The Use of Information and Communication Technologies for Improved Rural Agricultural Productivity in Tanzania: Challenges and Opportunities.

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Abstract

Many constraints that hamper the performance of agriculture in Tanzania are aggravated by poor agricultural information services, a situation which should no longer be on development agenda because, the use of Information and Communication Technologies (ICTs) can improve availability, access, use and sharing of agricultural information among rural communities for increased agricultural productivity and food security. However, given its potentials and applications in all economic sectors, the role of ICTs has not yet been given due attention in agricultural sector in Tanzania. The country has not done much to integrate ICTs into strategies and policies for increasing agricultural performance. Agricultural research findings available in libraries and research institutions are in inappropriate formats, languages and technical levels for adoption by both extension workers and farmers while such findings could have been repackaged using appropriate ICTs and disseminated to users for use.

Thus, this paper highlights possible opportunities, potentials and challenges of investment and promotion of ICTs in rural agriculture for productive extension services, increased, sustainable agriculture, food security and poverty reduction. The paper calls to undertake a project that aims at *investigating and taking interventions to enhance the use of ICTs in sharing agricultural information in rural communities in Tanzania to complement extension services, which have so far been inadequate to meet the diversified information needs of farmers. In conclusion, the paper calls for a closer collaboration among researchers, extension personnel and information personnel through capacity building to increase the level of awareness of rural communities to seek, access and share agricultural information through use of ICTs.*

Key Words: Information and communication technologies, agricultural

Introduction

The paper reviews the use of information and communication technologies(ICTs) in extension services delivery in Tanzania. Extension officers, particularly those working for the private sector, combine marketing inputs and outputs alongside information exchange and have become information brokers in connecting farmers with the outside world and vice versa (Nielinger 2003). The same is happening in the
Tanzanian public sector, though at a slower pace.

This paper also reviews successes and efforts made in bridging the digital divide in terms of access to sources of information. It also looks at the opportunities, which are already in place for exploitation, strengthening and usage of ICTs for accessing, dissemination, and sharing of information among farmers in rural communities.

"ICTs include telecommunication technologies, such as telephones, cable television, satellite, radio as well as digital technologies such as computer

information networks and software. ICT communication device." (http:www.law.harvard.edu/readinessguide/glossar/html).

In a much more simpler definition, ICT is any technology concerned with the capture, storage, transmittal or presentation of information using computer hardware and software, internet, e-mail, CD-ROMs, radio, mobile phones, television, telephones and all other electronic cadges that can be an information carrier. The ICTs facilitate interaction between key stakeholders in every sector through; websites; databases; mobile phones; satellites; e-discussions to mention but a few. Information Communication Technologies (ICTs) are widely accepted and used in daily information seeking and communicating activities in developed countries and are being encouraged for adoption in African, Caribbean and Pacific (ACP) countries to improve the acquisition, storage, retrieval, and dissemination of agricultural information in rural areas whose economy and livelihoods are very much dependent on farming activities.

The potentials of usage of ICTs in extension services in Tanzania are for enhancement of the speed and delivery of information to stakeholders specially farmers. The ICTs furthermore, will improve two-way communication between the government, farmers, researchers and other stakeholders. However, standards for sharing and exchanging information and data need to be critically considered before the Ministries of Agriculture and Co-operatives and Livestock Development provide extension personnel with computers, faxes, photocopiers, and email facilities where there are points of Internet connectivity (URT, 2002).

Prompt access to relevant and current agricultural information by farmers has been an issue for discussion debatable among information personnel for a long time because, agriculture remains the largest sector in the Tanzanian economy and how it performs has a significant is an umbrella term that includes any effect on crop output and correspondingly, on income and poverty levels. Reduction of poverty in rural Tanzania has been debated in the Agricultural Sector Development Strategy, Agriculture Sector Development Programme and in the Agricultural Services Support Programme (ASSP) and the District Agricultural Development Plans. All these strategies are supportive of agriculture's critical role in economic growth and poverty reduction, which nevertheless remains poor. In a bid to reach their clients through better means of communication and dissemination, many Tanzanian agricultural institutions and offices at national and local levels have connected to email facilities and some have access to the whole range of Internet services. Today, the Ministry of Agriculture is working towards connecting Internet facilities in all major institutes, district offices and ward centres and where not feasible, to provide them with easy means of communication such as mobile and wireless phones.

Agriculture and the Tanzanian economy

Agriculture remains the dominant sector in Tanzania's economy and its performance has a significant effect on output and corresponding income and poverty levels. About 70% of the population in Tanzania lives in rural areas and about 80% of this rural population lives on less than US$0.65 a day. To achieve the broad set of Millennium Development Goals (MDGs) by 2015, Tanzania will require accelerated growth, currently pegged at about 6–7% growth in annual GDP, and greater equality in growth and service delivery (URT, 2005).

The agricultural sector in Tanzania supports over 35 million people and contributes 60% of country's GDP, 61% to export earnings and provides 84% of rural employment. (URT,2000). Due to its central nature to the economy, agricultural development will continue to be a key factor in Tanzania's national

growth because of two basic reasons. It alleviates income poverty; and is a source of food and food security for the nation.

However, the full contribution of agriculture to the economic growth and poverty reduction has not been realized due to many constraints such as over-dependency on rain-fed agriculture; inefficiency of agro-processing industry; post-harvest systems; poor physical infrastructure and low participation of farmers in decision making. The impacts of all these constraints are often aggravated by lack of access to reliable, timely and relevant agricultural information (Chailla, 2001; URT, 2005a).

Furthermore, The Tanzania Development Vision 2025 has set a target of achieving a level of general standards of living typical of medium-income countries by the year 2025. For the agricultural sector to fully contribute towards the envisaged sustainable development target, it should grow annually by 7%, implying more than doubling the annual growth rate of 3.3% (URT, 2000b).

According to Ngirwa (1997:29) the national sample census of agriculture of 1994/5 estimated that there were 3.87 million small – scale agricultural holdings in the rural areas of Tanzania mainland where the size of area cultivated average 0.86 hectares. An average of about 90% of all farmers cultivate less than 2.0 hectares. Thus, rural agricultural productivity has to be increased to meet the national goal by 2025.

The challenges facing agriculture in Tanzania are numerous and have been stated in the livestock policy of the United Republic of Tanzania (1999) among which are:

1. Improving the farming methods in rural areas through use of new technologies.
2. Increasing foreign exchange earnings by encouraging the production of cash crops.
3. Developing and introducing new methods of technology transfer to farmers.
4. Providing support services to the agricultural sector which cannot be provided efficiently by the private sector; and
5. Promoting access of farming communities to agricultural related information, land, credit facilities and education.

Development of agricultural sector in Tanzania is therefore, the top priority of the government, but to meet the above challenges and many other institutional limitations to agricultural growth, Tanzania requires efforts from all stakeholders in terms of technical skills in agricultural knowledge management, sharing and utilization. The adoption of ICTs in agricultural information delivery to end users is much more desirable to-day than ever due to advancement in development of ICTs as information carriers in every sector of economy. To this end, the National ICT Policy of realizes the critical role of ICT and firmly states: -

> "*This policy framework makes it possible for enabling sectors such as communication, information or broadcasting to work together whereby enabled sectors such as education, health, governance or agriculture can become further empowered through the appropriate development and application of ICT* (URT: 2003)".

The ICT Policy further encourages multi-sectoral collaboration for achievement of national development goals and for transformation of Tanzania into a knowledge-based society through the application of ICT. One of the ICT Policy objectives is: -

"To create a favorable environment for cooperation and partnership in ICTs among public, private sectors, civil society and between all stakeholders at local, regional and international levels (URT: 2003)".

Given support of the Ministry of Agriculture and Food Security, Ministry of Higher Education, Science and Technology and other Institutions, the 21st Century should see a closer collaboration of agricultural information specialists with researchers, extension officers and farmers to realize the national goal of agricultural development by 2025 through dissemination of generated research findings to farmers.

Agricultural information generation in Tanzania

The scientific knowledge in the agricultural sector in Tanzania mainly is generated through National Agricultural Research Institutes (NARIs) and univerities, which comprise of the following institutions: Department of Research and Development (DRD) of the Ministry of Agriculture and Food Security, Tropical Pesticides Research Institute (TPRI), Sokoine University of Agriculture, and private research institutes such as Tea Research Institute of Tanzania (TRIT), Tobacco Research Institute of Tanzania (TORITA) and Tanzania Coffee Research Institute (TACRI). The Institutions' main activity is research in their own specialized fields aimed at coming up with new innovations/technologies for agricultural improvements.

For a long time information dissemination from NARIs has always been done through the national agricultural extension system. Unfortunately, the national agricultural extension system has not succeeded fully in doing so and has often been criticized as being weak due to a number of constraints in its operation. It has been alleged that weak linkages between researchers, extension workers and farmers have resulted in research findings, new innovations and other relevant scientific information not being applied by farmers for higher produce and food sustainability. Such information has been left wasting in shelves without processing, storage and dissemination to stakeholders. The ICTs are to-day acknowledged as important tools that can facilitate communication and access to information for agricultural and rural development in Tanzania. Through the use of ICTs, libraries can convert hardcopy research findings emanating from NARIs into digital formats first for preservation purposes and second for improvement in quality, relevance, timeliness, availability and wider dissemination of such information. The digitized publications will lead to optimal use of the generated reports thereby making agricultural information accessible to a wider agricultural and research communities in Tanzania and the world at large, by means of the library catalogue, and subject portals which can be accessible World wide.

Convergence of ICTs with agricultural development and extension services

The development in ICTs during the 21st Century has brought changes in knowledge acquisition, processing, storage and usage. The ICTs have facilitated knowledge sharing and global information flows that have resulted into the so-called 'global society'. Socio-economic and technological changes are transforming the way companies, institutions and even individuals work. At the same time, globalization has emerged and brought in new opportunities and increased competition and; "a growing emphasis on creating customers value and improving customer services" (Nyabundi, 2006). The biggest and significant impacts of electronic access in the information flow model include: timely sharing of data and intermediate results for collaboration and discussion by eliciting instant feedback from colleagues; global participation and narrowing the digital divide; instant interaction with publishers and editors of information; and wider scope for publication and dissemination of findings. In totality, it can be said that the advent of the Internet, reinforced with a variety of web-based information services, has meant that the boundaries between the actors in agricultural

information flow model are shrinking. It is this narrowing gap that will eventually bring change and improvement in agricultural productivity. This will help in alleviating poverty to the rural community. Tanzania has no option except to join the global society to benefit from the digital information and make that information accessible to farming rural communities.

While there is significant ICTs development in Tanzania, not much has been done to integrate them into policies and strategies for increasing agricultural performance. The ICT environment in Tanzania is not yet readily available and accessible to rural population but mostly concentrated in urban cities like Dar es Salaam, Arusha and Mwanza. The current problem should be how best can ICTs be introduced in rural communities in Tanzania for facilitation of accessing, using and sharing agricultural information. It has been argued that the isolation especially from the information available through the media and ICTs, is a major factor in the marginalization and degradation of rural agricultural communities. There is generally lack of information on how to increase agricultural productivity, improve the management of natural resources and develop rural enterprises and services that would enrich rural life and food security. The ICTs like radios, televisions, community radio stations, internet, mobile phones and faxes; if made affordable, would be an information bridge to numerous agricultural needs, problems and constraints, and a bridge to poverty reduction through increased food productivity and sustainable livelihood in rural Tanzania.

Need for application of ICTs in Extension services in Tanzania

The conventional delivery of agricultural information to rural farmers by extension services has been widely criticized. Weak linkages between researchers, extension officers and farmers have resulted in new innovations being abandoned. While farmers are most seriously constrained, intermediaries such as extension officers and community based organizations lack the necessary capacity to disseminate agricultural information. Consequently, research institutions are increasingly being criticized for inadequate dissemination of their research findings, as pointed out by former President Mkapa (2005:6):

> *"Whenever I visit agricultural fairs, I am shown an impressive array of research findings and appropriate technology to rapidly improve yields and increase acreage. Yet, this has not translated into the kind and magnitudes of growth in this sector that we want. Research findings in university libraries do not fill the basket in the farm (Mkapa, 2005:6)."*

The use of ICTs can improve the quality and relevance of information; increasing its timeliness and availability; allow wider dissemination; and ensuring feedback from marginalized communities. The major problems affecting extension services in LDCs are the inadequate number of extension officers, unrealistic ration of agricultural extension officers to farmers and untimely supply of information. In the case of Tanzania, the national extension system has not identified other information providers to effectively involve them in extension work and co-ordinate their activities and services to reach the rural farming communities. Above all, the extension service in Tanzania has not adopted ICTs as effective information carriers among rural farming communities for increased agricultural productivity, enhanced food security, poverty reduction and sustainable development. The poverty-reducing potential of ICTs is emphasized both in the global and national development strategies and policies. These include the Millennium Development Goals (MDGs) (UN, 2001); Agricultural Sector Development Strategy (ASDS) (URT, 2001); National ICT Policy (URT, 2003); and the National Strategy

for Growth and Reduction of Poverty (NSGRP) (URT, 2005b).

The application of ICTs in extension services will empower all farmers' increase their capacity in agricultural information access, use and sharing particularly women who are the majority of smallholders. The ICTs will further create informed rural agricultural communities in Tanzania who will be more enterprising by enhancing their knowledge in marketing, agro-processing in-puts and out-puts, metrological conditions and warnings and create a farming society that can participate in various issues: social, economic, and political consciousness.

Current ICT initiatives in Tanzania

Full integration of ICTs into strategies for improving agricultural productivity requires a process that involves many stakeholders particularly researchers, extension officers and agricultural information specialists. However, one of the major concerns that hinder the integration of ICTs is the lack of appropriate model to lead the way (Pelliccione, 2001). There should be a model in place to guide the development of relevant content; improve access to ICTs; and empower rural communities in accordance to the overall mission of Tanzania National ICT policy, which is: "*To enhance nation-wide-economic growth and social progress by encouraging beneficial ICT activities in all sectors through providing a conducive framework for investment in capacity building and in promoting multi-layered-co-operation and knowledge sharing locally as well as globally* (URT: 2003)".

There are ICTs already in place in Tanzania, which can be exploited for the benefit of farmers in accessing the most current agricultural information. The ICTs include;

(a) Tanzania broadcasting media

According to the most recent data available at the Tanzania Communication Regulatory Authority (TCRA), Tanzania has 34 operational radio stations: 31 are FM and the other 3 AM (TCRA: 2005). The concept of regional integration has been well spearheaded in the local media with a number of media organizations establishing regional Television and radio networks such as East Africa Radio and Television owned by IPP Media and which cover all capitals and many towns in East Africa. This is a medium through which information on avian flu, armyworm infestation or rabies outbreak can quickly be communicated beyond regional and national boundaries. Popular twice-weekly radio programmes such as Ukulima wa Kisasa (modern farming) have imparted awareness and knowledge to farmers covering not only agricultural, but also, all agriculture- and livelihood-related information.

The introduction of satellite broadcasting technology and the review of the Tanzania Broadcasting Act have enabled many Television and radio stations to cover almost all of Tanzania and beyond. In most developing countries, including Tanzania, radio is still the most appropriate communication technology available to most people, particularly the disenfranchised rural communities, women and the youth (TCRA, 2005).

In Tanzania major televisions are Tanzania Broadcasting Cooperation (TBC) and Independent Television (ITV). Recently, the state-run Television Tanzania has joined Independent Television, DSM TV, CTN, CEN, Star TV, and a number of religious networks such as Agape Television Network. These television stations run programmes on agricultural issues. The SUA-TV specifically broadcast agricultural programmes as its core busness.

In rural communities, Community television stations can be easily set up, even where there is no electricity, by using solar or batteries. But to qualify as community television, programmes must be produced in the community by the community. They are all expected to be community based, managed and run by community-based and other non-government organizations. They are

present in many communities such as Orkonerei (Maasai), Sengerema, Mwanza City; in many district and municipal councils they have proved effective in transmitting locally relevant information that affect the communities they serve.

(b) Mobile cinema

Mobile cinemas in Tanzania are run by private operators, church organizations and some government ministries, for example, the Ministry of Agriculture. This medium consists of vans carrying a video projector and screen, with operator vans travelling on fixed monthly itineraries from location to location, giving outdoor shows in the evenings at no charge. They provide a unique opportunity to reach a rural and down-market audience through this powerful medium. They target men and women in equal proportion. They provide a unique opportunity to spread messages on current agricultural developments and marketing opportunities for agricultural products.

Targeting densely populated areas, the operators inform their audiences of new crop and livestock developments that cover production, marketing, processing and other aspects. Besides screening movies and commercials, they distribute relevant leaflets and samples.

(c) Mobile advertising cinema

The IPL Mobile Advertising Cinema, a brainchild of Internal Printers Limited located in Moshi (northern Tanzania), is the latest mobile cinema. Covering about half of the country, it presents a unique opportunity for both urban and rural markets by enabling advertisers to channel audiovisual messages, programmes and consumer product knowledge to Tanzanians.

(d) Mobile phones

Access through mobile service has made communication by phone more available and affordable than fixed services due to the attractiveness of prepaid pricing, which is more convenient and appropriate to low-income users, who are the majority in Tanzania. Mobiles almost always have wider coverage than fixed networks; their coverage is growing faster, and increasingly they are reaching rural areas. There are an estimated four million mobile phone owners in the country. There are good opportunities to leverage the infrastructure further. With this vast ushering-in of mobiles, service providers have agreed to share existing infrastructure; they mainly rely on the extensive TTCL network facilities (COSTECH 2004).

(e) Outdoor marketing and promotion

Outdoor promotional marketing, also known as direct marketing, is used to focus on a person-to-person basis. Its use in Tanzania has been limited in the past but is now changing with the emergence of promotional companies. The benefits of direct marketing include not only introducing brands to consumers but also building and maintaining long-term brand growth. The method is appropriate because it generates feedback by dealing directly with the consumer.

Road shows can reach mass audiences of all incomes and age groups. *Jamii Yako* ('your community') is a radio programme designed with the specific intent of reaching women to inform them about new products and technologies and get their feedback.

(f) Videos for farmer empowerment

Community video programmes and theatre complement each other. Theatre is used mainly to identify a problem and videos to show how it can be solved. Video is chosen to illustrate problem solving because it shows realities and viewers can replicate the idea. NGOs collaborate and produce videos in the rural communities where they are operating and show these to neighbouring villages. These videos have also been useful in the area of governance, where promises made by village leaders at meetings are replayed, and they can assess if the promises have been fulfilled (COSTECH, 2004).

(g) ICT for rural schools—Schoolnets

The Schoolnet initiative in Tanzania aims at providing basic ICT training to both

rural and urban schools. It serves as a benchmark for a promising ICT-literate future generation, part of which will be absorbed in agriculture. It has been relatively easy to mobilize donations and support for ICT in schools, as several developed-country organizations have been willing to supply new or refurbished computers. To sustain and keep such nets running, there are several options for improving sustainability, such as charging students a small fee, opening the computer laboratory in the evenings to the general public, and offering computer training.

(h) Village IT projects (Telecentres)

A village ICT approach is being conducted by the Tanzanian Commission for Science and Technology (COSTECH) and the Commonwealth Organization for Information Technology (COMNET-IT). Two pilot villages have been supplied with the necessary equipment and training with the short-term goal of improving village governance and the long-term objective of determining whether the model can be applied in all Tanzania's 14,000 villages (IICD/DfID, 2003).

In the pilot villages, people are trained on how to use new ICTs to enable them to capture, process, store and disseminate information, including agricultural information; so far these pilot projects have proved viable, and preliminary results show that the experience gained can be applied in other villages. The Telecentres are found in Sengerema, Ngara, Kilosa, Hanang, Kasulu, Dakawa and Lugoba (Massawe, 2004). However, studies have shown that many of these telecentres have been multipurpose, with little attention to providing agricultural information.

Integration of ICTs in agricultural dissemination: challenges and future opportunities.

(i) The challenges

The role of both extension officers and agricultural information personnel is to improve the performance of agriculture and livelihood of rural farmers through sharing of agricultural information using ICTs. The challenges are:-

(1) To change the attitudes of policy makers and planners who consider ICTs a luxury that some people can do without. As Mammo (2006:84) commented:

> *"There is an attitude that it would be unwise and considered as irresponsible to spend money for ICTs in the country where there are many problems, like food insecurity, drought, lack of pure water and sanitation, environmental problems etc.(Mammo,2006:84)".*

(2) To identify agricultural information needs of rural farming communities, which should precede the process of providing information to users. However, the users' information needs may not be obvious, necessitating both information seekers and specialists to collaborate in determining such needs. Information needs vary among socio-economic groups and they depend on many factors such as time, place, literacy, technology, economic situation, social system, accessibility to information sources, user skills and cost (Haywood, 1993).

(3) To explore, identify and assess the appropriate ICTs for management, sharing and effective utilization of the repackaged information;

(4) To determine how women can be effectively involved in the use of ICTs for accessing, use and sharing information. This is pertinent because of involvement of majority of women in agriculture in rural areas;

(5) To build the capacity of rural agricultural communities through training in application and usage of ICTs for accessing, using and sharing agricultural information;

(6) To develop relevant local content through identification, collection and repackaging of agricultural

information into appropriate formats for sharing among communities;

(7) To develop a model for generating, accessing, using and sharing of agricultural information using ICTs.

The biggest challenge of all is to seek adequate funds for collaborative agricultural information repackaging, purchase of ICTs equipment/software/hardware and capacity building among rural agricultural communities through training in usage of ICTs. As stated by USAID (2003):

"Though, the performance of agriculture is dependent to a very large extent, on the availability of timely, reliable and relevant information, the agricultural information services in most developing countries face constraints such as under-funding, inadequate number of extension workers, and insufficient and ineffective communication facilities, resulting into poor access, sharing and effective utilization of agricultural information.

(ii) Future Opportunities

The core competencies of agricultural and research institutions are in research and development. Agricultural research and extension have an instrumental role in developing new technologies and bringing them out to farmers. Nevertheless, it is undisputable fact that the services of agricultural information specialists will add value to the delivered technologies to farmers because the information personnel are much more skilled in using and imparting information to the later using ICTs.

To-day it is much easier to reach rural farming communities due to improved communication infrastructures in Tanzania. It is possible and easy to reach many rural farming communities via numerous radio and television stations, mobile phones, landline telephones and telecentres. Conditions have become conducive for introducing ICTs to farmers in rural areas in Tanzania. The country needs commitment, resources and diligence for implementing ICTs because the agricultural institutions have the technical skills in all aspects of ICTs, especially on information repackaging for rural farming communities.

Conclusion

The mobile telephone industry, community radio and television stations, the Internet and VSAT technologies offer major opportunities for rural areas to communicate and access desired information. The agricultural growth can therefore be increased by supportive ICT policies in extension services.

Effective dissemination of agricultural innovations/technologies to farmers should also take into account convenient and mutual collaboration between agricultural information librarians, reserchers and extension officers. The new collaborative initiative will lead to creation of a network of collection of resources and research publications so as to synthensize the technical reports/findings into multimedia formats for easy understanding and adoption by farmers. Many public agricultural universities are computerized and, therefore, information can easily be accessed via electronic networks such as local intranets, extranets and the internet.

Tanzania's effort to bring equal opportunities to marginalized and disadvantaged communities and to integrate ICTs in rural activities including agricultural development is commended. However, in rural areas; basic requirements often taken for granted in other environments aggravate the difficulties of introducing ICTs. Poor infrastructures is a challenge, unreliable power supply hampers smooth business procedures, lack of sufficient bandwidth forces operators to opt for costly connectivity solutions, and fear of ICT illiteracy confronts communities trying to use a completely new technology. Despite all obstacles, Tanzania is committed to empowering agricultural rural

communities in agricultural production and hence integration of ICTs in extension services will contribute positively ' to agricultural productivity, food security and sustainability.

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