

Rural-ICT service providers and agro-pastoralists interface: implications of the processes for sustainable agro-pastoral livelihoods in rural Tanzania

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Abstract

This paper looks at Rural-ICT Service Providers (telecentres alongside with community radio) and agro-pastoralists interface in rural Tanzania. Specifically, the paper aim to provide an assessment of the processes at the interface and examine how these processes influence decisions, behavior, actions and livelihoods among actors. The focus is to understand whether these processes provide enabling environment at the interface, with particular emphasis on institutional arrangements, rules and regulations, power relations, conditions and policies which are crucial in shaping agro-pastoralists' livelihoods. This assessment is imperative because it provides a better understanding on how different institutional arrangements influencing delivery of ICT services in rural areas. The study adopted a combination of cross-sectional and case study designs. Purposive and random sampling techniques were employed to select the representative sample. Data collection methods comprised of household surveys, focused group discussions (FGDs), and key informants' interviews. Agro-pastoralists were directly administered with questionnaires. In addition, FGDs and key informants' interviews were conducted. F-statistics was used to test for significance of data and One-Way ANOVA used to analyse 5-points Likert-scale information.

The study findings show that there are government failures at the interface due to structural weaknesses and conflicts in the implementation of policies and guidelines. The findings underscored the importance of effective processes for sustainable agro-pastoralists' livelihoods. The processes in the form of contractual arrangements play an important role for effective access, use and delivery of ICT services in rural areas. The study recommends that in order to ensure access, use and delivery of quality and effective ICT services in rural areas, the government should make sure that there are clear mandates and responsibilities among actors to reduce structural weaknesses and conflicts.

Keywords: *agro-pastoral livelihoods, information and communication technology (ICT), rural-ICT service providers (RISP), telecentres*

Introduction

Information and communication technologies are commonly acknowledged as efficient means of sharing knowledge and information for socio-economic growth, especially in rural areas of developing

countries. As such, the interface (point of interaction where two actors act together towards defined goals) between Rural-ICT Service Providers (RISP) and agro-pastoralists (people whose livelihoods are based on agriculture and livestock-keeping ventures under natural settings in rural areas), and their implications for improving agro-pastoral livelihoods in rural Tanzania is the subject of the paper. Agriculture and livestock-keeping ventures (agro-pastoral livelihoods) are both a way of life and principal means of livelihoods for more than 70 percent of Tanzania's rural population (Ngowi et al 2015). In spite of having traditional agricultural and livestock extension services to serve agro-pastoralists in rural Tanzania, they still suffer from the absence of right information and knowledge (Massawe 2004). This is partly due to lack of knowledge-sharing practices and weak interaction among actors. The agro-pastoralists require timely information and knowledge on improving crop and livestock productivity. The information and knowledge needed among others include the availability of inputs, credits, weather conditions, sowing time, extension services, markets outlets, and other areas of interest to them. Regardless of the best efforts and expenditure, the traditional agricultural extension services have not been able to deliver the services satisfactorily. Herein lay the role of Information and Communication Technologies (ICT) which can efficiently address the concerns of agro-pastoralists dwelling even in remote locations of the country. The paper focuses on the conviction that ICT services play an important role in improving livelihoods and hence, fostering rural development.

In this paper, processes are conceived to represent diverse elements such as policies, legislations, the formal and informal rules and regulations governing the behavior and actions which are crucial in shaping agro-pastoral livelihoods (DFID 2000). These processes influence the behavior and actions of actors at the interface. However, it is clearly understood that different actors may have different motives and interests. These differences may result in intended and adverse outcomes to some actors at the interface (Massawe 2004; Galloway and Mochrie 2005; Cockerill and Carp 2009; Baregu 2011). Therefore, getting a better understanding how different institutional arrangements, rules and regulations taking place at the interface is imperative. This has the potential to generate information required for designing interventions which can help to improve and allow the identification of restrictions/barriers and opportunities for improving crop and livestock production ventures for a sustainable agro-pastoralists' livelihoods. Therefore, this introductory section introduces the paper and its epistemological roots.

Materials and methods

The study area

Tanzania is one of the most rural countries in Africa, with over 70 percent of the population living in rural areas (URT 2013). The major economic activity in rural areas of Tanzania is agriculture and livestock-keeping, predominantly smallholders. This study was conducted in rural areas in Tanzania, with particular emphasis on two selected rural areas of Kilosa District in Morogoro Region and Sengerema District in Mwanza Region. The identification and selection of these study areas were guided by specific features related to the availability and accessibility of RISP in forms of telecentres alongside with community radio, agriculture and pastoral livelihoods development in these rural districts that necessitates the need to link the fastest growing sector in Tanzania (ICT) with one of the most important economic sector (agro-pastoral livelihoods).

Research design and data collection methods

The study employed a combination of cross-sectional and case study research designs as the logic structure of inquiry. The main data collection methods employed was household survey, key informant interviews, focus group discussions (FGDs), and documentary reviews. The mixed

methods approach was chosen to allow collection of both quantitative and qualitative data sequentially. The study began with a broad household survey in order to generalize results to agro-pastoralists population. Thereafter, focus group discussions (FGDs) and key informant interviews were conducted to collect detailed views from agro-pastoralists and RISP managers. These were also complemented by documentary reviews relevant to the topic at hand. Finally, key informant interviews and documentary reviews were applied to collect institutional data from key officials at Tanzania Communication Regulatory Authority (TCRA), Tanzania Commission for Science and Technology (COSTECH) and the Ministry of Communication, Science and Technology in order to solicit some technical issues such as legal and policy frameworks.

In Sengerema District, a total of 180 (73.2%) out of 246 (100%) agro-pastoralists who had access and use ICT services offered by RISP were randomly selected to be included in the study because of their heterogeneous characteristics in terms of livestock numbers. In Kilosa District, a decision was made to include 227 (100%) agro-pastoralists who had access and use ICT services offered by RISP because of their homogenous characteristics in terms of livestock numbers.

Data processing and analysis

Qualitative and quantitative data analyses have been used in this study. Qualitative data analysis focused on making deductions out of views of the respondents. As such, information collected during the FGDs and key informants interviews were subjected to content analysis. Quantitative data collected were coded, processed and analysed using the Statistical Package for Social Sciences (SPSS 16.0 version) computer software. Descriptive and inferential statistics were used in describing the institutional arrangements, rules and regulations, power relations, conditions and policies at the interface. Furthermore, F-statistics was used to test for significance of data and One-Way ANOVA used to analyse 5-points Likert-scale information.

Results and discussion

This section discusses study findings following an assessment of the processes at the RISP and agro-pastoralists interface. The focus is to understand whether these processes provide enabling environment at the interface, with particular emphasis on institutional arrangements, rules and regulations, power relations, conditions and policies. Furthermore, the section presents an assessment by agro-pastoralists on the effectiveness of the processes at the interface. This analysis is imperative because it helps to provide a better understanding on how different institutional arrangements influencing the delivery of ICT services in rural areas. The findings presented in this section are based on the content analysis and cross-tabulations.

Processes and institutional mechanisms at the interface

Institutional mechanisms that affect behavior and actions of key actors were identified and assessed to determine the role they play and their implications at the interface. The rules they impose and their implications differ depending on their position and level at the interface. As such, at the national and local level, mechanisms are in place to ensure knowledge and information sharing. This is done through bringing various key actors together by exchanging and transacting different services as described below.

Contractual arrangements between government institutions and RISP

Government institutions that are important in this study include the Ministry of Communication,

Science and Technology, the Tanzania Communication Regulatory Authority (TCRA) and the Tanzania Commission for Science and Technology (COSTECH). In Tanzania, the formulation of policies and laws using these government institutions on the ICT sector, have facilitated market entry, customer services, costs reduction and increased productivity of the telecommunication and other ICT services (Njuguna 2006). The policies and laws formulated include Information and Communication Technology Policy of 2003, Postal Policy of 2003, National Information and Broadcasting Policy of 2003, Tanzania Communications Regulatory Authority (TCRA) Act of 2003, Converged Licensing Framework (CLF) of 2005 and Telecommunications Policy of 1997 (TCRA 2009). All these policies together facilitate transmission and distribution of ICT services and communication. However, the most relevant policies used in this study are the National ICT Policy of 2003 and TCRA Act of 2003. This is premised on the fact that the two policies have direct bearing on the RISP operations. TCRA, through TCRA Act of 2003, is responsible for regulating the ICT industry and creating a level playing field so that various ICT operators and users can exchange services fairly (TCRA 2009).

On one hand, COSTECH is mandated for evaluating existing National ICT policy implementations and advising the government regarding its ICT sector. It is also responsible for promoting and initiating innovation development in the ICT sector (COSTECH 2005). Furthermore, COSTECH is responsible for overseeing research in science and technology. COSTECH plays a crucial role in the establishment of telecentres as well as in promoting and linking different sectors to ICT based services in the country (COSTECH 2005). On the other hand, the Ministry for Communication, Science and Technology is the overseer of all these agencies. It is responsible for the overarching policy making and initiating legislations. The overall mission of the National ICT policy is to enhance national economic growth and social progress through the application of ICT in all sectors (URT 2003). The policy articulates a range of focus areas that aid optimal use of ICT in both urban and rural areas of Tanzania. The ministry has a responsibility of ensuring that these strategic focus areas are well implemented and deliver the intended outcomes to the users of ICT services. The major focus areas for action to improve the availability and developmental use of ICT services are as shown in Table 1.

Table 1. Focused Area in Tanzania National ICT Policy of 2003

Focus area	Description
Strategic leadership	To create a focused ownership and visionary in favor of ICT.
ICT infrastructure	To foster for supportive and inter-operable ICT infrastructure.
ICT industry	To build and promote, and regulate a conducive

environment.

Human capital

To bolster the human capital in favor and exploit ICT potentials.

Legal and regulatory framework

To create ICT enabling legal, legislative and regulatory framework.

Productive Sectors

To encourage and support the utilisation of ICT in productive sectors.

Service Sectors

To promote and encourage effective and efficient application in service sectors.

Public service

To support and become a role model in utilising ICT in the public service.

Local content

To allow, encourage, and promote the development of indigenous knowledge and traditional cultures.

Universal access

To address the digital divide for better and affordable universal access.

Sources: URT (2003)

The National ICT policy recognises the importance of "Strategic ICT leadership" and governance structures to guide the ownership and development of ICT services in rural and urban areas (URT 2003). The policy is striving to create an appropriate investment climate for public-private partnerships for ICT services delivery in rural and urban areas. Furthermore, the policy desire for ICT development is dependent on "ICT infrastructural development" in rural and urban areas as shown in Table 1. Recognising the importance and role of ICT in development, Tanzania is a member of the on-going project to connect the eastern side of the African continent to the international fibre optic network. This project is commonly known as the East African Submarine Cable System (EASSy), it is set to run from Durban in South Africa to Port Sudan in Sudan (APC 2007; TCRA 2009). EASSy is expected to lower costs of internet connectivity in rural and urban areas because it will enable operators to route their traffic via submarine cables, rather than via satellite connections, which are much more expensive for the operators (CIPESA 2006). This is confirmed in an interview sessions with RISP-managers who made a remark that:

"Infrastructure poses one of the main barriers for effective implementation of ICT in rural areas. The ICT infrastructures, such as the telecommunication network, roads and electricity supply, are inadequate in most of the rural areas".

The infrastructural development should go hand in hand with "human capital" development (see Table 1) as integral to the success of ICT services in rural and urban areas (URT 2003). As such, the Tanzanian government has committed itself to promoting knowledge and skills in ICT as a means of building a sustainable ICT transformation. The government encourages and supports ICT access and use throughout all sectors. It can be noticed that the National ICT Policy recognises and emphasizes that prior to ICT services and human capital development, suitable "institutional arrangements, legal and regulatory framework" must be established to facilitate access and use of ICT services (URT 2003; TCRA 2009).

The growth of the Tanzanian economy depends on many sectors, among others, agriculture, manufacturing and mining (TCRA 2009; URT, 2007). Recognising the importance of the sectors, the policy provides a provision for linking these sectors through ICT. As such, "productive sectors" becomes an important area of focus. Thus, the government is dedicated to meeting the needs and requirements of the producing sectors by fostering enterprise and ICT services innovation in rural and urban areas (TCRA 2009; URT, 2007). The policy recognises the importance of balancing the importation of foreign influences with the creation and protection of "local content". The government supports the creation and development of ICT services and encourages local content development for electronic services to protect producing sectors (URT 2003). The aim is to ensure that the domain and contents of the ICT knowledge and information address the needs and demands of the users, while at the same time ensuring adequacy and relevance to the local communities.

The policy also emphasizes on universal access as a strategy of ensuring that all ICT users are covered. Universal access to ICT services is in-line with the Tanzania Development Vision 2025 (TDV) and the Rural Development Strategy (RDS) of 2001. TDV insists on provision of ICT services to remote and rural areas to reduce rural-urban disparities in terms of information and knowledge accessibility and utilisation. The National ICT Policy stresses that every licensed ICT services provider must extend services to cover rural areas. The RDS promotes the introduction of ICT in rural areas through the creation of telecentres that offer a wide variety of public and private ICT-based services to support rural development (URT 2007).

In view of the above, it is evident that the National ICT Policy provides a conducive environment for ensuring universal access to ICT services in the country. This is an indication of the recognition of the importance and contribution of access to ICT services in productive sectors for increased productivity and poverty reduction. This is a cross-cutting area. As such, it is sometimes referred to as universal services policies or universal access policies. Collectively, it is also referred to as universality policies (Intven and Tetrault 2002). Universal service refers to the policy of providing ICT services to individual subscribers, usually measured by household penetration. Universal service is a practical policy objective in many industrialized countries (Benjamin and Dahms 1999). Likewise, universal access refers to the policy of ensuring that members of the community are able to use ICT often, via public provision, through public phones and telecentres. It is a goal adopted by many developing countries to provide convenient and affordable access to communications (Intven and Tetrault 2002). As such, Universality is the term that refers to both universal access and universal services. Therefore, the policy has a strategy for implementing universal access through Tanzania Universal Access Act of 2007. The Act stipulates the establishment of a universal access fund, which is known as the Universal Communications Service Access Fund (UCSAF). The purpose of the Fund is to reduce ICT access gap between rural and urban areas by supporting and facilitating ICT investors in

rural areas in establishing rural telecentres. The sources of funding for the universal access funds are mainstreamed in the national budgets, which are obtained from charges on connecting services, levies on subscribers and levies on operators' revenues. The Fund covers a variety of services, including basic telephone service and telecentres in rural areas. The Funds are meant to initiate and subsidize rural ICT service providers who hold communications licenses issued by TCRA. The funds are managed by the Ministry of Communications, Science and Technology and TCRA (TCRA 2009; URT 2007).

However, a number of concerns have been registered regarding how effective and efficient the policy has been implemented. For instance, Chilimo (2008) and Muriethi (2002) report that in Tanzania, competition and liberalisation of the telecommunication sector had shifted the focus of operators to the profitable urban areas, at the expense of the rural areas, abandoning the original purpose of the policy, which is to improve access and use of ICT services in rural areas. Chilimo (2008) argues that processes and structures on the implementation of the policy, especially on ICT rural service provision, are still uncertain. This is because there are overlaps in the management and execution of the Fund between the Ministry and TCRA. It is argued that this has created a lot of structural conflicts, especially in the ownership and disbursement of funds to telecentres operators. This tends to have negative repercussions on the delivery of quality and affordable ICT services in rural areas. This suggests that there is a need of defining a clear line of responsibilities and mandates on the ownership and management of the Fund in order to ensure proper operations and delivery of ICT services by the operators.

It is also reported that there are structural weaknesses on the management and administration of the Fund. Sedoyeka and Hunaiti (2008) report that there are various weaknesses in the Tanzanian policy on ICT services operators in the country, among others, including lack of proper policy directives and implementation plans on accessibility and use of ICT services in rural areas. These affect the delivery and quality of services. ICT services provision in rural areas is mainly done by small-scale and, in most cases, isolated projects. The same has been reported by Mercer (2005) who argues that because of this kind of environment, the pace in the diffusion of ICT services in rural areas is slowing down.

Another problem reported to be hindering access and use of ICT services is the fees and charges imposed by TCRA to ICT services providers. It is reported that TCRA imposes annual fees attached to licenses for the RISP operation (URT, 2007). These charges are transferred to customers (agro-pastoralists). This makes the services expensive for the communities. The regulator is functioning as a means of generating revenues for the government in the form of collection of licensing fees and loyalty paid by the RISP operators, rather than facilitating the spread of the ICT services. Chilimo (2008) cautions this kind of practices, whereby a regulatory agency acts as revenue generating for the government instead of playing a facilitating role in the delivery of ICT services. This kind of practice affects smooth operation of RISP in delivering of ICT services to agro-pastoralists. This eventually limits the access and use of these services by agro-pastoralists because this makes ICT services expensive and unaffordable.

Contractual arrangements at the interface

RISP operating, both in Sengerema and Kilosa districts, also impose rules and regulations for ICT services delivery in rural areas. During the study it was noted that RISP impose a number of rules and regulations, ranging from formation of groups among agro-pastoralists an understanding on how to read and write in Kiswahili and ability to pay a token for the use of ICT services. It was noted that formation of groups and having a better understanding on how to read and write were a requirement

to access and use ICT both in Kilosa and Sengerema districts. The groups were required to have a constitution containing a set of rules and by-laws as a pre-requisite for accessing and using RISP ICT services. Members were required to form a group composed of individuals with qualities compatible to each other in terms of trustworthiness, honesty, reliability and punctuality. In order to ensure easy management of the groups, RISP in Sengerema District imposed a condition on the maximum numbers per group. It was required that each group should not exceed 30 individuals per group. Additionally, capacity building was done to agro-pastoralists' groups in Sengerema District through Sengerema Informal Sector Association (SISA). Through this arrangement, agro-pastoralists were exposed to better knowledge on how to manage their groups.

On the contrary, RISP in Kilosa District did not restrict the number of individuals per group nor was capacity building on better management done to groups. During the study, it was noted that in Kilosa District some groups were larger, in some cases more than 100 individuals per group. It should be noted that larger groups are difficult to manage. This is from the fact that a large group tends to face asymmetric and imperfect information and knowledge due to adverse selection and moral hazard (N'Guessan and Laffont 2000; Gruber 2011). Adverse selection refers to a process in which undesired results occur as results of access and use of the imperfect information (asymmetric information) (Gruber 2011). Moral hazard is a situation where a party of the group takes risks because the cost that could incur will not be felt by the party taking the risk (Gruber 2011). All of these problems may lead to market failure. Therefore, asymmetric information means that one party has more or better information than the other when making decisions and transactions that affect production activities. Asymmetric and imperfect information and knowledge may result into conflicts and misunderstandings and thus mistrust among members. Mistrust can result into undesirable livelihood outcomes at the interface.

It is evident from the study results that agro-pastoralists in Sengerema District had a relatively better exposure to ICT services than those in Kilosa District. The probable explanation to this is the fact that agro-pastoralists in Sengerema District are organised into relatively smaller manageable groups as compared to larger groups in Kilosa District. This suggests that larger groups are relatively difficult to manage and assurance of trustworthiness, honesty, reliability and punctuality cannot be achieved (Lenoir 2009; Greene 2010). Greene (2010) argues that larger groups in farmers' organisation are more difficult to manage and meeting interests of each individual as compared to smaller groups. This is from the fact that a manageable group organisation is important for collective voice and drive balanced outcome. Furthermore, Lenoir (2009) and Zappacosta (2008) point out that farmers benefit from small groups' organisation by helping each other on the utilisation of ICT services to enquire marketing advantages, exchange of knowledge and experiences, and through the increased bargaining power in the purchase of inputs. With small groups it is easy to build confidence, trust and bring individuals with common interests and mutual understanding. In this way, interaction of group members can fully cooperate and share knowledge and experience effectively and efficiently for mutual benefits. This is also confirmed during the study by RISP official (personal communication) who pointed out that;

"Information and knowledge spread more quickly when agro-pastoralists are working in manageable groups and members get more economic benefits when helping each other in small groups. Additionally, working with small groups helps RISP officials to get more insight in agro-pastoralists' conditions, problems and needs. In this way, RISP officials can better prepare their ICT services and activities that reflect conditions, problems and needs, and remain informed more about the group organizational activities".

In addition to the above conditions, RISP in Kilosa District had an extra condition which requires ICT

users to pay a token or fee. During the study, it was found that agro-pastoralist in Kilosa District were required to pay some fees in order to access and use certain ICT services. During FGDs and key informant interviews, agro-pastoralists in Kilosa District reported to pay fees to access and use ICT services ranging from internet, off-line resources (CD-Rom, leaflets, brochures and magazines). It was reported by RISP Manager in Kilosa District that in order to use those services agro-pastoralists were charged a fee of about US\$ 2 per 60 minutes to access and use internet services for a person who does not need any assistance. Those who needed assistance were charged a fee of US\$ 3 for the same 60 minutes. These charges were mainly raised for internet connectivity for the telecentre. The telecentre was liable to pay about US\$ 200 to 220 per month. The telecentre Manager lamented that the charges were too high for service providers. As such, they shift the burden to agro-pastoralists (personal communication with RISP Manager in Kilosa District).

Imposing charges to access and use of ICT services led to exclusion of some agro-pastoralists. This is supported by the fact that agro-pastoralists in Sengerema District had more exposure to ICT services as compared to those in Kilosa District. This is because RISP in Sengerema District is a public and donor supported which offered services free of charges as opposed to RISP in Kilosa District, a private and independent RISP, which charged agro-pastoralists a fee to access and use of ICT services. This is consistent with other studies (Akpabio et al 2007; Lwoga 2010). They found that high cost of ICT infrastructure, high charges for telecentres and community radio presentations, high cost of access and electricity, limit the farmer's access and use of ICT services.

Assessment of processes as perceived by agro-pastoralists at the interface

This sub-section presents an assessment of the perception and attitudes of agro-pastoralists on the processes taking place at the interface. A 5-point Likert Scale was used to draw opinions on agro-pastoralists' perceptions and attitudes towards the processes taking place at the interface. A mean score based on Likert Scale were distributed as follows; 5= not at all, 4= to a small extent, 3= to a lesser extent, 2= to a reasonable extent, and 1= to a large extent. The assessment was mainly focused at understanding how agro-pastoralists consider the rules and regulations, conditions, practices and activities in terms of their effectiveness, applicability, reliability, adequacy and relations at the interface. This is imperative due to the fact that these elements have far-reaching implications for access and use of the RISP ICT services by agro-pastoralists. A one-way ANOVA was performed to establish the mean average score on each element. The results on one-way ANOVA are as presented in Table 2.

The results indicate that rules and regulations at the interface were relatively favorable in Sengerema District as compared to those in Kilosa District. This is supported by the results in Table 2 which show that the average mean score for Sengerema District is 2.24. This is below the mid-point average mean score of 2.5 on a 5 scale point. Correspondingly, the average mean for Kilosa District is only 2.47, which is at the mid-point average mean, suggesting that the rules were not that much friendly. The results show a statistically significance different at 1% level.

Table 2. Assessment of Rules and Regulations as Perceived by Agro-pastoralists

Agro-pastoralists' Assessment	Districts	F-statistics
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	Kilosa (n=227)	Sengerema (n=180)	
Favorability of the rules and regulations.	2.47	2.24	8.09***
Extent of rules and regulations in facilitating sharing of knowledge and information among actors.	2.33	2.03	13.27***
Extent of the rules and regulations to meet demands/needs for agro-pastoralists.	2.56	2.30	4.13***
Adequacy of ICT content in meeting agro-pastoralists information and knowledge needs.	2.31	2.09	7.88***
Reliability of RISP in delivering ICT services to agro-pastoralists.	2.06	1.87	6.14**

*Note: *** significant at 1% level; ** significant at 5% level*

It is believed that people tend to look for services they consider to be important and relevant in carrying out their daily activities (Ngowi et al 2015). Therefore, it was deemed important to assess the extent of rules and regulations in facilitating acquisition of knowledge and information among actors at the interface. The results in Table 2 show that agro-pastoralists in both study locations perceive the rules and regulations facilitates the acquisition of knowledge and information as substantiated by the average mean of less than 2.5 on a 5 scale point. However, the results show that the rules and regulations in Sengerema District seemed to facilitate acquisition of knowledge and information better than in Kilosa District. The results show that the mean score in Sengerema District is 2.03 while the mean score for Kilosa District is 2.33. This is statistically significant different at 1% level.

The extent to which the rules and regulations imposed to meet or address the demands and needs of agro-pastoralists was determined. The responses by agro-pastoralists show that the rules and

regulations imposed for ICT services that met their demands and needs were better in Sengerema District as compared to Kilosa District. This is supported by the results in Table 2, which indicate that the average mean score for Kilosa District (2.6) which is greater than that for Sengerema District (2.3) which is below the mid-point average mean score of 2.5 on a 5 scale point Likert scale. The results show a statistically significant difference at less than 1%.

It is also important to understand the adequacy of RISP ICT services content in meeting agro-pastoralists information and knowledge needs. This is based on the fact that appropriate content of ICT services is important for production activities. In view of this, it is of paramount importance to investigate the same in order to reveal whether the RISP ICT services contents had useful information and knowledge. The results for this analysis are presented in Table 2. The results show that RISP ICT services contained useful and adequate information and knowledge to help them in improving and promoting their production activities. However, the contents of ICT services contained more information and knowledge in Sengerema District than in Kilosa District. Furthermore, the results show that RISP in Sengerema District was more reliable in delivering ICT services to agro-pastoralists as compared to RISP in Kilosa District. The average mean score is higher in Kilosa District as compared to Sengerema District. This is due to the fact that agro-pastoralists in Sengerema District had more access to ICT services as compared to those in Kilosa District. The results are statistically significance different at 1% level.

Respondents were also asked to assess the effectiveness of rules and regulations on various aspects of ICT services rendered in rural areas. The results in Table 3 show that the effectiveness of rules and regulations in facilitating smooth interaction at the interface in extending ICT services to agro-pastoralists are on the higher side in Sengerema District as compared to Kilosa District. This is supported by the lower average mean score of 2.3 in Sengerema District which is below the mid-point average mean score of 2.5 on a 5- point Likert scale. The corresponding figure for Kilosa District is 2.5 which are equal to mid-point average mean score. The effectiveness of the rules and regulations in facilitating sharing of experiences among agro-pastoralists for RISP in Kilosa District have an average mean score of 2.22 as compared to 1.97 for RISP in Sengerema District, although the score is below the mid-point average mean score. The results in Table 3 reveal that agro-pastoralists perceived the rules and regulations to be effective in facilitating smooth interaction and sharing experience among agro-pastoralists at the interface in both districts. The results are statistically significant different at 1% level.

Table 3. Effectiveness of Rules and Regulations as Perceived by Agro-pastoralists

Agro-pastoralists' Assessment	Districts		F-statistics
	Kilosa (n=227)	Sengerema (n=180)	

Effectiveness of rules and regulations in facilitating smooth interaction at the interface.	2.49	2.30	6.41***				
				Effectiveness of the rules and regulations in facilitating sharing of experiences among agro-pastoralists.	2.22	1.97	14.3
				Effectiveness of the rules and regulations in ensuring a gro-pastoralists benefit in ICT services.	2.40	2.19	6.9
				Effectiveness of rules and regulations in facilitating knowledge tapping.	2.27	1.96	17.1

*Note: *** significant at 1% level; ** significant at 5% level*

The respondents were requested to express their opinion on the effectiveness of the rules and regulations in ensuring the benefits and facilitating knowledge tapping. The results in Table 3 show that there is a significant difference in the two study locations in terms of the effectiveness of the rules and regulations in ensuring benefits and facilitating knowledge tapping. It can be observed from the results that the rules and regulations in ensuring benefits and facilitating knowledge tapping were more effective in Sengerema District than in Kilosa District. This is reflected by the average mean score of 2.40 on benefit from ICT services and 2.27 on knowledge tapping in Kilosa District which is greater than that for Sengerema District 2.19 and 1.96 respectively. The results are both below the mid-point average mean score. However, in both cases, Sengerema District has lower scores compared to Kilosa District. This suggests that the effectiveness of the rules and regulations in ensuring benefits

and facilitating knowledge tapping to agro-pastoralists is relatively high in Sengerema District compared to Kilosa District. The results are statistically significant different at 5% and 1% level, respectively.

Implications of contractual arrangements

Processes in the form of contractual arrangements play an important role for effective and efficient delivery and distribution of ICT services in rural areas. This is because they facilitate knowledge, information and experiences sharing that have direct and indirect implications for the sustainability of agro-pastoralists' livelihoods. This is premised from the fact that Tanzania National ICT Policy of 2003, TCRA Act of 2003, Tanzania Universal Access Act of 2007 and RDS of 2001 clearly stipulate the need for provision of an enabling environment between actors at the interface.

However, despite recognising the importance of these contractual arrangements between the government and ICT service providers, there are government failures in terms of implementation and execution problems that hamper effective provision and delivery of ICT in rural areas as described in Figure 1. According to Figure 1, if all conditions at "A", "B" and "C" are fulfilled, it is believed that there will be mutual benefits among actors. However, the study findings reveal that the government has not been fulfilling its obligations. One of the government failures hinges on the implementation problems. The results reveal that there are structural weaknesses and conflicts in the management of the universal access funds between the Ministry for Communication, Science and Technology and TCRA. The structural conflict is on universal access funds management. The funds are being managed by the Ministry of Communications, Science and Technology and the regulatory agency-TCRA. The arrangement affects the ICT services in rural areas negatively in terms of quality and affordability of services. This is because of shifting the focus to profitable urban areas and abandoning the original purpose, which is to improve access and use of ICT services in rural areas.

Figure 1. Institutional Mechanisms for ICT Services Delivery at the Interface (*Sources: Derived from the findings*)

It is also evident from the findings that the government has failed to live to its promises of facilitating and providing an enabling environment for the operations of RISP in delivering ICT services in rural areas. Instead, the government agencies like TCRA are acting as revenue generating agencies on behalf of the government. TCRA imposes charges attached to licenses for the RISP operation. These charges are transferred to customers, thus limiting access and use of ICT services. This implies that TCRA is functioning as a means of generating revenues for the government, rather than playing a supporting and facilitating role in ICT services delivery in rural areas. This kind of arrangement affects the smooth operation of RISP in effectively and efficiently delivery of ICT services. This is because the government agencies are supposed to support and facilitate a working environment of RISP to ensure quality of services, accessibility and affordability.

In view of the above findings, it is apparent that the government has not been facilitating and providing an enabling environment for RISP to effectively deliver ICT services to agro-pastoralists in the study locations. It is clear from the findings that due to the government's failure, RISP have also failed to effectively deliver ICT services in rural areas. This has translated into inaccessibility and underutilization of ICT services by agro-pastoralists in the two study locations. This is supported by the average mean score greater than the mid-point average mean score of 2.5. This is particularly the case for RISP in Kilosa District, a private operated, which is charging the access and use of ICT services, thus limiting accessibility and utilisation of ICT services by agro-pastoralists.

It can also be noticed that where support was provided, accessibility and utilisation of ICT services was relatively better as supported by the average mean score less than 2.5 in almost all elements in Sengerema District as compared to Kilosa District. Sengerema District with a public and donor funded RISP had an advantage of offering ICT services for free, thus agro-pastoralists in Sengerema District having a better exposure to ICT services.

Conclusions

- This paper has presented an analysis of the processes taking place at the interface. It has examined whether these processes provide an enabling environment at the interface, with particular emphasis on institutional arrangements, rules and regulations, power relations, conditions and policies. In order to understand the processes and institutional mechanisms at the interface, the study assessed contractual arrangements of the key actors which interact in the development, access and utilisation of ICT services in rural Tanzania.
- It is apparent from the findings of this study that there are a number of processes taking place at the RISP and agro-pastoralists interface. This is taking place at two levels namely; processes taking place between government agencies and RISP and processes taking place between RISP and agro-pastoralists. The processes taking place between government agencies and RISP are that the government and its agencies impose policies, guidelines, strategies, provide funds and levies on subscribers and RISP operators and issue licenses which the RISP has to meet in order to operate in rural areas. Whereas the processes taking place at the RISP and agro-pastoralists interface are imposed by RISP. At this level, RISP institute rules and regulations, which require agro-pastoralists to be organised in groups, have a better knowledge and understanding to read and write in Kiswahili and be able to pay a token for the use of ICT services.
- However, according to the findings of the study it is evident that there are government failures at the interface. The results reveal that there are still uncertainties, structural weaknesses and conflicts in the implementation of policies and guidelines as well as structural weaknesses on the management and administration of Universal Access Fund. TCRA imposes levies on licenses for ICT operators in rural areas. These levies increase operating costs to the RISP, thus transferring the burden to agro-pastoralists and thus limiting accessibility and utilisation of ICT services.
- It is evident from the findings of the study that the processes were relatively perceived to be fair and favorable in providing an enabling environment for delivery of ICT services in Sengerema District as compared to Kilosa District. This is because the working environment for a private operator as the case with RISP in Kilosa District limits access and use of ICT services due to charges imposed as compared to public and donor funded-RISP in Sengerema District.
- The important policy implications that can be drawn from the findings of this study are as follows:

- In order to enhance a household welfare through acquisition of important information and knowledge, policy interventions and programmes should strengthen and take into account information and knowledge resource to improve productivity and better management of the produce. Such efforts should focus on improving access and use of ICT services for acquisition of important information and knowledge on production activities.
- In order to ensure access, use and delivery of high quality and effective ICT services in remote rural areas, the government should make sure that there are clear mandates and responsibilities among actors so as to reduce structural weaknesses and conflicts.
- The government should provide a favorable environment in rural areas in order to encourage RISP operators to deliver high quality and effective ICT services. This can be done by providing incentives that will encourage RISP operators to deliver ICT services in remote areas at affordable charges.

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