Information and knowledge needs, access and use for small–scale farming in Tanzania

Edda Tandi Lwoga, Patrick Ngulube and Christine Stilwell

Edda Tandi Lwoga
Muhimbili University of Health and Allied Sciences,
Dar es Salaam, Tanzania.
tlwoga@gmail.com

Patrick Ngulube
Graduate Studies,
University of South Africa, Pretoria.
ngulup@unisa.ac.za

Christine Stilwell
Information Studies Programme,
University of KwaZulu-Natal, Pietermaritzburg.
Stilwell@ukzn.ac.za

Abstract

This article assesses information and knowledge needs, access and use for agricultural development in the rural areas of developing countries, with a specific focus on Tanzania. Data from focus groups and information mapping and linkage diagrams were used to triangulate with the interview data in order to bring together the strength of all data sets to validate, confirm and corroborate findings from various sources. The findings revealed that the information seeking patterns of farmers were location specific. The major sources of information for farmers were predominantly local. Most respondents indicated public extension as an important source of agricultural information. Private extension services, village meetings and farmer groups were significant sources of information in some regions. Printed information had low use. The role of information and communication technologies in providing access to agricultural knowledge and information, and the application of information and knowledge on farming systems in the rural areas of Tanzania are also

presented. The article concludes with recommendations for improved access to agricultural knowledge and information in the rural areas of Tanzania.

Introduction

Agricultural development relies to a great extent on how effectively information and knowledge are accessed and used (World Bank 2007). Information and knowledge can play a key role in enhancing productivity and access to markets, which lead to sustainable rural livelihoods, improving quality and yield, food security and national economies (Asaba *et al.* 2006). Research shows that there is a positive link between increased access to information and knowledge, and improved agricultural productivity, such as in Tanzania (Mchombu 2003) and Malawi (Muyepa 2002). The terms "knowledge", and "information" however are often used inter-changeably in the literature but a distinction between the terms is helpful. It is therefore important to define them in order to show the differences that exist between these terms. According to Joia (2000: 69), information is "is understood as a message, usually having the format of a document or visual and/or audible message." Unlike information, knowledge is, "a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information" (Davenport and Prusak 1998: 5). It is clear that information is processed data which has meaning, purpose and relevance, and knowledge is contextualised information which guides action, and they are used in this context in the study.

The agricultural sector is the backbone of many economies in Africa. In Tanzania, the economy depends heavily on agriculture, which accounts for more than 25.7 per cent of gross domestic product (GDP), provides 30.9 per cent of exports, and employs 70 per cent of the work force (United Republic of Tanzania 2009). Despite the importance of the agricultural sector to the national economy, there is still low agricultural productivity in Tanzania (United Republic of Tanzania, 2009). One of the factors that contribute to the low productivity is lack of access to relevant agricultural information in the rural areas of Tanzania. This situation is largely attributed to the weak linkages between research, extension, not for profit organisations, libraries and farmers and thus information has neither reached nor been adopted by the intended beneficiaries to improve farming activities in developing countries, including Tanzania (Tire 2006). It was thus significant to assess the access and use of the agricultural information and knowledge in the rural areas of Tanzania.

Advancements in the information and communication technologies (ICTs) provide an opportunity for developing countries to harness and utilise information and knowledge to improve productivity in various sectors including agriculture (Lwoga and Ngulube 2008). Unfortunately, resource poor farmers are mainly affected by the digital divide which is a gap between groups or individuals in their ability to use ICTs effectively due to differing literacy, technical skills, and useful digital content (Ghatak 2007). Nevertheless, the emergence of low cost ICTs (such as radio, mobile phones, and the media provided by the telecentres) may bridge the digital divide (Tanzania Commission for Science and Technology 2005). Given the fact that there are disparities in the accessibility and utility of the ICTs, especially for rural areas in the developing world contexts, it is also important to investigate the application of these tools for improved farming activities especially in the rural areas. Thus, assessment of the information needs, the role of ICTs, and the access and use of knowledge and information in the rural areas were pertinent issues to this study.

The objectives of the study included the following: (i) to establish the agricultural information needs of farmers in the study area; (ii) to assess how farmers accessed and used the agricultural information and knowledge in the local communities; and (iii) to assess how farmers accessed and used the agricultural information and knowledge communicated through ICTs in the local communities.

Methodology

This study used qualitative and quantitative data collection methods to seek convergence and corroboration of results to support the research objectives of the study (Leedy and Ormrod 2005). Six districts from six of seven research zones were selected for the study due to their high agriculture production and presence of ICTs such as telecenters, community radio, and cellular phone networks. These districts were Karagwe, Kasulu, Kilosa, Moshi Rural, Mpwapwa and Songea Rural. The qualitative data was collected through semi-structured interviews, focus groups, and other participatory rural appraisal techniques (information mapping and linkage diagrams), while quantitative data was gathered through closed questions which were embedded in the same semi-structured interviews. The stratified purposive sampling technique was used to identify two strata in each district based on high agricultural production and the presence of ICTs such as telecentres, telecommunication signals, and infrastructure. The first stratum comprised one village in each district which

was close to the telecentre and other basic ICT facilities such as telecommunication signals, and having a good road. The second stratum included one remote village in each district (approximately 10 to 20 km from the telecentres). These districts and villages included the following: Mpwapwa district (Vinghawe and Mazae villages), Karagwe district (Katwe and Iteera villages), Moshi Rural district (Lyasongoro and Mshiri villages), Kilosa district (Kasiki and Twatwatwa villages), Songea Rural district (Matetereka and Lilondo villages), and Kasulu district (Nyansha and Kidyama villages). A typical case sampling technique was also used to select the respondents from identified strata.

A total of 181 smallholder farmers participated in the semi-structured interviews, and the respondents ranged between 27 and 37 farmers per district. On the other hand, 128 smallholder farmers participated in the focus group discussions. A total of 12 focus group sessions were held in the surveyed villages, and one focus group session was held per village. The focus group discussion and interview data were studied and analysed as they were collected, until it was clear that perspectives were being repeated and data saturation had been reached. Both quantitative and qualitative data analyses were kept separate, and were then combined or integrated into meta-inferences (Teddlie and Tashakkori 2009). Some of the qualitative themes were transformed into counts in order to validate and compare quantitative and qualitative findings.

Research findings and discussions

This section presents study findings according to the following: information needs, access and use of agricultural information and knowledge, and the role of ICTs in disseminating agricultural knowledge and information. The respondent's demographic characteristics are also presented.

Profile of respondents

In the semi-structured interviews, 181 smallholder farmers participated, where 112 were men and 69 were women. The mean age of the respondents was 48, where the majority of the respondents 135 (74.6%) were between 29 to 68 years. The study mainly involved smallholder farmers, with the average farm size of 1.98 hectares, and where the majority of the crop farmers had farm sizes that were below 1.98 hectares. Of the 181 respondents, 152 (84%) had some level of formal schooling and 163 (91.2%) could read and understand simple

instructions. Among those with formal schooling, male respondents dominated the higher education category as compared to female farmers. For the focus groups, 128 smallholder farmers participated in the group discussions, where 65 (50.8%) were male, and 63 (49.2%) were female. Twelve focus groups were held in 12 villages. The study participants for focus group discussions ranged between six and 12 respondents per session depending on their availability. The mean age of the respondents was 45, where almost half of the respondents 62 (48.4%) were between 29 to 48 years. One hundred and fourteen (89.1%) respondents had some level of formal schooling and 116 (90.7%) could read and understand simple instructions.

Farmers' information and knowledge needs

The findings showed that the major information and knowledge needs identified in this study related to control of plant diseases and pests 120 (66.3%), marketing 107 (59.1%), credit and loan facilities 106 (58.6%), and control of animal diseases 99 (54.7%) (see Table 1). Further, the findings indicated that knowledge and information needs varied across the surveyed communities as shown in Table 1. These needs were location specific due to slight variations in development, agricultural activities and agro-ecological conditions in the surveyed communities. These findings were similar to other studies on agricultural information needs in Kenya and South Africa (Wafula-Kwake and Ocholla 2007), and Tanzania (Matovelo, Msuya and de Smet 2006).

Table 1: Farmers' information and knowledge needs (N=181)

Information and knowledge needs	**Districts**													
	Mpwapwa		**Karagwe**		**Kasulu**		**Moshi Rural**		**Kilosa**		**Songea Rural**		**Total**	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Soil classification	8	4.4	6	3.3	9	5	11	6.1	20	11	18	9.9	72	39.8
Crop varieties	11	6.1	11	6.1	18	9.9	17	9.4	22	12.2	8	4.4	87	48.1
Crop husbandry	6	3.3	8	4.4	8	4.4	13	7.2	20	11	3	1.7	58	32
Irrigation	4	2.2	3	1.7	13	7.2	12	6.6	19	10.5	2	1.1	53	29.3
Agricultural tools	16	8.8	22	12.2	14	7.7	11	6.1	21	11.6	5	2.8	89	49.2
Animal feeding	2	1.1	8	4.4	8	4.4	19	10.5	31	17.1	2	1.1	70	38.7
Animal breeding	4	2.2	3	1.7	8	4.4	13	7.2	31	17.1	2	1.1	61	33.7
Credit facilities	10	5.5	17	9.4	16	8.8	15	8.3	34	18.8	14	7.7	106	58.6

Land preparation	6	3.3	3	1.7	11	6.1	13	7.2	20	11	1	0.6	54	29.8
Soil fertilisation	7	3.9	14	7.7	20	11	12	6.6	21	11.6	13	7.2	87	48.1
Value added	10	5.5	4	2.2	10	5.5	12	6.6	22	12.2	7	3.9	65	35.9
Marketing	7	3.9	27	14.9	11	6.1	15	8.3	32	17.7	15	8.3	107	59.1
Animal housing	2	1.1	5	2.8	8	4.4	13	7.2	27	14.9	2	1.1	57	31.5
Animal diseases	11	6.1	16	8.8	19	10.5	16	8.8	34	18.8	3	1.7	99	54.7
Plant diseases and pests	21	11.6	24	13.3	24	13.3	22	12.2	17	9.4	12	6.6	120	66.3

(Multiple responses were allowed)

Access to agricultural information and knowledge in the surveyed communities
The study findings showed that neighbours and friends were the main sources of agricultural information and knowledge in the local communities, with a score of 132 (72.9%) respondents, followed by public extension officers 130 (71.8%) and parents and family 103 (56.9%) as shown in Table 2. Similar findings were observed in Nigeria (Adomi, Ogbomo and Inoni 2003), and Tanzania (Matovelo Msuya and de Smet 2006).

In this study, the extension officers were important sources of information and knowledge, although farmers were dissatisfied with the frequency of their interactions, as was also found in Nigeria (Adomi, Ogbomo and Inoni 2003), and Vietnam (Castella *et al.* 2006). Agricultural input suppliers, village meetings, and farmer groups were important sources of agricultural information and knowledge in some regions. Explicit sources of knowledge, with the exception of books, had low use due to their unavailability and the absence of the reading habit. Explicit sources refer to the knowledge which is expressed in formal and systematic language and communicated in the form of data, scientific formulae, specifications and manuals (Nonaka, Toyama, and Konno 2000). This finding is consistent with the research findings observed in Nigeria (Adomi, Ogbomo and Inoni 2003) and South Africa (Mosia and Ngulube 2005). Thus, there are still gaps in access to information and knowledge which need to be addressed.

Table 2: Tacit and explicit sources of agricultural information and knowledge by districts (N=181)

Sources of information and knowledge	Districts													
	Mpwapwa		Karagwe		Kasulu		Moshi Rural		Kilosa		Songea Rural		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Parent/Children/family	14	7.7	27	14.9	8	4.4	16	8.8	24	13.3	14	7.7	103	56.9
Extension officers	27	14.9	12	6.6	17	9.4	26	14.4	20	11.0	28	15.5	130	71.8
Agricultural shows	7	3.9	3	1.7	2	1.1	7	3.9	5	2.8	4	2.2	28	15.5
Agricultural researchers	7	3.9	1	0.6	3	1.7	9	5.0	5	2.8	3	1.7	28	15.5
Cooperative unions	3	1.7	17	9.4	21	11.6	16	8.8	0	0	19	10.5	76	42.0
Individual traders	1	0.6	0	0	1	0.6	2	1.1	6	3.3	2	1.1	12	6.6
Religious leaders	4	2.2	4	2.2	1	0.6	16	8.8	3	1.7	0	0	28	15.5
Neighbours/ friends	12	6.6	27	14.9	23	12.7	28	15.5	25	13.8	17	9.4	132	72.9
Village meetings	13	7.2	7	3.9	2	1.1	15	8.3	11	6.1	15	8.3	63	34.8
Farmer groups	6	3.3	3	1.7	8	4.4	11	6.1	8	4.4	22	12.2	58	32.0
NGOs	3	1.7	6	3.3	7	3.9	9	5.0	6	3.3	17	9.4	48	26.5
Input suppliers	1	0.6	0	0	21	11.6	23	12.7	17	9.4	17	9.4	79	43.6
Schools	1	0.6	9	5.0	2	1.1	3	1.7	2	1.1	1	0.6	18	9.9
Observation					1	0.6	20	11	1	0.6	6	3.3	28	15.5
Village leaders	1	0.6	0	0	0	0	6	3.3	1	0.6	0	0	8	4.4
Social gatherings	1	0.6	0	0	0	0	14	7.7	0	0	3	1.7	18	9.9
Government agency	0	0	0	0	0	0	1	0.6	0	0	0	0	1	0.6
Seminars	3	1.7	5	2.8	0	0	2	1.1	0	0	8	4.4	18	9.9
Books	7	3.9	14	7.7	7	3.9	4	2.2	8	4.4	6	3.3	46	25.4
Posters	5	2.8	3	1.7	2	1.1	4	2.2	4	2.2	6	3.3	24	13.3
Training modules	1	0.6	1	0.6	0	0	0	0	0	0	1	0.6	3	1.7
Leaflets	7	3.9	3	1.7	1	0.6	4	2.2	7	3.9	3	1.7	25	13.8
Newspapers	8	4.4	9	5.0	2	1.1	2	1.1	3	1.7	3	1.7	27	14.9
Newsletters	5	2.8	6	3.3	2	1.1	11	6.1	0	0	2	1.1	26	14.4

(Multiple responses were possible)

Further, the tacit and explicit sources of knowledge varied across the districts as was found in a study in India (Conroy *et al.* 2004) (see Table 2). For instance, public extension officers were the main sources of agricultural exogenous knowledge in Songea Rural 28 (15.5%), Mpwapwa 27 (14.9%) and Moshi Rural 26 (14.4%). Cooperative unions were important sources of knowledge in Kasulu 21 (11.6%), Songea Rural 19 (10.5%) and Moshi Rural 16 (8.8%). Agricultural input suppliers were important sources of knowledge in Moshi Rural 23 (12.7%) and Kasulu 21 (11.6%), while farmer groups and non governmental organisations (NGOs) were significant in Songea Rural and Moshi Rural. There is thus a need to evaluate the effectiveness of these sources

of knowledge in order to improve the information provision strategies in the rural areas.

The findings also indicated that there were variations in sources of knowledge according to gender. Figure 1 shows that males dominated formal sources and explicit sources of knowledge, while women dominated NGOs and local sources of knowledge. Studies in India (Conroy *et al.* 2004) and Nigeria (Adomi, Ogbomo and Inoni 2003) also showed that women were frequently disadvantaged in accessing information and knowledge. Illiteracy and cultural responsibility could be some of the factors which limited women's access to information and knowledge.

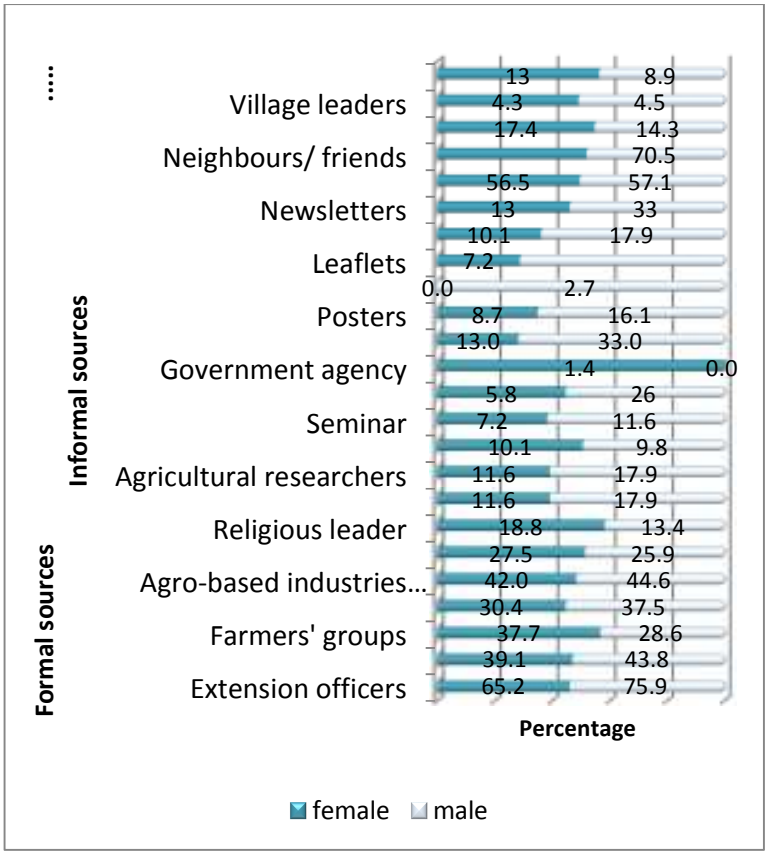

Figure 1: Tacit and explicit sources of agricultural information and knowledge by gender (N=181) *(Multiple responses were possible)*.

Information was consolidated from the 12 information maps. Each focus group session had one information map, and the study conducted 12 focus group sessions. It was clear from the information mapping and linkage diagrams which were conducted during focus group sessions that local and informal contact with parents and family, personal experience and neighbours and friends

were the dominant sources of knowledge in the local communities, followed by public extension officers (Figure 2). Village leaders, livestock headers, agricultural shops, NGOs, cooperative unions, farmer groups, religious bodies, and middle men were important sources of knowledge in some local communities. Explicit sources of knowledge were considered as less important sources of knowledge in the communities.

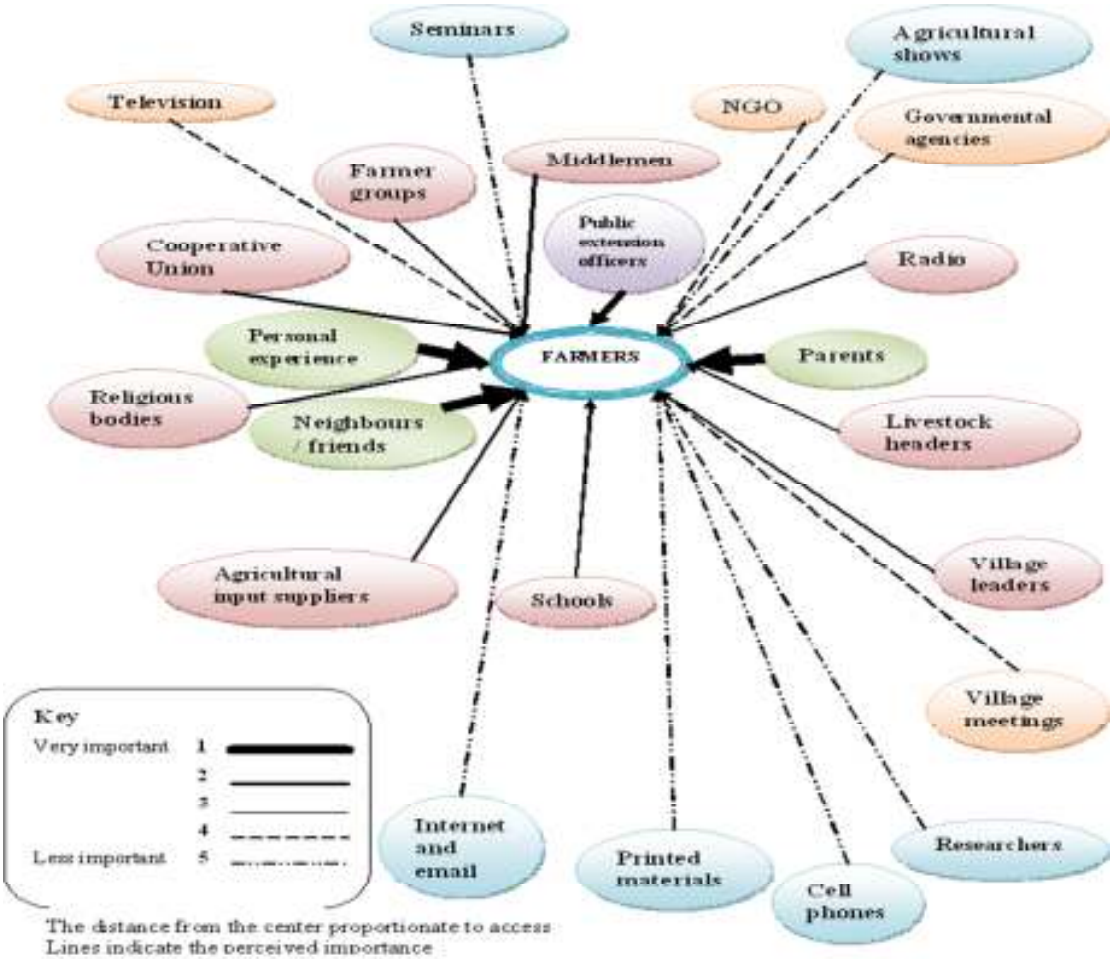

Figure 2: Consolidated information maps of the surveyed districts.

Use of information, knowledge and technologies in farming systems

The study findings showed that 141 (77.9%) respondents had applied conventional knowledge and techniques to their farming activities, while 40 (22.1%) had not. It was evident from the findings that farmers mainly applied information and knowledge to crop husbandry 87 (61.7%), and new varieties

and techniques 50 (35.5%) as shown in Figure 3. The study findings further showed that improved agricultural production was the major reason for applying information and technologies, especially on crop husbandry, control of plant and animal diseases, soil fertility, new varieties and techniques, agricultural tools, and value added techniques, accounting for 133 (94.3%) respondents. The focus group discussions confirmed that improved agricultural production was the major reason for applying information and technologies on crop husbandry, new varieties and techniques, and improvement of soil fertility. These findings show that farmers use information and knowledge they receive from various sources to improve their farming activities.

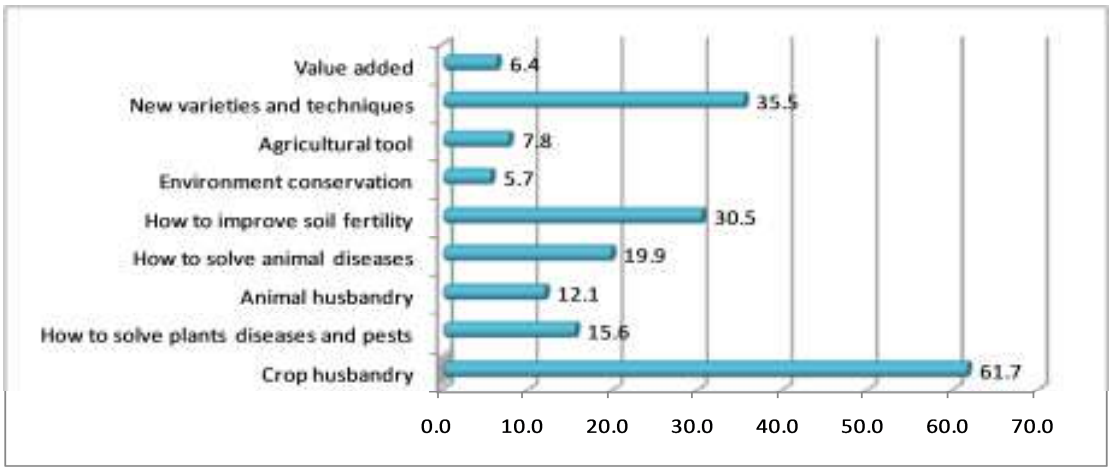

Figure 3: Application of information and knowledge and technologies in farming systems (N=141).

Access to agricultural information through ICTs

One hundred and sixty one (89%) respondents used ICTs to access information and knowledge, and the remaining 19 (10.5%) did not. Most farmers 155 (96.3%) used radio to access information and knowledge on farming systems. ICTs used at the next highest rate were mobile phones 71 (44.1%) and television 64 (39.8%), while e-mail, 12 (7.5%), internet, nine (5.6%), film shows, eight (5%), and video cassettes, six (3.7%) were used at a low rate. Findings from Nigeria (Adomi, Ogbomo and Inoni 2003) and Tanzania (Chilimo 2009) showed that few farmers had used internet and e-mail services for knowledge acquisition. The study findings indicate that the mass media and interpersonal channels were the major sources of agricultural information and knowledge in the local communities.

The information mapping confirmed that radio was the principal ICT used by farmers to access knowledge as indicated in Figure 3. Television and mobile phones were important tools used by farmers to access information and knowledge in some locations, while advanced ICTs such as Internet and e-mail were used less to access agricultural information and knowledge in the surveyed communities.

Application of agricultural information and knowledge through ICTs

The study findings established that the majority of the respondents applied information and knowledge, with 141 (77.9%) receiving it from tacit and printed sources of knowledge in the farming systems and 64 (35.4%) obtaining it from ICTs. These findings show that oral communication channels were regarded as more effective ways of delivering information and knowledge in the surveyed local communities than ICTs. Similarly, Chapman, Blench, Kranjac-Berisavljevic and Zakariah (2003) found that the use of participatory communication techniques and indigenous communication channels (such as drama) utilising local languages and rural radio had some influence on the majority of the farmers regarding their decisions whether or not to cut down trees and to discontinue bush burning on their farms. Indications are that the combination of participatory techniques, indigenous communication channels and ICTs can improve the sharing and adoption of agricultural technologies in the local communities.

The present study established that crop husbandry techniques 31 (48%) were the major adopted technique that were received through ICTs in the local communities, followed by new techniques and varieties 21 (32.8%), and improvement of soil fertlity, 15 (23%). Other techniques adopted through ICTs were control of plant diseases and pests, eight (12.5%), and control of animal diseases, seven (10.9%). Few farmers applied knowledge on agricultural tools, five (7.8%), livestock husbandry, one (10.9%) and value added, one (1.6%).

The major reasons for adopting agricultural information and technologies were improved crop and animal production 63 (98.4%). These findings were similar to the major reasons for adopting information and knowledge from tacit and printed sources of knowledge in the surveyed communities. Indications are that ICTs can also play a key role in providing access to relevant and effective information and knowledge which can improve agricultural productivity and increase income in the local communities.

Conclusions and recommendations

From the above research findings, it can be concluded that access to relevant information and knowledge is very important to improve agricultural performance and livelihoods in the rural areas especially in African countries. However, the findings revealed that there was a large information and knowledge gap in the districts sampled because the rural information provision services were not driven by the farmers' needs in the surveyed communities. The findings also suggest that to improve their farming skills, farmers will continue to rely on face-to-face communication and probably radio and cell phones more than printed material and advanced ICTs, such as internet and e-mail, to access information and knowledge. Based on the findings, the following recommendations are made:

- Rural knowledge provision strategies should conduct regular studies on information and knowledge needs, and involve farmers in the design and development of agricultural technologies to encourage their use; and
- The establishment of community radio that uses vernacular languages and indigenous communication mechanisms, such as drama, storytelling, should be encouraged in the local communities in order to disseminate relevant knowledge to farmers.

For further studies, this article recommends that research be undertaken to establish the role of community radio, mobile phones and television in managing and integrating indigenous and external knowledge for effective agricultural practices in the local communities. The linkages between face to face communication and ICTs need to be investigated for effective agricultural performance in African countries, particularly in rural areas.

References

Adomi, E. E., Ogbomo, M. O. and Inoni, O. E. 2003. Gender factor in crop farmers' access to agricultural information in rural areas of Delta State, Nigeria. *Library Review* 52 (8): 388-393.

Asaba, J. F., Musebe, R., Kimani, M., Day, R., Nkonu, M., Mukhebi, A., Wesonga, A., Mbula, R., Balaba, P. and Nakagwa, A. 2006. Bridging the information and knowledge gap between urban and rural communities through rural knowledge centres: case studies from Kenya and Uganda. *International*

Association of Agricultural Information Specialists (IAALD) Quarterly Bulletin 51: 3-4.

Castella, J., Slaats, J., Quang, D. D., Geay, F., Van Linh, N. and Tho, P. T. H. 2006. Connecting marginal rice farmers to agricultural knowledge and information systems in Vietnam Uplands. *The Journal of Agricultural Education and Extension* 12(2): 109–125. Available at: http://dx.doi.org/10.1080/13892240600861625 Accessed 1 November 2007.

Chapman, R., Blench, R., Kranjac-Berisavljevic, G. and Zakariah, A. B. T. 2003**.** Rural radio in agricultural extension: the example of vernacular radio programmes on soil and water conservation in Northern Ghana. *Agricultural Research and Extension Network Paper* 127. Available at: http://www.odi.org.uk/agren/papers/agrenpaper_127.pdf Accessed 11 November 2007.

Chilimo, W. L. 2009. Information and communication technologies and sustainable livelihoods: a case of selected rural areas of Tanzania. PhD. Pietermaritzburg: University of KwaZulu-Natal.

Conroy, C., Sparks, N., Chandrasekaran, D., Shindey, A. D., Singh, L. R., Natarajan, A. and Anitha, K. 2004. Understanding livestock keepers' agricultural knowledge and information systems: a case study from India. The International Workshop on Enhancing the Contribution of Small Livestock to the Livelihoods of Resource-Poor Communities, Masaka, Uganda, 15–19 November 2004. Available at: http://www.smallstock.info/research/reports/R7633/R7633-masaka2.pdf Accessed 13 December 2007.

Davenport, T. H. and Prusak, L. 1998. *Working knowledge: how organizations manage what they know.* Boston: Harvard Business School Press.

Ghatak, S. 2007. Brief note on ICTs. Available at: http://topics.developmentgateway.org/poverty/rc/filedownload.do~itemId=1098665 Accessed16 March 2009.

Joia, L. A. 2000. Measuring intangibles corporate assets: linking business strategy with intellectual capital. *Journal of Intellectual Capital* 1 (1): 68-84.

Leedy, P. D. and Ormrod, J. E. 2005. *Practical research: planning and design*. 8th ed. New Jersey: Pearson Education.

Lwoga, E.T. 2009. Application of knowledge management approaches and information and communication technologies to manage indigenous knowledge in the agricultural sector in selected districts of Tanzania. PhD. Pietermaritzburg: University of KwaZulu-Natal.

Lwoga, E. T. and Ngulube, P. 2008. Managing indigenous and exogenous knowledge through information and communication technologies for agricultural development and achievement of the UN Millennium Development Goals. In Njobvu, B. & Koopman, S. (eds). *Libraries and information services towards the attainment of the UN Millennium Development Goals.* pp. 73-88. Berlin: Walter de Gruyter.

Matovelo, D. S., Msuya, J. and de Smet, E. 2006. Towards developing proactive information acquisition practices among smallholder farmers for empowerment and poverty reduction: a situation analysis. *International Association of Agricultural Information Specialists (IAALD) Quarterly Bulletin* 51: 3-4.

Mchombu, K. J. 2003. Information dissemination for development: an impact study. *Information Development* 19 (2): 111-125.

Mosia, L. N. and Ngulube, P. 2005. Managing the collective intelligence of local communities for the sustainable utilisation of estuaries in the Eastern Cape, South Africa. *South African Journal of Libraries and Information Science* 71(2): 175-186.

Muyepa, F. 2002. The role of agricultural information in poverty monitoring in Malawi. Paper read at the Poverty Monitoring Stakeholders Workshop. Available at <http://www.sarpn.org.za/documents/d0000293/P288_Muyepa.pdf> Accessed 19 October 2007.

Nonaka, I., Toyama, R. and Konno, N. 2000. SECI, *ba* and leadership: a unified model of dynamic knowledge creation. *Long Range Planning* 33: 5-34.

Tanzania Commission for Science and Technology (COSTECH). 2005. ICT projects. Available at: http://www.costech.or.tz/ Accessed 6 March 2008.

Teddlie, C. and Tashakkori, A. 2009. *Foundation of mixed methods research: integrating quantitative and qualitative approaches in the social and behavioural sciences*. Thousand Oaks, CA: Sage.

Tire, M. 2006. An evaluation of the information dissemination mechanisms for small scale subsistence farmers. MA. Stellenbosch: University of Stellenbosch. Available at: http://ir.sun.ac.za/dspace/bitstream/10019/135/1/TireM.pdf Accessed 6 June 6 2007.

United Republic of Tanzania (URT). 2009. Budget Speech 2009/10 of the Ministry of Agriculture and Food Security. Available at: www.parliament.go.tz Accessed 6 August 2009.

Wafula-Kwake, A. K. and Ocholla, D. N. 2007. The feasibility of ICT diffusion amongst African rural women: a case study of South Africa and Kenya. *International Review of Information Ethics* 7. Available at: http://www.i-r-i-e.net/inhalt/007/03-wafula-kwake.pdf Accessed 6 March 2009.

World Bank. 2007. Enhancing agricultural innovation: how to go beyond the strengthening of research systems. Washington DC. Available at: http://siteresources.worldbank.org/INTARD/Resources/EnhancingAgInnovation ebook.pdf Accessed 6 March 2009.