Library Philosophy and Practice (e-journal)　　　　Libraries at University of Nebraska-Lincoln

2023

Dissemination of Agro-based Information by Telecentres among Selected Rural Farmers in Tanzania with a focus on Moshi Rural District, Kilimanjaro Region

Neema Florence Mosha Dr
University of South Africa, florenceneema@gmail.com

Edith Talina Luhanga Dr
Nelson Mandela African Institution of Science and Technology, edith.luhanga@nm-aist.ac.tz

Pascal Nade Dr
Nelson Mandela African Institution of Science and Technology, pascal.nade@nm-aist.ac.tz

Patrick Ngulube Prof
University of South Africa, ngulup@unisa.ac.za

Introduction

Telecentres were established in low- and middle-income countries (LMICs) for several purposes including creating, storing and enabling access to information in rural communities (Buhigiro, 2012; Lwoga, 2010; Mtega & Msungu, 2013) through information and communication technology (ICT) (Dahalin *et al.*, 2009; Lashgarara, Karimi & Mirdamadi, 2012; Lwoga & Chigona, 2020). Most Telecentres are available in areas that do not have access to other information centres such as libraries and community information centres (Lwoga & Chigona, 2020; Mtega & Msungu, 2013). The Telecentres provide open public venues to enable communities to use ICTs to access needed information at a low cost (Jensen & Esterhuysen, 2001; Methusela, 2007; Mtega & Msungu, 2013), and enhance knowledge and information sharing (Buhigiro, 2012; Lashgarara, Karimi & Mirdamadi, 2012; Mulozi, 2008). Services offered include internet and computer services, community radio services, printing and photocopy services, secretarial and consultancy services, scanning, communication, and lamination (Mtega & Msungu, 2013; Methusela, 2007; Mbangala & Samzugi, 2014; Lwoga & Chigona, 2020). Other services include telephone and fax, library training, e-mails, CD-ROM, television, and community radios (Jensen & Esterhuysen, 2001; Latchem and Walker, 2001; Methusela, 2007). Mtega and Msungu (2013) add that Telecentres are used as meeting places for community members, where various topics on development are discussed. Furuholt and Saebo (2018) posit that telecentres have positive impacts on the social-economic development of target communities.

Since the early 2000s, LMICs have adopted various policies and strategies to ensure modern ICTs facilities are available to facilitate online communication and sharing of information through established Telecentres (Mtega & Malekani, 2009; Mtega & Msungu, 2013; Mbangala & Samzugi, 2014) at very low cost (Mulozi, 2008). A few studies have been conducted to assess the extent to which Telecentres have fulfilled the role they were designed for. Heeks and Kanashiro (2008) evaluated the impact of Telecentres in Peruvian mountainous regions on remoteness and exclusion while (Breitenbach, 2013) evaluated the economic impact of a Telecentre in South Africa. More recently, Tabassum *et al.*, (2019) and Kapondera, Khumbo and Bernardi (2020) reviewed the direct and indirect effects perceived by users and non-users of a Telecentre in Malaysian Borneo and Malawi respectively. While the benefits of Telecentres are highlighted in these and other studies, the evidence remains inconclusive. Different models of Telecentres can be adopted (Molnar & Karvalics, 2002) and each may have its own impact and sustainability records. In addition, culture is known to influence use of the ICTs (Kaba & Osei-Bryson, 2013) and may influence how Telecentres are used. There is therefore a need to conduct more studies on the effect of Telecentres in different national and cultural contexts.

The Government of Tanzania established Telecentres to serve communities in rural areas to access different types of information for their well-being (Mtega & Msungu, 2013), and to empower rural communities in the use of ICTs services at a low cost (Ariyabandu, 2009; Jensen & Esterhuysen, 2001; Lashgarara, Karimi & Mirdamadi, 2012; Mbangala & Samzugi, 2014). The country established its first Telecentre in 1999 with the main aim of bridging the digital divide among rural communities (Lwoga, 2010; Mbangala & Semzugi, 2014). Among the main

users of these Telecentres are farmers who need agro-based information for agricultural development. Agro-based information includes information on seeds, fertilizers agriculture credit, irrigation, disease, climate change, soil management and pest management (Lwoga, 2010; Mtega & Msungu, 2013; Rahman, Ara & Khan, 2020). According to Chilimo and Ngulube (2011) using Telecentres in Magu and Karagwe Districts, women learned different farming techniques including how to cultivate several farm products. Thus, farmers believed that the establishment of these Telecentres could bring agro-based information and other farming services (Rahman & Bhuiyan, 2016). Rahman, Ara and Khan (2020) add that among the main constraints faced by the farmers in seeking and using agro-based information including the use of modern technologies (e.g., resistance to change and adoption of new technology), relatively high costs of and low awareness regarding agro-based information, poor infrastructure to be able to support ICT services, spatial inconvenience, in terms of location and availability of ICTs facilities, and low literacy among the farmers. Additionally, the lack of agro-based information and dissemination facilities within Telecentres can be a contributor to poor farming techniques and production (Harris *et al.*, 2003; Rahman & Bhuiyan, 2016). Overall, the established Telecentres' feasibility for offering desired services to communities is unclear (Mtega & Malekani, 2009). The lack of agro-based information hinders rural farmers from accessing important information for solving their agricultural challenges is among challenges. Thus, this study assessed the role of Telecentres in the dissemination of agro-based information among farmers in rural areas of Tanzania to enable rural farmers to access agro-based information. The study specifically addresses three specific objectives: farmers' awareness of Telecentre services, Telecentres' strategies for disseminating agro-based information to farmers and challenges faced by Telecentres in disseminating agro-based information to rural farmers.

Literature review

Telecentres were established to provide ICTs facilities to connect rural farmers to key farming stakeholders. The dissemination of agro-based information in rural areas has been facing numerous challenges such as a lack of reliable information for social-economic development, proper information transfer mechanisms, poor information preservation mechanisms, ICTs infrastructure, storage facilities, and human resources (Barrett & Slavova, 2011). Thus, the establishment of Telecentres with ICTs facilities and services is likely to minimize the challenges of disseminating information among rural communities members. (Mtega & Msungu, 2013; Mbangala & Samzugi, 2014).

The establishment of Telecentres enables community members to get internet services which can facilitate easy access to agro-based information at the right time, in the right place, in the right formats, and by the right people (Buhigiro, 2012; Lashgarara, Karimi & Mirdamadi, 2012). The information provided by Telecentres should, therefore, reflect the local context, allowing users to have a vision of their environment on how to handle their daily activities, especially farming issues. Providing agro-based information requires coordination with responsible ministries, as they confirm the national curriculum, adhere to ethical issues, and be produced (or permitted) by responsible ministries (Furuholt & Saebo, 2018). In other words,

Telecentres should establish links and cooperation with individuals (agricultural specialists), agriculture agents, and ministries responsible for agriculture.

Tanzania has several organizations and research institutions that provide agricultural information including the Department of Research and Development (DRD) of the Ministry of Agriculture, Food Security and Cooperatives, Tropical Pesticides Research Institute (TPRI), Sokoine University of Agriculture (SUA), Nelson Mandela African Institution of Science and Technology (NM-AIST), Tanzania Forestry Research Institute (TAFORI), Southern Agricultural Growth Corridor of Tanzania (SAGGOT) Catalyst Trust Fund, agricultural databases such as Research4Life and The Essential Electronic Agricultural Library (TEEAL), as well as private sector that includes crop and animal research institutes all to help farmers to improve their products by using various ICTs platforms in the country. However, such information remains in the custody of these institutions and is not possible to be accessed by communities especially those in rural areas. It is at this juncture that Telecentres need to create a link and good communication with these individuals, institutions and organizations for the availability, accessibility and dissemination of agricultural information among rural people in Tanzania (Mtega & Malekani, 2009). Telecentres should have a manager and some workers to assist users with the various services offered.

Rural communities in Tanzania have access to a variety of traditional information sources (TV, radio, newspapers, other farmers, government agricultural extension services, traders, input dealers, seed companies and relatives) which they regularly access for agricultural information (Mittal, Gandhi & Tripathi, 2010; Saravan, 2011). According to Mittal and Mehar (2012), these traditional ICTs have been important tools over the past several decades for disseminating scientific and technical agricultural knowledge to farmers and also leading to improved adoption of technologies. The development of modern ICTs and other technological tools such as social media tools, intranets, and groupware has created many changes in the ways people communicate and share information online (Mosha, Holmner & Penzhorn, 2015). The current technological environment, with its focus on the use of ICTs and other communication media to facilitate online collaboration and information sharing, has become an integral part of people's everyday lives. It is therefore not surprising that even more adjustments to the understanding of the concept have evolved (Penzhorn, 2013).

Thus, the application of ICTs to enhance the accessibility and usability of information is not a new concept; however, it can bring information close to people through online means. Garrido *et al.* (2012) add that the main aim is to bring the technology closer (physically and financially) to people who would otherwise have limited or no access and to provide additional value by offering unique training facilities, learning environments and additional services that have the potential to impact broader social and economic goals. With emerging technologies such as Web 2.0 and Telecentres 2.0, Telecentres networks go beyond the IT infrastructure and encompass access to knowledge, social transformation, opportunities and partnership building through online collaboration and communication Mosha, Holmner and Penzhorn (2015). For example, with access to ICTs farmers can increase their income by helping them regularly

check prices and easily communicate with buyers (Kenny, 2002), and there is an increase in social interaction and sharing of ideas among people (Buhigiro, 2012).

ICTs narrow the information and communication gaps between rural and urban people by giving rural people access to valuable information in their local language (Sirimane, 1996). ICTs offer enormous benefits to rural communities and agricultural organizations and improve communication between non-governmental organizations government services, private sector entities and educational institutes that support rural and agricultural development. ICTs improve horizontal communication through existing media services that serve rural stakeholders. For example, throughout the developing world, rural radio and, increasingly, television broadcast services, are important information delivery mechanisms (Gcora *et al.*, 2015).

The establishment of Telecentres enables access to both traditional facilities (television, radio, magazines) and modern ICTs facilities (computers, mobile phones). People in developing countries own mobile phones, television, and radio to enhance communication. The mentioned equipment helps rural areas to have access to agro-based information which will be communicated to them from the Telecentres. Mtega and Msungu (2013:2) add that "ICTs have revolutionized life whereby the acquisition and usage of cellular phones by actors in the agricultural sector including farmers is increasing very rapidly". Rural radios have increasingly been established in many developing countries, such as Cameroon, Mali, Ghana and Uganda (Kiplang'at, 2003; Odame & Atibila, 2003). For example, community radio has been effective in reaching illiterate women and providing them with health information in a language they understand (Chapman *et al.*, 2003). Thus, ICTs enable the access of information at a distance (intermediation) or close range (via Telecentres and community radio). Despite efforts by private and government stakeholders to establish Telecentres among rural areas, lack of agro-based information is still a challenge which hinder the dissemination of such important information to rural farmers. Lack of reliable ICTs facilities to dissemination information is also a challenge to reach rural farmers who cannot be able to physically visit Telecentres for agro-based information seeking. Additionally, it is not clear how rural farmers access the agro-based information from the established Telecentres. Thus, this study specifically identified farmers' awareness of the services offered by Telecentres, assessed the strategies employed by Telecentres in disseminating agro-based information and explored the challenges facing rural farmers in accessing agro-based information from the Telecentres.

Methods

Study setting

The study was conducted in the Kilimanjaro region, northern Tanzania from August to December 2020. Kilimanjaro region is one of the 31 administrative regions in Tanzania and it is composed of 7 administrative districts: Rombo, Moshi Rural, Moshi Urban, Same, Mwanga, Hai and Siha districts. This study was conducted in the Moshi Rural district. The district has a land area of 1,713 square kilometres, and administratively, this district is divided into 31 wards

and 150 villages (URT, 2010). Additionally, the district has a total population of 8,657 according to the 2012 census (NBS, 2013). Guerba computer centre was established in 2005 and Marangu village internet service was established in 2006 (URT, 2010). This district was purposely selected based on the availability of working Telecentres serving community members which are Marangu Village Internet Service and Guerba Computer Centre.

Study population

The population of this study were community members of the Moshi Urban District. The sample frame comprised rural farmers aged 21–60 who were recruited from the 31 wards. The names of the villagers were obtained from the ward offices located in each village. It was easy to obtain the names of the villagers because most of them registered to obtain National Identification Cards for their personal use. We selected farmers aged 21-60 since in this age group, people can be able to work, farm, read and express themselves and this reduced the complexities of completing the questionnaires. In other words, the age range of 21-60 represents a group of people who are more homogenous in their physical activity. Questionnaires were developed in the English Language but were transcribed into the Swahili Language during the interview to make respondents respond to the questions in their native language.

Sample size and sampling procedure

The Sample Size Calculator of Creative Research System (Creative Research System, 2003) was employed to calculate the sample size of this study. The margin was assumed with an error/precision of +/-5%, and this resulted in the total estimated sample size of 368 farmers. Furthermore, 20% of the sample size was added to account for non-responses, giving the final sample size of 442. We used the list provided for the interviews and some of the respondents were not available; thus, were forced to account for non-responses to replace the missing respondents.

Data collection

Data was collected using structured questionnaires which was developed in English Language and then transcribed in the local language (Swahili) to enable respondents to respond to the questions properly. Upon arrival in each ward, the research team was introduced to respondents using the list obtained to build a rapport and get written informed consent. Thereafter, instructions on how to fill out the questionnaires were read to respondents and the research team guided respondents step by step through each question. Respondents answered the questionnaire independently. The collected data were first coded and analyzed using Statistical Package for the Social Sciences (SPSS) version 15.1 (IBM SPSS, TX, USA) software. Descriptive statistics, specifically percentages and frequencies were employed to summarise the collected data.

Results
Demographic characteristics of respondents

A total of respondents (n=290, 65%) were male and respondents (n=152, 35%) were female. The average age was 32 years, among respondents (n=192, 51%) were aged between 31 and 40 years. Respondents (n=184, 42%) had acquired secondary level school education. Respondents (n=236, 53%) had a moderate monthly income of 1,000,000 Tanzanian Shillings (Tshs) equivalent to 435 USD (Table 1).

Table 1: Demographic characteristics of respondents

SN	Demographic characteristics		Frequency	Percentage
1	Gender	Male	290	65
		Female	152	35
2	Age	21 – 30 years	166	37
		31 – 40 years	184	42
		41 – 50 years	69	16
		51 – 60 years	23	5
3	Education level	Primary school	154	35
		Secondary school (ordinary and high level)	192	43
		Tertiary education (Post-secondary education level at the college level)	67	15
		University education	29	7
4	Monthly income (<)	100,000 Tshs (43 USD)	67	15
		Be500,000 Tshs (217 USD)	103	23
		1,000,000 Tshs (435 USD)	236	53
		5,000,000 Tshs (2,174 USD)	25	6
		e 10,000,000 TShs (4,348 USD)	11	3

* 1US$ equivalent to Tshs 2,300

Awareness and the services offered within Telecentres

Figure 1 illustrates respondents' awareness of the existence of the Telecentres. More than half of the respondents (n=326, 74%) were not aware of the existence of the Telecentres.
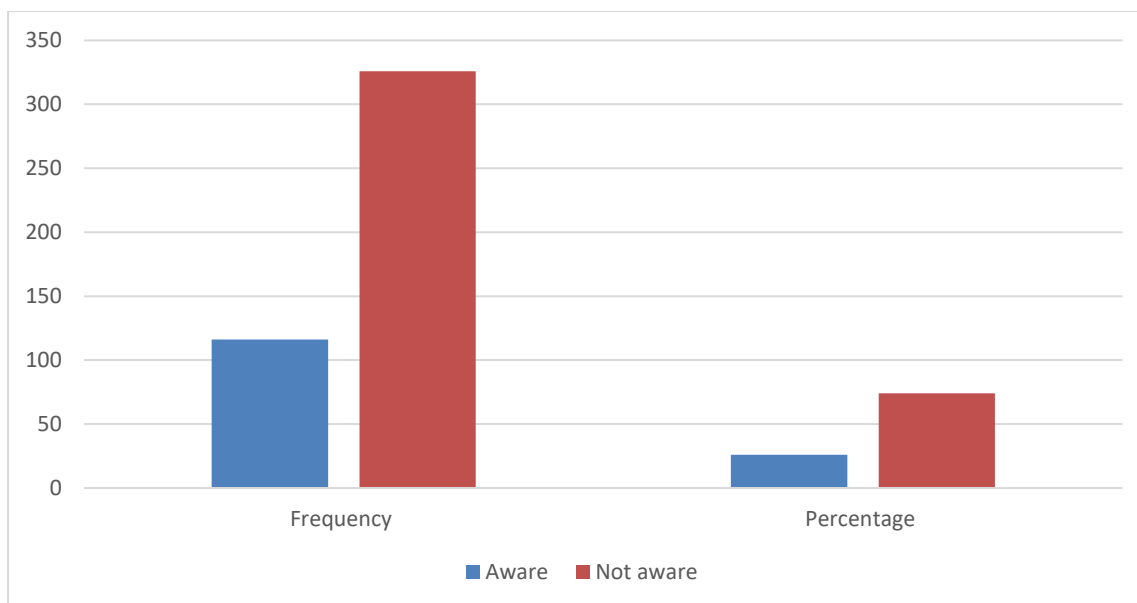
Figure 1: Farmers' awareness Telecentres

Visiting the Telecentres

Table 2 summarizes how frequently respondents who were aware of the Telecentres' existence visited them. The majority (n=116, 26%) reported visiting Telecentres once a year. Only 12 (3%) reported visiting Telecentres daily (Table 2).

Table 2: Frequency of visiting the Telecentres

SN	Visiting time	Frequency	Percentage
1	Daily	12	10
2	Once a week	9	8
3	Once a month	10	9
4	Once every six months	15	13
5	Once a year	70	60
Total		**116**	**100**

Services offered within Telecentres

Table 3 provides the services which should be offered within Telecentres. Respondents 140 selected computer services including internet, printing and scanning in Telecentres.

Table 3: Services offered within Telecentres

SN	Services	Frequency
1	Information access and retrieval services	112
2	Computer services e.g., Internet services, electronic mail services and electronic message services	140
3	Community radio and television services	130
4	Printing and photocopy services	128

5	Knowledge and information sharing	90
6	Community information services	67
7	Consultancy services	41
8	Newspapers, magazines and reports	30
Total		**738**

Multiple responses were allowed

Telecentres strategies for disseminating agro-based information to farmers

Table 4 shows the strategies which should be employed to enhance the dissemination of agricultural information within Telecentres in rural areas. Respondent 162 recommended promotion and marketing strategies to enhance the usage of Telecentres among rural farmers.

Table 4: Strategies employed in the dissemination of agricultural information within Telecentres

SN	Strategies	Frequency
1	Resource and funds	123
2	Qualified and supportive staff	105
3	Fund and support from donors, government etc.,	94
4	Agricultural information on local language	211
5	Reliable opening hours	109
6	Promotion and marketing of their services	162
7	ICTs facilities and infrastructure to enhance the dissemination of agricultural information	120
8	Information transfer technologies from Telecentres to farmers	80
9	Reliable and updated agricultural information	130
10	Network and partnership	128

Multiple responses allowed

Types of agricultural information disseminated by Telecentres

Table 5 indicates different types of agro-based information selected by respondents. Respondent 200 requested agro-based information on crop diseases and pest problems.

Table 5: Type of agro-based information in Telecentres

SN	Types of agricultural information	Frequency
1	Information on planting and cultivation techniques	105
2	Information on market prices for farming products	203
3	Information on how to improve soil fertility, crop harvesting, processing and storage	187
4	Information on communication and identification of buyers	150
5	Information on crop diseases and pest problems	200
6	Loan and financial information on agriculture products	192
7	Information related to transportation of agricultural products	129

| 8 | Information related to weather conditions | 135 |

Multiple responses allowed

Challenges hinder the usage of Telecentres among farmers

Table 6 provides various factors that hinder Telecentres to disseminate agricultural information among farmers in rural area. Inadequate agro-based information in the local language (Swahili) was reported among the challenges hindering the usage of Telecentres among 180 respondents.)

Table 6: Challenges facing Telecentres to disseminate agricultural information

SN	Challenges hinder Telecentres to disseminate agricultural information	Frequency
1	Lack of funds to acquire and disseminate agricultural information	101
2	Inadequate ICTs facilities and other communication media	100
3	Lack of agro-based information in the Telecentres	110
4	Lack of agro-based information in the local language (Swahili)	180
5	Reliable hours of the Telecentres	120
6	Shortage of experienced and qualified Telecentres workers	78
7	Poor and slow internet connection	80
8	Lack of confidence and ability to use the technology	108
9	Location of the Telecentres	114
10	Lack of support from government and donors	90
11	Lack of collaboration between Telecentres and farmers on the content of the needed information, access points and the like	89

Multiple responses were allowed

Discussion

The study found that male respondents were the main users of the Telecentres. The same observation was obtained from studies by Chigona *et al.* (2011), Neville (2012) and Mbangala and Samzugi (2014). Understanding what leads to few women using the Telecentres is important because this disparity could continue widening the already existing digital divide that Telecentres aims to bridge (Neville, 2012). The study by Lwoga and Chigona (2014) adds that digital literacy is a problem among women and that affects the usage of most of the Telecentres services. In Tanzania, 77% of women compared to 86% of men own a mobile phone, according to the 2019 Mobile Gender Gap Report by the GSM. Only 17% of women in Tanzania have mobile internet access compared to 35% of men (UNESCO, 2021). Again, the study done by Rega *et al.* (2013) female respondents framed Telecentres as a training place and the benefits they would gain after accessing the internet. The highest educational qualification of respondents was secondary school qualifications. There are mixed findings on the educational levels of users, while some studies reveal that most users are educated (Chigona *et al.,* 2011; Neville, 2012), others have reported that Telecentres are used by the less educated because the communities served by these Telecentres have very few people with tertiary qualifications (Lashgarara, Karimi & Mirdamadi, 2012). However, having many people with

low-income levels as users of Telecentres is a good development since Telecentres target disadvantaged communities where individuals cannot afford ICTs facilities (Islam & Hassan 2009; Mbangala & Samzugi 2014). The income level of most of the respondents 211 (56%) was 1,000,000 Tshs which is equal to 435 USD which is moderate income. This observation differs from the study by Kumar and Best (2007) who found that most Telecentres users had high incomes.

Farmers' awareness of the existence and services offered within Telecentres services are very critical before accessing the respective information. The study found that 168 (45%) farmers were aware of the several services offered within Telecentres ranging from information access and retrieval the access to newspapers, magazines and reports. We also found other services available including internet services, library services and consultancy services. Awareness was also assessed in terms of the frequency of farmers' visits to Telecentres whereby we found a low number of visitors visiting Telecentres per day which revealed that Telecentres need to promote and market their services to communities. The findings concur with the study done by Lwoga (2010) indicated a low number of Telecentres users (between 15 to 20) during the high tourism season (August to January), while a low number of users was observed in the low tourism season (January to July).

It was also revealed that most of the users in these Telecentres were students, potters, and volunteers (that is, volunteers who come to teach at the primary school and those who come to work at the church) (Lwoga, 2010). The use of online mechanisms for disseminating agricultural information will enable such information to reach farmers wherever they are. This is supported by studies by Mtega and Malekani (2009) and Lwoga (2010) indicated the low number of visitors in Telecentres could be minimized by shifting the services to radio broadcasting services. Concerning the type of information offered by the Telecentres, the study found that farmers needed information on plant planting and cultivation techniques. In addition, farmers needed loans and financial information among farmers are very important. The findings concur with the study conducted by Misaki, Apiola and Gaiani, (2016) that provided different types of information which farmers needed include market information, expert advice on farming, knowledge sharing of farming practices, information on pesticides, herbicides, storage, information management, risk management and knowledge transfer.

The lack of awareness of the existence of the Telecentres and their services could partly be attributed to the fact that some of the Telecentre's workers did show a willingness of marketing and promote their services to the communities surrounding them. A similar finding was obtained from a study by Dossani, Misra and Jhaveri (2005) which indicated major challenges for the underutilization of Telecentres in India the lack of demand from the rural communities, which might be due to the lack of awareness of the existence of the Telecentres and the services provided by them.

In addition, we found strategies which could be used by Telecentres to enhance the dissemination of agricultural information. Among the strategies found include the availability of ICTs facilities and infrastructure to enhance the dissemination of agro-based information, as

well as, the dissemination of agricultural information in the local language to enable the access of such information among illiterate farmers. We also found the types of agricultural information indicated by farmers to enhance their farming activities. Respondents 305 (19%) needed information on plant planting and cultivation techniques Availability of loans and financial information among farmers is very important. The study by Njelekela and Sanga (2015) indicated different types of agricultural information including marketing information which provides farmers with agricultural information to bargain and improve their incomes, seize market opportunities through adjustment of production plans and better allocation of production factors, as well as, the information to make informed choices about marketing strategies. Misaki, Apiola and Gaiani (2016) add that types of information which farmers include improved access to market information, expert advice on farming, knowledge sharing of farming practices, information on pesticides, herbicides, storage, information management, risk management and knowledge transfer.

Among several challenges that hindered Telecentres in disseminating agricultural information, respondents reported inadequate ICTs facilities and other communication mediums. a lack of adequate ICT facilities is also a major challenge in most the Telecentres in KwaZulu-Natal, South Africa (Mbatha, 2015). The study found few computers available with Telecentres, thus the findings is consistent with other studies which observed few computers among Telecentres including the poor internet connection (Hassan *et al.*, 2010; Gcora *et al.,* 2015; Kapondera & Namusanya, 2016). The study also found a lack of agricultural information in the Telecentres. A similar observation was observed by a study by Mtega and Malekani (2009) which also found limited information among people in Telecentres. The study also found that agricultural information written in English Language which hinders the dissemination of agricultural information in Telecentres. The same finding was obtained from a study done by Mtega and Malekani (2009) which found that a lot of web-based information resources are in foreign languages not understood by local communities. Moreover, information materials are about foreign countries which hinder communities from appreciating how the techniques discussed can be applied to Tanzania. The study by Misaki, Apiola and Gaiani (2015) also found that farmers' lack means to access market information meant farmers' faced various complications originating from the middlemen who have the authority of setting the prices. Providing direct access to such information is thus of vital importance also. Shortage of qualified staff operating in Telecentres was also revealed in this study whereas studies by Gcora *et al.*, (2015), Mtega and Malekani (2009) and Buhigiro (2012) respectively revealed similar findings. In countries where electricity is also an issue, e.g. Malawi, power cuts are also a serious factor experienced in Telecentres that hinder the dissemination of agricultural information among farmers in rural areas (Taulo, Gondwe & Sebitosi, 2015).

The study also found the lack of funds and support from the government and other donors to enable Telecentres to disseminate agricultural information. A similar finding was obtained from a study done by Lwoga (2010) reveals lack of funds inhibited Telecentres from acquiring appropriate ICT facilities, internet connectivity, and paying for staff remunerations and Telecentre operational costs. Support from the government and donors is well needed to provide funds to enable Telecentres to disseminate agricultural information, however, most of

these funds might not be sustainable. For example, Telecentres such as WIDA were established with financial support from the Embassy of Sweden but the support was provided for a limited time, and thus they were supposed to sustain themselves. This is when the donors pulled out, and the organization had to sustain itself, which is very difficult at times (Lwoga, 2010). The study by Lwoga (2010) adds that Guerba computer centre resorted to charging 5$ per 15 minutes for a person who did not need assistance, and 8$ for the same 15 minutes for a person who needed assistance on the internet use. The study done by Pick and Gollakota (2010) revealed that funds were not primarily an issue to run the Telecentres in rural areas in India. This was due to the reasons such as the cost of computers dropping rapidly and the shared model dropping price, Furthermore, many Telecentres offered subsidized or even offer free access.

The main strength of this study was its large sample size and the use of the specific types of information (agro-based information) to understand multiple factors that contribute to farmers as among the main users of Telecentres located in rural areas. However, this study has some limitations: the cross-sectional nature of the study meant we could not assess connection among farmers, Telecentres and Telecentres workers. Also, the exclusion of farmers who could not read and write may have led to selection bias, as these farmers might have different opinions toward Telecentres. The main implication of this study was to enable the establishment of policies regarding the establishment and running of Telecentres in the country and enable professionals' farmers to conduct and publish more research works which could be shared among farmers through Telecentres and other communication channels.

Conclusion

Rural farmers were relatively aware of the Telecentres and their activities. However, the use of Telecentres in accessing agro-based information is relatively low compared to the levels of farmers' awareness. Strategies employed within Telecentres to enhance the dissemation of agro-based information among farmers were reliable however they need to be improved and developed, for example the use of ICTs resources contributes to the dissemination of agriculture-based information to rural farmers, despite the few computers found within the Telectres. Lastly, several challenges that hinder access to agro-based information among rural farmers were identified including a lack of funds to acquire and disseminate agricultural information, inadequate ICTs facilities and other communication media and a shortage of experienced and qualified Telecentres workers and these should be taken as a new research gap which will come up on means of overcoming such challenges to enhance the dissemination of agro-based information in rural areas.

Recommendations
a) Telecentres should promote and market their services to rural communities.
b) The government should establish Telecentres to marginalized and information-deserted areas.
c) Telecentres should facilitate capacity-building forums for farmers.
d) Telecentres should store agro-based information in the local language.

e) Telecentres should employ local volunteers and trainers (such as secondary school students, teachers etc.,) to minimize the workload.

References

Ariyabandu, R. (2009). Role of Telecenters as knowledge networks: Successes and challenges. http://ictlogy.net/bibliography/reports/projects.php?idp=2212

Barrett, M., & Slavova, M. 2011. Making ICT infrastructure, appliances, and services more accessible and affordable in rural areas. In ICT in agriculture sourcebook: *Connecting smallholders to knowledge, networks, and institutions,* 15-48). The World Bank

Buhigiro, S. (2012). *The role of telecenters in promoting socio-economic development in Rwanda* [Unpublished Master of Management in ICT Policy and Regulation thesis]. University of the Witwatersrand. https://citeseerx.ist.psu/viewdoc/download?doi=10.1.1.1003.9412&rep=rep1&type=pdf

Chapman, R., Blench, R., Kranjac-Berisavljevic, G., & Zakariah, A. B. T. (2003). Rural radio in agricultural extension: The example of vernacular radio programmes on soil and water conservation in Northern Ghana. *Agricultural Research and Extension Network Paper 127.*

Chigona, W., Lekwane, O., Westcott, K., & Chigona, A. (2011). Uses, benefits and challenges of public access points in the face of growth of mobile technology. *The Electronic Journal* of Information Systems in Developing Countries, 49 (5), 1–14.

Chilimo, W., & Ngulube, P. (2011). Role of information and communication technologies in sustainable livelihoods in selected rural areas of Tanzania. *African Journal of Library, Archives and Information Science,* 21(2), 145–157.

Chisango, G. (2014). *Technology challenges faced by rural women in the Eastern Cape Province of South Africa: A case in the Chris Hani Municipality.* University of South Africa.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). Routledge Falmer.

Creative Research Systems, (2003). Sample size calculator. https://www.surveysystemcom/sscalc.htm

Dahalin, M. Z., Yusop, N.I., Ibrahim, H., Kasiran, M.K., & Mat A. Z. (2009). Socio-economic benefits of telecentre implementation in Peninsular Malaysia [Paper presentation]. In International Conference on Computing and Informatics 2009 (ICOCI09).

Dossani, R., Misra, D.C., & Jhaveri, R. (2005). *Enabling ICT for rural India. Report. Asia-Pacific Research Center.* Stanford University.

Ellen, D. (2003). Telecentres and the provision of community based access to electronic information. *Information Research, 8:2.*

Etta, F. Agonga, A., & Katia, S. (2001). ACACIA in Kenya: A study of information and communication technologies and community development, final research report. http://www.idrc.ca.uploads/user-S/10342620740ict-cbd_kenya final_report.pdf

Etta, F.E. & Parvyn-Wamahiu, S. (2003). Information and communication technologies for development in Africa. In F. E. Etta [ed.], *The Experience of Community Telecentres,* Ottawa and CODESRIA Dakar. IDRC.

Furuholt, B. (2009). Bridging the digital divide: Sustainable supply and demand of internet access in developing countries. *In Publication N0. 49. Denmark.*

Furuholt, B. & Sæbø, Ø. (2018). The role telecentres play in providing e-government services in rural areas: A longitudinal study of Internet access and e-government services in Tanzania. *Electronic Journal of Information Systems in Developing Countries*, 84 (1), 1–14, doi: 10.1002/isd2.12006.

Garrido, M., Sey, A., Hart, T., & Santana, L. (2012). Literature review of how telecentres operate and have an impact on e-inclusion. https://digital.lib.washington.edu/researchworks/handle/1773/20955

Gcora, N., Gopeni, A., Tuswa, M., Lwoga, T., & Chigona, W. (2015). The challenges rural women face in using Telecentres: The case of the Eastern Cape Province [Paper presentation]. 9th IDIA Conference, IDIA2015, Zanzibar, 84–95.

Gollakota, K. (2008). ICT use by businesses in rural India: The case of EID Parry's

Indiagriline. *International Journal of Information Management*, 28 (4), 336–341.

Gomez, R. (2012). *Libraries, telecenters, cynercafes and public access to ICT: International comparisons.* Information Science Reference.

Gray, D. (2004). *Doing research in the real world.* Sage publications.

Harris, R. (2001). Telecenters in rural Asia: Towards a success model. *Europe*, 40 (23), 71–111.

Hassan, S., Yusof, Y., Seman, M. A. A., & Sheik, W. R. (2010). Impact analysis on utilization of telecenter: The case of telecenter in Baling. http://www.kmice.cms.net.my/prockmice/kmice2010/Paper/P G14_19.pdf.

Heeks, R., and Kanashiro, L.L. (2008). Telecentres in mountain regions: A Peruvian case study of the impact of information and communication technologies on remoteness and exclusion. Journal of Mountain Science, 6 (300), https://doi.org/10.1007/s11629-009-1070-y

Hellstrom, J. (2010). The innovative use of mobile applications in East Africa. *SIDA Review*, 12. http:www.sida.se/publications, (accessed 18 March 2021).

Hsieh, J.J. P., Rai, A., & Keil, M. (2008). Understanding digital inequality: Comparing continued use behavioral models of the socio-economically advantaged and disadvantaged. *MIS Quarterly*, 32 (1), 98–126.

Hudson, H. E. (2000). From African village to global village: Lessons in bridging the African digital divide. https://www.tprc.org/abstracts00/africanvillage.pdf.

Islam, S., & Hassan, N. (2009). Multipurpose community telecentres in Bangladesh: Problems and prospects. *The Electronic Library*, 27 (3), 537–553.

Jensen, M., & Esterhuysen, A. (2001). *The community telecentre cookbook for Africa.* Paris Publishing.

Kaba, B., & Osei-Bryson, K. (2013). Examining influence of national culture on individuals' attitude and use of information and communication technology: Assessment of moderating effect of culture through across countries study. International Journal of

Information Management, 33(3), 441-452, DOI: 10.1016/j.ijinfomgt.2013.01.010.

Kapange, B. (2003). Information and communication technologies and national agricultural research systems: The case of Tanzania, Department of Research and Development, Ministry of Agriculture and Food Security, Dar-es-Salaam. https://www.tanzania.go.tz/egov_uploads/documents/griculturalresearch.

Kapondera, S. K., Panteli, N., & Bernardi, R. (2020). Telecentre users as mediators of empowerment of rural communities in Malawi. In M. Cunningham, & P. Cunningham [Eds.], IST-Africa 2020 Conference Proceedings https://www.ist-africa.org/conference2020/

Kapondera, S. K., & Namusanya, D. M. (2016). Uses, benefits and challenges of using rural community telecentres as tools for development: The case of Vikwa Community Telecentre in Kasungu, Malawi. *Journal of Development and Communication Studies*, 5 (1), 1–21.

Kenny, C. (2002). Information and communication technologies for direct poverty alleviation: Costs and benefits. *Development Policy Review*, 20 (2), 141–157.

Kiplang'at, J. (2003). Does agricultural extension have a new beginning because of ICTs? reflections on experience in sub-Saharan Africa [Paper presentation]. ICTs-transforming agricultural extension Wageningen, 23-25 September 2003.

Kumar, R., & Best, M. L. (2007). Social impact and diffusion of telecentre use: A study from the sustainable access in rural India Project. *The Journal of Community Informatics,* 2(3).http://cijournal.net/index.php/ciej/article/viewArticle/328.

Lashgarara, F., Karimi, A., & Mirdamadi, S. M. (2012). Effective factors on the villagers use of rural Telecenters (case study of Hamadan province, Iran). *African Journal of Agricultural Research*, 7(13), 2034–2041.

Latchem, C., & Walker, D. (2001). *Perspectives on distance education: Telecentres and key issues.* The Commonwealth of Learning.

Lwoga, E. T. (2010). Bridging the agricultural knowledge and information divide: The case of selected Telecenters and rural radio in Tanzania. *The Electronic Journal on*

Information Systems in Developing Countries (EJISDC), 43 (6), 1–14, doi: 10.1002/j.1681-4835.2010.tb00310.x.

Lwoga, E. T., & Chigona, W. (2020). Telecenters and the expansion of human capabilities among rural women. *Global Knowledge, Memory and Communication*, 69 (6–7), 501–520, doi: 10.1108/GKMC-11-2019-0136.

Lwoga, E. T., & Chigona, W. (2019). Perception, usage and barriers towards the utilisation of the telecentres among rural women in Tanzania. *Journal of Information, Communication and Ethics in Society,* 17(1), 2-16.

Mayanja, M. (2002). The African community telecenters: In search of sustainability: World Bank Institute. http://topics.developmentgateway.org /ict/rc/filedownload.do?itemId=284130.

Mbangala, B., & Samzugi, A. (2014). The socio-economic impacts of telecentres in rural Tanzania: A case study of Sengerema district, Mwanza. *Library Philosophy and Practice,* 1224, 1–27.

Mbatha, B. (2015). Diffusion and adoption of information and communication technologies in South African telecentres: selected telecentres in Kwazulu-Natal. *Mousaion,* 33(1), 103-120.

Methusela, D. (2007). Rural communication access and development centre (RCADC) Kibengwe, Kagera, Tanzania. 2007. https:// www.epolafrica.org/ictkig ali 2007 /resources.

Misaki, E., Apiola, M., & Gaiani, S. (2015). Technology for agriculture: Information channel for decision making in Chamwino, Tanzania [Paper presentation]. 21[st]ICE/IEEE International Technology Management Conference, June 22nd -24th, Belfast, Northern Ireland.

Misaki, E., Apiola, M., & Gaiani, S. (2016). Technology for small scale farmers in Tanzania: A design science research approach. *The Electronic Journal of Information Systems in Developing Countries,* 74 (4), 1–15.

Mittal, S., Gandhi, S., & Tripathi, G. (2010). Socio-economic impact of mobile phone on Indian

agriculture. *ICRIER Working Paper no. 246, International Council for Research on International Economic Relations.*

Mittal, S., A., & Mehar, M. (2012). How mobile phones contribute to growth of small farmers ? evidence from India. *Quarterly Journal of International Agriculture*, 51 (3), 227–244.

Molnár, S., & Karvalics, L.Z. (2001). Two models and six types of the telecentres: A typological experiment. www.ittk.hu/english/docs/two_models_six_type.pdf.

Mosha, N.F., Holmner, M., & Penzhorn, C. (2015). The role of social media tools to enhance knowledge sharing among knowledge workers in higher learning institutions: A case of Nelson Mandela African Institution of Science and Technology, Arusha, Tanzania [Paper presentation]. 81st International Federation of Library Associations and Institutions (IFLA) - World Library and Information Conference (WLIC). Cape Town, South Africa, 15-21 August 2015.

Mtega, W. P., & Malekani, A. W. (2009). Analyzing the usage patterns and challenges of telecenters among rural communities: Experience from four selected telecenters in Tanzania. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, 5 (2), 68–87.

Mtega, W. P., & Msungu, A. C. (2013). Using information and communication technologies for enhancing the accessibility of agricultural information for improved agricultural production in Tanzania. *The Electronic Journal on Information Systems in Developing Countries (EJISDC),* 56 (1), 1–14.

Mulozi, D. (2008). Telecentres: Knowledge sharing in rural Africa, Lusaka, Zambia. https://www.share4dev.info/kb/documents/4344.pdf.

National Bureau of Statisctics (NBS) (2013). Tanzania national bureau of statatics. https://www.nbs.go.tz/http://www.nbs.go.tz/ (accessed 4 January 2021).

Neville, K. (2012). Libraries, telecenters, cybercafes and public access to ICT: International comparisons. in R. Gomez [ed.] *IGI Global/Information Science Reference*, Taylor Francis Routledge.

Njelekela, C., & Sanga, C. (2015). Contribution of information and communication technology

in improving access to market information among smallholder farmers: The case study of Kilosa district. *International Journal lof Management Science and Information Technology*, 17, 56–71.

Odame, H. H., & Atibila, J. (2003). *Linking agricultural research and rural radio in Africa: New opportunities for communicating innovation and experiences from Northern Ghana.* Ghana Press.

Penzhorn, C. (2013). The use of social media in teaching a campus-wide information literacy course. *Mousaion*, 31(3), 57–73.

Pick, J. B., & Gollakota, K. (2010). Technology for rural telecenters in India: A model and exploratory study of diffusion of information for telecenter use and sustainability [Paper presentation]. 16th Americas Conference on Information Systems, Lima, Peru from August 12 to 15, 2010. Peru.

Rahman, T., Ara, S., & Khan, N. A. (2020). Agro-information service and information-seeking behaviour of small-scale farmers in rural Bangladesh. *Asia-Pacific Journal of Rural Development*, 30 (1–2), 175–194, doi: 10.1177/1018529120977259.

Rahman, T., & Bhuiyan, S. H. (2016). Multi-purpose community telecenters in Rural Bangladesh: A study of selected union information and service centers. *Information Development*, 32 (1), 5–19.

Rangaswamy, N. (2006). Social entrepreneurship as critical agency: A study of rural internet kiosks [Paper presentation]. International Conference on ICT and Development. Berkeley University Press, 143–152.

Rega, I., Vannini, S., Fino, E., & Cantoni, L. (2013). Exploring the meanings of community multimedia centers in Mozambique: A Social Representation Perspective. Information Technologies & International Development, 9(4), 35–54

Richardson, D., Ramirez, R., & Haq, M. (2000). Grameen Telecom's village phone programme in Rural Bangladesh: A multi-media case study, Canadian International Development (CIDA).https://www.t-forum.org/mausklick/background/Grameenfinalreport.pdf.

Richardson, D. (1997). The internet and rural agricultural development: An integrated

approach. https://www.fao.org/docrep/w6840e/w6840e02.htm

Rogers, E. M. (2003). *Diffusion of innovations*. Free Press.

Saravan, R. (2011). A report on tribal farmers personal and socio-economic information, communication pattern and information needs assessment. *E-Agrikiosk Publication No. 1.*

Sirimane, S. (1996). The information technology revolution: What about the developing countries? CIDA International Development Centre. *Development Express, No. 04.* https://www.acdi_cida.gc.ca/xpress/dex/dex9401.htm

Tabassum, G., Kulathuramaiyer, N., Harris, R., & Yeo, A.W. (2019). The indirect and intangiable impacts of a telecentre on a rural community. The Electronic Journal of Information Systems in Developing Countries, 85(3), https://doi.org/10.1002/isd2.12087

Taulo, J., Gondwe, K., & Sebitosi, A. (2015). Energy supply in Malawi: Options and issues. *Journal of Energy in Southern Africa*, 26 (2), 19–32.

The United Nations Educational, Scientific and Cultural Organization (UNESCO). (2021). Adolescent girls and young women in Tanzania expand digital literacy and skills. https://en.unesco.org/news/adolescent-girls-and-young-women-tanzania-expand-digital-literacy-and-skills

United Republic of Tanzania (URT) (2008). *Agricultural Sector Reforms in Tanzania: Perspectives from within Tanzania.* Government Printer.

United Republic of Tanzania (URT). (2010). *Kilimanjaro region socio-economic profile.* Government Printer.

Yonah, Z.O., & Cons, R. (2005). ICTs as tools for poverty reduction [Paper presentation]. Disclourse on engineering contribution in poverty reduction from 18th to 19th March 2005. https://www.tzonline.org/pdf/ictsastoolsforpovertyreduction1.pdf.