



Research Article

The role of ICT in facilitating farmers' accessibility to extension services and marketing of agricultural produce: The case of Maize in Mbozi District, Tanzania

Francis Lwesya^{1*} and Vicent Kibambila²

^{1,2} Department of Business Administration, School of Business Studies and Economics, University of Dodoma, Tanzania.

* Corresponding author's email: flwesya@yahoo.com

The rapid pace of ICT development and its consequent use across economic, social and political spectrums has raised concerns among policy makers and practitioners over its potential to spur productivity in the agriculture sector as well. This paper examines the role that ICT can play in facilitating smallholder farmers' accessibility to extension services and marketing of agricultural produce in Mbozi District. The study used structured questionnaires to collect information. A sample of 250 farmers was selected randomly and interviewed. The findings reveal that farmers are using ICT facilities to get access to extension services and in marketing maize in Mbozi District. The most preferred and major ICT tools used to inquire and receive extension services and market information are the mobile phones (53.88%), radio (23.67%), television (14.69%) and the internet (7.75%). However, effective use of ICT in the study area is constrained by poor infrastructure in rural areas, and lack of technical know-how exhibited in the lack of basic ICT skills. Other constraints are the erratic power supply, poor signals, lack of network, and lack of internet connectivity and a high cost of some ICT tools. This suggests that if requisite ICT infrastructures are put in place in Mbozi District, ICT can bring about significant benefits to smallholder farmers leading to increased agricultural productivity and hence poverty reduction. Thus, the study recommends promoting investment in renewable energy sources in order to address the problem of power in rural areas. Creating an enabling environment for ICT services accessibility, including the construction of transport and communication network infrastructures. The establishment of market information centers and telecenters in Mbozi District particularly in rural areas and advocating for the use of collective marketing through strengthened farmers groups to ease their access to ICT facilities.

JEL Classification Codes: o32, o33

Keywords: ICT, agricultural produce, maize, extension services, farmers, market information

INTRODUCTION

For the past three decades, there has been unprecedented growth in the use of Information and Communication Technology (ICT) in various social and economic fields across the world. Matambalya and Wolf

(2001) observed that through the rapid spread of ICT and ever decreasing prices for communication, markets in different parts of the world become more integrated. Moreover, the report by Economic, Social, and Research

Foundation (ESRF) in Tanzania (2009), claims that recent developments in ICT have greatly increased the opportunities for people to “connect” virtually without the absolute need for physical contact for social or trading purposes.

According to Lewis (2009), ICT is an umbrella term that includes any communication device or application, encompassing: radio, television, mobile phones, computers and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. This definition was qualified by Angelo and Wema (2010), who stated that ICT are the techniques, methods and tools used to access information and to communicate with others. It consists of all technical means used to handle information and aid communication, including computer and network hardware as well as necessary software. On the other hand, Birner et al (2009), Christoplos, (2010), Davis and Heemskerk (2012), define agricultural extension and advisory services as systems that facilitate the access of farmers, their organizations, and other value chain and market actors to knowledge, information, and technologies; facilitate their interaction with partners in research, education, agribusiness, and other relevant institutions; and assist them to develop their own technical, organizational, and management skills and practices as well as to improve the management of their agricultural activities. While, USAID (2013) defines agricultural marketing as the process of identifying, communicating with, and maintaining relationships with buyers of a producer's products to directly affect volume, value and timing of sales. Marketing activities enable a producer to find new buyers, build and maintain relationships with current buyers, and access market research to manage supply, anticipate demands and establish prices. Farmers' accessibility to extension services and access to better markets of agricultural produce are important aspects for raising agricultural productivity, ICT seems to offer strategic and cheap solutions in accessing both extension services and markets for agricultural produce as USAID (2013), remarks that ICT solutions can increase efficiencies and improve competitive dynamics in agriculture, which can raise agricultural productivity and incomes and increase food security.

Following the development of ICT across the world, its usage has gained prominence in many developing countries as well. Njelekela and Sanga (2015), state that many activities in the modern world are becoming more dependent on the application of ICTs in one use or another. The benefit of ICTs has increased in such a way that it reaches even those who do not themselves have first-hand access to them. For instance in Tanzania ICT

is being used in sectors like agriculture, education, transport and communication, manufacturing and construction both in public and private domains. This is because of its importance in fostering social and economic development as ESRF (2009), states that the use of ICTs is reducing transaction cost, time, and space barriers, allowing mass production of customized goods and services.

Looking at the agriculture sector, Tanzania has registered some progress in the use of ICT despite its usage still being at an infancy stage. It is believed that an effective use of ICT in agriculture can spearhead significant development in the sector. This is because 70% of the population lives in rural areas and depends on agriculture for their livelihood. ICTs are crucial in facilitating communication and access to information for agricultural and rural development. Since agriculture is the national priority sector, it is one of the potentially beneficial areas for the application of ICTs for economic transformation. Thus, if there is an effective application of ICT in the agriculture sector, farmers could be informed of inputs prices, market information, in that way they will be able to increase the yield of products. Bolarinwa and Oyeyinka (2011), states that there will be a timely exchange of agricultural information between the extension agents and farmers if ICT components are integrated with the delivery of agricultural information to farmers. Different tools of ICT such as email, SMS, website and TV can aid interaction and communication between researchers, extension agents, and farmers, which in turn will help to develop market linkages and producers can become more informed about the needs of consumers. Sutrisno and Lee (2010) state that these technologies are increasingly being seen as cost effective and as practical tools to facilitate information delivery and knowledge sharing among farmers, extension agents, and other stakeholders.

Since to a large extent in rural areas agriculture is carried out by smallholder farmers, they are exposed to many challenges including shortage of reliable markets, lack of reliable sources of market information, falling labor and land productivity due to an application of poor technology and dependence on unreliable and irregular weather conditions. Further, Tadesse and Shively (2013) notes that the village markets are characterized by asymmetric information in which traders are more informed than farmers about the prices in the central or regional markets. In such circumstances, ICT can be critical in assisting smallholder farmers to raise agricultural productivity by addressing market information asymmetry problem and facilitating their accessibility to extension services. According to Winrock (2003), Knowledge, communication, and information exchange have influenced farmers decision on what to plant, when to

plant, how to cultivate and harvest, where to store and where to sell and at what price. That is why the World Bank (2011) stated that the proliferation of adaptable and more affordable technologies and devices has also increased ICT's relevance to smallholder agriculture and improvement of agricultural productivity will be realized when farmers are linked to market information.

Maize is one of the major staple foods for the majority of Tanzanians; it provides 60% of dietary calories to more than 37 million Tanzanians. The Southern Highland regions of Iringa, Songwe, Ruvuma and Rukwa are the most important producers of maize, they account for 35.9% of the national output (Sanga, 2013). For the case of Songwe region, Mbozi District is the leading maize producer. The district lies between latitude 8° and 9' South of Equator and longitudes 32° 7' and 33° 2' East of Greenwich Meridian. The district share borders with Mbeya district to its eastern part, Ileje district to the South, Zambia and Rukwa region to the west and Chunya district to the North. Mbozi district is divided into three distinct agro-ecological zones. These are the South Western Plateau zone (Ndalambo plateau), the Coffee zone (Mbozi plateau) and the Lowlands of Lake Zone (Msangano plains). The District lies between 900 and 2750 meters above the sea level. On average it receives rainfall between 1350 mm and 1550 mm per annum; while temperature ranges between 200°C to 280° C. There is a large arable land which is suitable for agriculture, out of 766,640 Ha of arable land only 216,198 Ha is cultivated, which is equivalent to 28% of the total arable land in Mbozi District. The existence of a good number of rivers and fertile valley suitable for irrigation is another sign for the potential of the area in agricultural production. However, Mbozi maize farmers face many challenges such as high transport and transactional costs, small and inefficient markets, low agricultural productivity and slow adoption of new technologies. Nevertheless, according to Tofik (2014), awareness of up-to-date market information on prices for commodities, inputs and consumer trends can improve farmers' livelihoods substantially and have a dramatic impact on their negotiating position.

This paper explores the role ICT has in facilitating farmers' accessibility to extension services and marketing of maize in Mbozi district. The specific objectives of this paper were to determine;

- i. What are the major ICT tools through which farmers get access to agricultural and market information?
- ii. What are the attitudes of smallholder farmers towards ICT?
- iii. What are the major factors that hinder the effective use of ICT?

METHODOLOGY

The study was conducted in Mbozi District, a district which is one of the largest sources of Maize in Songwe region. Prior to actual data collection, a pilot test was conducted in order to establish whether the questionnaires are capturing the intended objectives or not, by looking if the wording is clear, questions are interpreted in the same way by the respondents, and if there is any research bias and what response is provided. Researchers also ensured that the language was clear to assist respondents in answering questions and instructions given clearly. Thus, a pilot study was conducted to 40 respondents in Mbozi District. The objective of the pilot study was to pre-test the research questionnaires and helped researchers to refine the items which were not clear to the respondents. During the actual data collection, a total of 25 villages of Mbozi District were visited. Interviews, desk work review, and structured questionnaires were used to collect information and 250 questionnaires were distributed to randomly selected farmers. A 5-point Likert scale ranging from 1 as strongly disagrees to 5 as strongly agree was used for the measurement. The reliability analysis was used to detect the internal consistency of the farmers' responses using Cronbach's alpha. Cronbach's alpha is a coefficient (a number between 0 and 1) that is used to rate the internal consistency or the correlation of items in a test. The coefficients for the variables chosen for the study should have to be more than 0.70, to consider it as an acceptable value (Nunnally, 1978). The paper uses descriptive statistics to analyze the role of ICT in facilitating marketing of Maize farmers' access to extension services and marketing of Maize in Mbozi District. In order to capture the attitudes of farmers on the role of ICT in Mbozi district, we used the model applied by Aydin and Tasci's (2005) in which the alternatives were designed in a way that provides easy coding and assessment of the users. The alternatives were coded as 1, 2, 3, 4 and 5 as in a five point likert scale. Since this paper uses a five point likert scale measurement, this model fits properly. According to Aydin and Tasci's (2005), the 3.41 mean score can be identified as the expected level of readiness, while other responses enable organizations to show higher or lower levels of readiness. The mean average of 3.4 was determined after identifying the critical level: 4 intervals/5 categories = 0.8 as shown below.

STUDY FINDINGS AND DISCUSSIONS

Characteristics of the sampled respondents

Of the total 250 questionnaires distributed, 245 were collected. 156 (63.67%) were male and 89 (36.33%) were female (table 1). Age wise, 31 to 60 years (40%) a

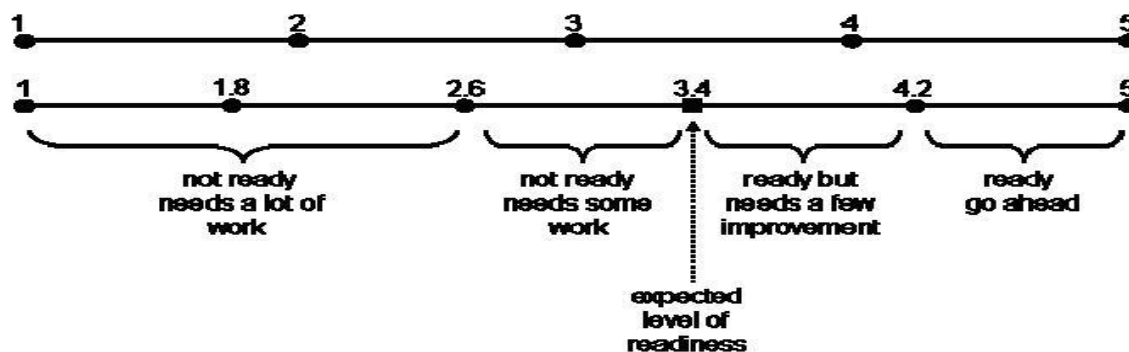


Table 1: Selected Socio-economic Characteristics of Respondents

<i>Item</i>	<i>Frequency</i>	<i>Percentage</i>
Gender		
Male	156	63.67
Female	89	36.33
Total	245	100
Age		
Less than 30 years	44	17.96
31 to 60	98	40
61 to 75	62	25.31
Above 75	41	16.73
Total	245	100
Education		
Informal education	33	13.47
Primary education	98	40
Secondary education	71	28.98
College education	20	8.16
University education	23	9.39
Total	245	100
House hold size		
1 to 15	75	30.61
16 to 25	89	36.33
27 to 30	58	23.67
31 to 45	14	5.71
Above 46	9	3.67
Total	245	100
Monthly Income (Tanzania Shillings)		
less than 100000	18	7.35
101000 to 200000	64	26.12
201000 to 400000	58	23.67
401000 to 600000	50	20.41
601000 to 1000000	25	10.20
Above 1000000	30	12.24

Table 1: Cont.: Selected Socio-economic Characteristics of Respondents

Total	245	100
Years of farming		
1 to 15	79	32.24
16 to 30	104	42.45
31 to 45	42	17.14
above 46	20	8.16
Total	245	100
Area of farming		
1 to 2 Acres	84	34.28
3 to 6 Acres	98	40
7 to 10 Acres	49	20
11 to 15 Acres	14	5.72
Total	245	100

Source: Field Survey (2016)

Table 2: Major ICT tools farmers use to get access to agricultural and market information in Mbozi District

ICT tools used		Frequency	Percentage
Mobile phone	Calling	76	31.020
	SMS	56	22.857
Radio		58	23.673
Television		36	14.69
Internet	Website	10	4.082
	Email	9	3.673
Total		245	100.00

Source: Field Survey (2016)

group with the most respondents, followed by those between 61 to 75 years (25.31%). Respondents less than 30 years (17.96%) and the relatively lower number of respondents were above 75 years (16.73%). This suggests that above 75 is an ageing population, according to Chete and Fasoyiro (2014), an ageing population will likely affect productivity in a negative way and reduce volume of sales or market participation. In terms of the level of education most of the respondents had primary education (40%), followed by those who had secondary education (28.98%). Respondents who had not received any formal education were (13.47%). Those who had University and College education were 9.39% and 8.16% respectively. This suggests that most of the respondents had informal, primary and secondary education. Lack of education or low level of education may mean the majority of farmers could not be able to apply ICT tools effectively in the agriculture sector to their advantage as Matungal *et.al* (2001) note that a higher level of education is desirable to minimize costs of search and screening information and transaction cost in both factor and product market.

The respondents (36.33%) had the highest household size of between 16 and 25, followed by 1 to 15 (30.61%). The households size 27 to 30 (23.67%) while 31 to 45 and above 46 had 5.71 and 3.67 respectively. According to Lapar *et.al*, (2003), the propensity to participate in the market economy declines with the number of household members. Most of the farmers had working experience of between 16 to 30 years (42.45), followed by 1 to 15 years (32.24%), then 31 to 45 (17.14%) and lastly above 46 (8.16%). This suggests that most farmers had several years of farming experience, according to Matungal *et.al* (2001), the expectation is for farmers with higher farming experience to have higher commercialization index and thus better participation in the markets.

Major ICT tools farmers use to get access to agricultural and market information in Mbozi District

The major ICT tools used by farmers in Mbozi district are mobile phone, Radio, television and the Internet. A total of 132 farmers use mobile phones, whereas 31.020% use for calling while 22.86% use text SMS to inquire and

Table 3: Reliability Analysis

Item	Cronbach's Alpha
Attitudes of farmers on the use of ICT	
ICT tools are easily accessible by farmers	0.785
ICT tools are easier for farmers to learn how to use	0.788
ICT tools are easy for farmers to use and operate	0.797
ICT tools are valuable information source for farmers	0.783
ICT tools enhance agricultural productivity	0.785
ICT improves the quality of service offered to farmers	0.782
ICT enables farmers to get correct and updated agricultural and market information	0.775
ICT improves farmers communication with agricultural extension workers and input suppliers	0.761
ICT enables farmers to reach new markets	0.766
ICT increases farmers profitability	0.782
ICT reduces travel time and expense	0.771
ICT leads to improved negotiation power	0.764
ICT leads to broader network	0.776
ICT helps secure better markets and prices	0.773
Factors that hinder the usage of ICT tools	
ICT tools are too expensive	0.762
Language barrier	0.768
Erratic power supply	0.775
Low education/literacy	0.774
lack of internet connectivity	0.765
Poor signals or reception (lack of network)	0.766
lack of technical knowhow i.e. lack of basic ICT skills	0.772
Poor infrastructures in rural areas hinder effective use of ICT	0.779
Lack of ICT related facilities e.g tele-centers	0.789

receive agricultural and market information. With the increase of mobile service subscribers in Tanzania, their services have penetrated even in rural areas. There are approximately 3.18 million core mobile subscribers in the market, compared to 2,963,737 in 2005. Internet service subscribers have increased to about 11,000,000 by December 2014 from 3,563,732 in 2008. Kapange (2012) observes that with the mushrooming of mobile phones in Tanzania are increasingly becoming affordable, and they help overcome rural isolation and make communication easier. The wireless technologies that have entered remote rural areas have reduced reliance on costly fixed telephone infrastructures. This has propelled the use of mobile phones in the agriculture sector in Mbozi District as well. Those who use radios were 23.67%. This is because radios have been one of the traditional means of receiving information for a long time particularly in rural areas due to its affordability and wide reception in the absence of network or electricity. These factors make it one of the most preferred ICT tool. The farmers who use television were 14.69% while 19 farmers use internet, among those 4.08% use website services while 3.67% use email. Internet is the ICT tool with relatively lower number of users in Mbozi District, mostly the knowledgeable and educated farmers were found to be using internet.

Reliability Analysis

The Reliability analysis shows that all the factors have shown alpha value greater than 0.7 (Table 3), suggesting the presence of internal consistency in the instrument of measurement. The overall Cronbach's Alpha is 0.783. The factors and dimensions included for analysis carry a good degree of reliability to support the objectives of the study. Hence it can be concluded that the data collected is highly reliable.

Attitudes of farmers on the use of ICT in Mbozi District

Table 4 presents the farmers attitudes on the role of ICT in marketing of maize and facilitating their access to extension services in Mbozi District. Based on these findings, many farmers seemed to appreciate the importance of ICT in the agriculture sector. For instance farmers stated that ICT tools are valuable information source for farmers. This item had 4.331 (86.62%) mean and the views of the farmers in this component were the most consistent with coefficient of variation of 19.6%. Also item, ICT enhances agricultural productivity had 4.1184 (82.30%) and the views expressed were consistent by 27.3% coefficient of variation (C.V). In

Table 4: Attitudes of farmers on the role of ICT

NO.	Perception statement	Mean	Std. Deviation	Coefficient of variation (C.V) (%)
1	ICT tools are easily accessible by farmers	3.9673	1.07455	27.085
2	ICT tools are easier for farmers to learn how to use	3.8612	0.97779	25.32
3	ICT tools are easy for farmers to use and operate	3.8082	1.11984	29.40
4	ICT tools are valuable information source for farmers	4.3306	0.84983	19.62
5	ICT enhances agricultural productivity	4.1184	1.13363	27.52
6	ICT improves the quality of service offered to farmers	3.5184	1.19282	33.90
7	ICT enables farmers to get correct and updated agricultural and market information	4.2612	0.90825	21.31
8	ICT improves farmers communication with agricultural extension workers and input suppliers	3.8000	0.96920	25.51
9	ICT enables farmers to reach new markets	3.6327	1.06920	29.43
10	ICT increases farmers profitability	4.2327	0.96185	22.72
11	ICT reduces travel time and expense	3.9184	1.04483	26.66
12	ICT leads to improved negotiation power	3.9469	1.08324	27.44
13	ICT leads to broader network	4.0286	0.98097	24.35
14	ICT helps secure better markets and prices	3.9061	1.14312	29.26

Source: Field Survey 2016

Decision rule: the mean above 3: Ready but needs few improvements = Farmers have a positive attitude on ICT

terms of whether ICT enables farmers to get correct and updated agricultural and market information, the item recorded 4.2612 (85.2%) and the views of farmers were consistent by 21.3% coefficient of variation. Also, farmers stated that ICT increases farmers profitability, the mean was 4.26 (84.65%) and 22.7% coefficient of variation. Further, farmers agreed as well that ICT leads to broader network with the mean of 4.0286 (80.6%) and the views expressed were consistent by 24.4% coefficient of variation. However, regarding whether ICT improves farmers' communication with agricultural extension workers and input suppliers, the views expressed were above the ready but needs a few improvement level, the mean was 3.8 (0.76%) and the views expressed were consistent by 25.5% coefficient of variation. The results suggest that the farmers have a positive attitude on the ICT use in Mbozi District. The positive perception of farmers on ICT reflects what was highlighted in the URT (2007) report which stated that ICT has currently spread even to the remote rural area which in the past lagged behind and as such, Obayelu and Ogunlade, (2006) state that due to this drastic change, the farmers in rural areas have been aware of the various issues of interest to them that affect their livelihood. The views are shared also by Chapman and Slaymaker (2002) who argue that any ICT intervention that improves the livelihoods of poor rural families will likely have significant direct and indirect impacts on enhancing agricultural production, marketing and post-harvest activities which in turn can further contribute to poverty reduction.

Factors that hinder the usage of ICT tools in Mbozi District

Table 5 shows the barriers associated with ICT usage in Mbozi District. The major constraints to the use of ICTs were lack of ICT related public facilities 4.17 (83.4%), poor infrastructures in rural areas 4.16 (83.2%), low education/literacy 4.04 (80%) and lack of technical knowhow i.e. lack of basic ICT skills 3.96 (79.2%). These items recorded the highest scores. Erratic power supply 3.95 (79%), language barrier (3.89) and Poor signals or reception (lack of network) 3.87 (77.4%), lack of internet connectivity 3.85 (77%) and that ICT tools are too expensive 3.84 (76.8%) recorded relatively lower scores. This suggests that the identified barriers are a hindrance to the effective use of ICT in Mbozi District since all measurement instruments have recorded its mean above 3. The findings reflect what was observed on the ground where factors like low education/literacy and lack of basic ICT skills resulted in slower adoption of ICT tools to some farmers particularly to informal and primary school education holders. This informs that knowledge of ICT and having basic skills are important aspects if farmers are to use ICT effectively. Basic knowledge and skills can enable farmers to take advantage of going beyond the local market through global supply chains via the Internet, etc. Poor infrastructures in rural areas is another barrier for the effective use of ICT in Mbozi District, this because most remote villages seemed to lack infrastructures to enable proper connectivity with other parts of the District.

Table 5: Factors that hinder the usage of ICT tools

Perception statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean
ICT tools are too expensive	66 (26.9%)	99 (40.4%)	57 (23.3%)	20 (8.2%)	3 (1.2%)	3.84
Language barrier	94 (38.4%)	70 (28.6%)	47 (19.2%)	27 (11%)	7 (2.9%)	3.89
Erratic power Supply	86 (35.1%)	104 (42.4%)	28 (11.4%)	10 (4.1%)	17 (6.9%)	3.95
Low education/literacy	78 (31.8%)	122 (49.8%)	29 (11.8%)	9 (3.7%)	7 (2.9%)	4.04
lack of internet connectivity	77 (31.4%)	96 (39.2%)	45 (18.4%)	13 (5.3%)	14 (5.7%)	3.85
Poor signals or reception (lack of network)	75 (30.6%)	89 (36.3%)	57 (23.3%)	21 (8.6%)	3 (1.2%)	3.87
Lack of technical knowhow i.e. lack of basic ICT skills	100 (40.8%)	65 (26.5%)	59 (24.1%)	13 (5.3%)	8 (3.33%)	3.96
Poor infrastructures in rural areas hinder effective use of ICT	117 (47.8%)	79 (32.2%)	25 (10.2%)	20 (8.2%)	4 (1.6%)	4.16
Lack of ICT related facilities i.e Tele-centers	118 (48.2%)	79 (32.2%)	24 (9.8%)	20 (8.2%)	4 (1.6%)	4.17
Total mean						27.91
Grand mean						3.99

Source: Field Survey, 2016

Roads and bridges, especially in developing countries form part of the ICT infrastructure. Very limited agricultural products are delivered over the information infrastructure or the Internet. Most of the agricultural products purchased are still delivered the conventional way (physical delivery). Hence, poor roads and bridges, inefficient transport systems, coupled with the high cost of transport are among the obstacles in the uptake of ICT in Mbozi District.

CONCLUSION AND RECOMMENDATIONS

The objective of the study was to examine the role of ICT in facilitating marketing of agricultural produce and farmers' accessibility to extension services in Mbozi District. Based on the attitudes of farmers, the ICT tools mostly used are mobile phones (53.88%), Radio (23.6%), television (14.69%) and the internet (7.75%) to inquire and receive agricultural and market information. While the findings seem to suggest that there is progress towards the use of ICT in the study area and there is an appreciation of the importance of ICT in maize production and marketing, farmers are constrained by poor infrastructures in rural areas, low education/literacy and lack of technical know-how i.e. lack of basic ICT skills. Other constraints are the erratic power supply, language barrier, poor signals or lack of network, lack of internet connectivity and the high cost of ICT tools. This study has the implication that if requisite infrastructures are put in

place in rural areas, particularly where agricultural activities takes place, ICT can bring significant benefits to smallholder farmers by raising agricultural productivity and hence leading to poverty reduction. Therefore, the study recommends that establishing market information centers and telecenters in Mbozi rural areas should be done so as to expand access to market information. Promoting investment in renewable energy sources in order to address the problem of power as they are relatively cheap and sustainable and encouraging more investments in the national physical and transport infrastructure; and creating enabling environment for ICT accessibility, including more construction of infrastructure with particular emphasis on networks which are already widely available (television, radio and mobile phones).

REFERENCES

- Angelo C, Wema E (2010). Availability and usage of ICTs and e-resources by livestock researchers in Tanzania: Challenges and ways forward, *International Journal of Education and Development using Information and Communication Technology*, Vol. 6, Issue 1, pp. 53-65.
- Aloyce M (2005). ICT for improved crop marketing in rural Tanzania: Project summary. Retrieved from <http://www.uneca.org/aisi/icomnectafrica/v2n2.htm>
- Aker JC (2008). Does Digital Divide or Provide? The Impact of Mobile phones on Grain Markets in Niger. Center for Global Development Working Paper No. 154.

- <http://www.cgdev.org/content/publications/detail/894410>, accessed January 2011.
- Annerose D (2010). "ICT for Social and Economic Development." Presentation by Manobi at the World Bank, Washington, DC, August.
- Tanzania Agricultural Marketing Policy (2008)
- Birner RK, Davis J, Pender E, Nkonya P, Anandajayasekaram J, Ekboir A, Mbabu D, Spielman D, Horna, and Benin, S. (2009). "From Best Practice to Best Fit: A Framework for Analyzing Agricultural Advisory Services Worldwide." *Journal of Agricultural Extension and Education* 15 (4):341–55.
- Christoplos I (2010). *Mobilizing the Potential of Rural and Agricultural Extension*. Rome: Food and Agriculture Organization of the United Nations (FAO) and the Global Forum for Rural Advisory Services (GFRAS)
- Cecchini S, Scott C (2003). Can information and communications technology applications contribute to poverty reduction? Lessons from rural India, information technology for development, 10(2), 73-84.
- Cieslikowsk DA, Halewood NJ, Kimura K, Zhen-Wei Qiang C (2009). Key trends in ICT development (World Bank Report). Retrieved August 7, 2010, from the Communication Initiative Network website: www.comminit.com/en/node/298770/307.
- Djankov, S., McLeish, C., Nenova, T., & Sheifer, A. (2001). Who owns the media? *Journal of Law and Economics*, 46(2).
- Davis K, Heemskerk W (2012). Investment in Extension and Advisory Services as Part of Agricultural Innovation Systems. World Bank. In *Agricultural Innovation Systems: An Investment Sourcebook* 179-260). Washington, DC: World Bank
- Dodds T (1999). Non-formal and adult basic education through open and distance learning in Africa. University of Namibia, Center for External Studies
- Fafchamps M, Minten B (2011). Impact of SMS-based agricultural information on Indian farmers, *The World Bank Economic Review*, 1-32, Open University Press, Oxford. doi: 10.1093/wber/1hr056 [10]
- Gakuru M, Winters K, Stepman F (2009). Inventory of Innovative Farmer Advisory Services using ICTs. The Forum for Agricultural Research in Africa (FARA).
- Ilahiane H (2007). "Impacts of Information and Communication Technologies in Agriculture: Farmers and Mobile Phones in Morocco." Paper presented at the Annual Meetings of the American Anthropological Association, December 1, Washington, DC.
- Lapar M, Holloway G, Ehui S (2003). Policy options promoting market participation among smallholder livestock producers: A case study from the Philippines. *Food Policy*, 28, 187–211
- Katengeza SP, Mangisoni JH, Okello JJ (2010) The role of ICT-based market information services in spatial food market integration: the case of Malawi Agricultural Commodity Exchange, contributed paper presented at the Joint 3rd African Association of Agricultural Economists (AAAE) and the 48th Agricultural Economists Association of South Africa (AEASA) Conference, Cape Town, South Africa, September 19-23, 2010. [20]
- Kapange B (2012). ICTs and National Agricultural Research Systems .The case of Tanzania, unpublished paper, Ministry of Food Security and Cooperatives.
- Kotable M, Helsen K (2001). *Global marketing management*. 2nd edition. New York: John Willey & Sons, Inc.
- Labonne J, Chase RS (2009). "The Power of Information: The Impact of Mobile Phones on Farmers' Welfare in the Philippines." World Bank Policy Research Working Paper No. 4996. Washington, DC: World Bank.
- Lashgarara and Omid (2011). ICT Capabilities in Improving Marketing of Agricultural Productions of Garmsar Township, Iran, *Annals of Biological Research*, 2011, 2 (6):356-363
- Matambalya F, Wolf S (2001). The Role of ICT for the Performance of SMEs in East Africa, Empirical Evidence from Kenya and Tanzania, Discussion Papers on Development Policy No. 42, Center for Development Research, Bonn, December 2001, pp. 30.
- Masuki KF, Tukahirwa J, Kamugisha R, Mowo J, Tanui J, Mogoi J, Adera EO (2012). Mobile phones in agricultural information delivery for rural development in Eastern Africa: Lessons from Western Uganda
- Mittal S, Mehar M (2012), How Mobile Phones Contribute to Growth of Small Farmers? Evidence from India, *Quarterly Journal of International Agriculture* 51 No. 3: 227-244
- Matungal P, Lyne, M, Ortman G (2001). Transaction costs and crop marketing in the communal areas of Impendle and Swayimana, KwaZulu Natal. *Development Southern Africa*, 2001; 18(3); 347-363
- Munyua H, Adera E, Jensen M (2008), "Emerging ICTs and their potential in revitalizing small scale agriculture in Africa". A paper presented at World Conference on Agricultural Information and Information Technology
- Mwakaje, A (2010). Information and Communication Technology for Rural Farmers Market Access in Tanzania, *Journal of Information Technology Impact* Vol. 10, No. 2, pp. 111-128, 2010
- Mtega, W, Msungu, A (2013), Using Information and Communication Technologies for Enhancing the accessibility of agricultural information for Improved agricultural Production in Tanzania, *The Electronic Journal of Information Systems in Developing Countries*, Volume 56, 1, pages 1-14
- Munyua H (2008). ICTs and small-scale agriculture in Africa: a scoping study. International Development Research Centre (IDRC) Policy brief, realizing the potential of ICT in Tanzania.
- Asenso-Okyere K, Mekonnen DA (2012). The Importance of ICTs in the Provision of Information for Improving Agricultural Productivity and Rural Incomes in Africa, working paper, United Nations Development Programme
- Sanga C, Kalungwizi VJ, Msuya CP (2013). Building an agricultural extension services system supported by

- ICTs in Tanzania: Progress made, Challenges remain, International Journal of Education and Development using Information and Communication Technology (IJEDICT), 2013, Vol. 9, Issue 1, pp. 80-99
- Stien J, Bruinsma W, Neuman F (2007). How ICT can make a difference in agricultural livelihoods: The Commonwealth Ministers Reference Book: International Institute of Communication and Development (IICD). Retrieved from <http://www.iicd.org/files/ICT%20agricultural%20livelihoods.pdf>
- Shaffril H, Hassan M, Hassan A, D'Silva J (2009). "Agro-based Industry, Mobile Phone and Youth: A Recipe for Success." European Journal of Scientific Research 36(1):41-8.
- Shetto MC (2008) Assessment of Agricultural Information Needs In African, Caribbean and Pacific (ACP) States Eastern Africa Country Study: Tanzania. Ministry of Agriculture, Food Security and Cooperatives on behalf of the Technical Centre for Agricultural and Rural Cooperation (CTA). http://icmpolicy.cta.int/filesstk/Tanzania_Final-report-081209.pdf
- Tanzania Communication and Regulatory Authority (TCRA), Report, 2014
- Tofik I (2014). Use of Mobile Phone in Camel Marketing, The case of Babille District of Fafau Zone, Somali Region, Ethiopia, Unpublished Master's Thesis
- World Bank (2011). ICT in Agriculture, connecting small holder to knowledge, network and institutions
- USAID Briefing Paper (2013). Using ICT to Enhance Marketing for Small Agricultural Producers. Last updated May 2013.

Accepted 9 May, 2017.

Citation: Lwesya F, Kibambila V (2017). The role of ICT in facilitating farmers' accessibility to extension services and marketing of agricultural produce: The case of Maize in Mbozi District, Tanzania. International Journal of Agricultural Marketing, 4(2): 142-151.



Copyright: © 2017. Lwesya and Kibambila. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are cited.