access and disseminate livestock information*

N=254

<b>Challenge</b>	<b>Frequency</b>	<b>Percentage (%)</b>
High communication costs	84	33.1
Poor network	57	22.4
Lack of computer skills	55	21.7
Long distance to Internet services	51	20.1
Unawareness of the programme schedules	43	16.9
Not aware of programmes	33	13.0
Lack of electricity	20	7.9

*Source: Field survey, 2011*

- High cost of communication

One of the limitations that was mentioned by 84 of the livestock keepers (33.1%) was the high cost of communication for mobile phones. The respondents complained that the high cost of communication hindered the frequent use of mobile phones. Lack of allowances for communication and incentives from the government was also reported to be a limitation by most of the extension officers during the interviews. Their work required them to communicate with the

livestock keepers and visit them from time to time. This required the extension officers to use their money for communication and transport. This was a big challenge to the extension officers because the government did not offer allowances or any incentives to enable the extension officers do their work efficiently. The extension officers were forced to use money from their pockets to communicate with their livestock keepers. This hampered the use of mobile phones in dissemination of information because the extension officers could not communicate with many livestock keepers.

- Poor mobile phone network

Poor mobile phone network was another limitation that faced the livestock keepers in using their mobile phone that was mentioned by 57 of the respondents (22.4%). It was an obstacle in the use of ICTs because sometimes the livestock keepers could not communicate to get information due to poor network. This challenge was also mentioned by some of the extension officers during the interviews; it was experienced by only a few extension officers depending on the areas they came from and with only some mobile phone networks which were not functioning well in some areas.

- Lack of computer skills

Lack of computer skills was another limitation facing the livestock keepers that hindered them from using the Internet to access livestock information; it was mentioned by 55 of the respondents (21.7%). It was also reported by most extension officers during the interviews that lack of IT skills was a big challenge for them in this era of information technology. This lack of IT skills hindered the extension officers from accessing more information and communication with their fellows who have the IT skills.

- Distant Internet services

It was revealed that 51 respondents (20.1%) complained that the Internet services were located far from their places. This was a hindrance to use of the Internet in accessing livestock information. Observations in this study confirmed that in some areas, the Internet services were located far from the livestock keepers.

- Not aware of livestock programmes and their schedules

Some of the of the livestock keepers 43 (16.9%) were not aware of the radio and television programme schedules. This posed a limitation to these respondents because they could neither access nor follow-up any livestock programmes because they did not know when the programmes were being broadcasted. In addition, other livestock keepers 33 (13%) were not aware of the existence of the radio and television livestock programmes. This hinders effective access to information through use of radio and television because the livestock keepers cannot watch or listen to the livestock programmes hence cannot get relevant information that is offered in these programmes. These respondents said that if they knew the programmes and their schedules, they would be listening or watching the programmes frequently.

- Lack of electricity

The findings showed that 20 respondents (7.9%) had no electricity in their homes and they claimed this situation to be a challenge to them because they could not watch television hence could not benefit from the livestock programmes. During the survey, there was a national crisis of power rationing. This was a limitation because the respondents could not use their radios and television to access livestock information.

- Poor radio/television signals

The radio and television programmes could not be accessed by some of the livestock keepers because of poor radio and television signals. This was a limitation to 11 of the livestock keepers (4.3%) and it was a hindrance to the use of radio and television to access livestock information. It

was revealed that in some areas (mostly peri-urban) there was a problem of poor or weak signals, or absence of the signals for some of the radio and television channels. As a result, these channels could not be heard or watched clearly in some areas and were totally absent in other areas. This resulted to failure to access livestock information from these programmes.

### Opinions on improvement of ICT use in accessing livestock information

Several limitations in ICT use have been identified in the previous discussion. In order to minimize these limitations, opinions on how to improve use of ICTs in accessing livestock information were solicited from the livestock keepers and extension officers through questionnaires and in-depth interviews respectively. Some of the findings from questionnaires are presented in Table 5.

**Table 5:** Opinions for improvement of ICT use

N=254

Opinion	Frequency	Percentage (%)
Advertise programmes	139	54.7
Improve schedules	104	40.9
Show programmes frequently	15	5.9
Increase number of programmes	13	5.1
Diversify and increase content of programmes	9	3.5
Make programmes interactive	5	2.0
Increase duration of broadcast	4	1.6
Sensitize ICT use	1	0.4

Source: Field survey, 2011

- Advertisement of relevant livestock programmes

It was realized from the findings of this study that many livestock keepers did not watch or listen to livestock programmes because they were not aware of the existence of these programmes, neither did they know when the programmes were being broadcasted. Thus, 139 of the respondents (54.7%) advised that the radio and television programmes should be advertised so that they are well known by the livestock keepers. In interviews, it was realized that some of the extension officers were also not aware of the existing radio and television livestock programmes and even those who were aware of the existence of the programmes did not know the schedules of the programmes. Thus, in order for the respondents to benefit from the programmes, there was need for the programmes to be advertised frequently. This could lead to an increase in the number of respondents who would follow up the programmes hence benefit from them.

- Improvement of the livestock programme schedules

The results of this study also revealed that most of the respondents did not know the schedules for the livestock programmes and did not follow up the programmes because of poor schedules of the programmes. They were concerned that the programmes were being broadcasted during day time when most of them were out or busy with other activities. As a result, 104 (40.9%) of the respondents recommended that these programme schedules should be improved such that the programmes are broadcasted at night or during the weekends to enable the livestock keepers access and benefit from the programmes. The extension officers when interviewed also suggested that radio and television programmes should be improved so that many livestock keepers could benefit from them. They also suggested that the programmes should be scheduled at night (after 8 p.m) or during the weekends when most of the livestock keepers and

the extension officers are at home, this would make it easier for them to follow up and learn from the programmes.

- Frequent broadcasting of the livestock programmes

The livestock keepers also advised the broadcasting media to show the livestock programmes frequently and persistently. In the findings of this study, it was revealed that the radio and television programmes were not followed up because these programmes were not shown frequently. Thus, 15 livestock keepers (5.9%) advised that the programmes should be broadcasted frequently in order to enable frequent follow-ups by the livestock keepers. This would lead to improvement of use of the radio and television in accessing livestock information. Some extension officers argued that the radio/television livestock programmes were not persistent; they advised that the programmes should be sustainable to enable easy and constant follow ups by the livestock keepers.

- An increase on the number of livestock programmes

Some of the livestock keepers 13 (5.1%) in this study also suggested that the broadcasting media should increase the number of programmes on livestock keeping. The respondents argued that the livestock programmes were very few compared to other programmes. As a result, the respondents suggested that the number of livestock programmes should be increased so that all the livestock keepers can get sufficient information from them. It was also advised by some of the extension officers during the interviews that the livestock programmes should be increased to enable many livestock keepers to benefit from them.

- Diversify and increase content of livestock programmes

Broadcasting a diversity of programmes on livestock keeping was another recommendation given by nine of the livestock keepers (3.5%) as a means to improve use of radio and television to access livestock information. The findings of this study revealed that the livestock keepers kept different types of animals. For all of the livestock keepers to benefit from the livestock programmes, it was advised that the programmes should be diversified in terms of a variety of animals and enough content to enable all the livestock keepers to benefit from them. These livestock keepers pointed out that the livestock programmes were biased to only some few types of livestock hence other livestock keepers were not benefiting from the programmes. During the interviews, the extension officers also advised that the programmes should have enough content and show experiences from different places. This would enable the livestock keepers with different animals to benefit from the programmes as opposed to the current programmes which are biased to only a few livestock and experiences shown are always from the same areas.

- Make livestock programmes interactive

The broadcasting media was also advised to make the programmes on livestock keeping more interactive. The findings from this study revealed some of the livestock keepers stating that the livestock programmes were not as interactive as the other non-livestock programmes. Five livestock keepers (2.0%) recommended that the livestock keeping programmes should be made more interactive by giving the livestock keepers a chance to ask questions or seek for clarifications from the programme producers. This could make the programmes more educative because the livestock keepers would better understand the programmes by asking for clarification in cases where they did not understand the programmes or when they needed more advice.

- Increase duration of broadcasting livestock programmes

In order to get sufficient education and benefit from the programmes, it was suggested by four of the livestock keepers (1.6%) that the duration of broadcast should be increased. The results of this study revealed some of the respondents who watched or listened to the livestock

programmes concerned that these programmes were very brief, hence they advised that the duration of these programmes should be increased to make the livestock keepers benefit more from the programmes. In in-depth interviews, the extension officers also advised that the radio and television programmes should be long enough to enable the livestock keepers to learn more from the programmes. This was because all the extension officers admitted that these programmes were very useful to them and the livestock keepers hence if the programmes were extended, the respondents could benefit more from them.

- Sensitize on use of ICTs

Another opinion for improvement of ICTs in accessing livestock information that was given by one (0.4%) of the livestock keepers was to sensitize the livestock keepers through advertisements or extension services to use different ICTs to access livestock information. Livestock keepers should be educated on importance of using different types of ICTs (especially radio, television and the Internet) to access livestock information. They should also be sensitized to use these ICTs so that they can get more information and improve their livestock keeping practices for economic development. The livestock keepers can be sensitized to use ICTs such as radio and television through advertisements that will raise their awareness on the existence of the programmes and the importance of radio and television in accessing livestock information. Through observations, it was realized that the radio and television livestock programmes are not frequently advertised resulting to reduced awareness on the existence and importance of these programmes. Frequent advertisements of the programmes will sensitize the livestock keepers to watch/listen to the programmes that will enable them to get relevant information on livestock keeping.

## RECOMMENDATIONS

Since ICTs are important tools for providing education on livestock husbandry, it is recommended that;

- The broadcasting media should increase the frequency of broadcasting relevant livestock programs. These radio and television programs should be advertised frequently to increase the awareness of the livestock keepers on the existence of the programs.
- The programs should be improved in order to include simple and affordable techniques that are relevant to our environment so that the knowledge obtained from the programs is applied by all the livestock keepers.
- The programs should be sustainable to enable the livestock keepers to continue learning and benefitting from the programs.
- Relevant government bodies (e.g. The Tanzania Communications Regulatory Authority) in collaboration with mobile phone service providers in Tanzania (e.g. Vodacom, Airtel, Tigo and Zantel) and Internet service providers should reduce the costs of using mobile phone and Internet services so that all livestock keepers are able to use them effectively.
- Relevant authorities should also take into consideration the possibility of starting up ICT projects in urban areas to help specific urban communities gain easy access to information. This can be done by providing computer and Internet skills to the farmers and extension officers; this will promote use of the Internet to access livestock information.
- The ICT infrastructure in some of the remote (peri-urban) areas should also be improved in order to enable availability of good signals for radio and television.

## CONCLUSION

This paper concludes that different types of ICTs are used to access and disseminate information on livestock husbandry, and are considered as important sources of information by urban and peri-urban livestock keepers. Mobile phone is used by the majority of livestock keepers whereby it

helps them to get veterinary services easily and quickly, it enables availability of markets, feeds and chicks. It also enables the livestock keepers to exchange ideas with fellow livestock keepers. However, other ICTs such as radio, television and the Internet are used by a few livestock keepers to learn and disseminate different skills and knowledge on livestock husbandry. This is due to several limitations including; unawareness of the existing radio and television livestock programs, lack of necessary computer skills and ignorance on the importance of the ICTs in accessing livestock information. If these limitations are taken into considerations and rectified, ICTs can be very useful to the livestock keepers in providing education on livestock husbandry techniques, hence improving the livestock husbandry practices especially in peri-urban areas where livestock keeping is highly practiced.

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