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Accessibility of agricultural knowledge and information by rural farmers in Tanzania- A review

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Key words: Agricultural knowledge, Information accessibility, Research dissemination, Farmers research Network (FRN), Traditional communication methods (TCMs)

Abstract

Appropriate agricultural knowledge and information are among important tools in agricultural sector development in Tanzania. The traditional information flow is set to be moving from knowledge creating organs (KCOs) such as research institutions and universities to consumers of the knowledge (COKs) who are mainly farmers. To increase penetrability of the information, there exist a special category of information interpreters known as agricultural extension officers (AEOs). In this review, it has been found that despite the established information flow structure; there are poor linkages between KCOs, AEOs and COKs. There seems to exist a fact that the agricultural knowledge and information sourced from the KCOs are not uniformly distributed throughout the country and hence many small and marginal famers have poor access to the same. Enhancing agricultural knowledge and information accessibility will not only liberate farmers from the vicious cycle of poverty but will also lead to economic development of the nation which is largely depending on agriculture. A comprehensive literature review with critical analysis of the agricultural knowledge and information accessibility by rural farmers was conducted in order to identify i. Common agricultural needs among small holder farmers in rural areas of Tanzania ii. Important sources of agricultural knowledge and information accessibility iii. Strength and weakness of various knowledge and information sources and iv. Barriers in accessing agricultural knowledge and information among rural smallholder farmers. Furthermore, areas requiring critical research on how to improve agricultural knowledge and information accessibility among smallholder farmers have been identified for implementation consideration in Tanzania.

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Introduction

Agriculture is an important sector and it is regarded as the backbone of the economy in Tanzania. About 75% of the country's population, majority being smallholder farmers who are mostly concentrated in rural areas is employed in agriculture (Magesa *et al*., 2014; URT, 2009). Despite the recognized importance of agriculture sector, there seems to be less efforts devoted towards improvement of this sector in many African countries including Tanzania (Adomi *et al.*, 2003). Even when some efforts are done, access to correct information by small scale farmers seems to be unsatisfactory due to poor coordination of agricultural extension services (Daniel *et al*., 2013). There is therefore a need to consider proper and effective ways of information dissemination among rural farmers basing on their agricultural knowledge and information needs.

It is clear that there are other factors affecting agriculture sector such as unfavourable weather conditions (Sarris *et al*., 2006), pest infestation (Delate *et al.,* 2008; Grzywacz *et al*., 2014; Mwang'ombe *et al*., 2007; Shannag and Ababneh, 2007), drought (Levira, 2009) and low levels of input and poor market (Elly and Silayo, 2013), leading to increased poverty among farmers. However, all the factors mentioned above are accelerated by poor knowledge associated with lack of agricultural information among most of the poor rural farmers due to poor coordination between KCOs, AEOs and COKs. According to Bachhav, (2012) and Churi *et al*., (2012), farmers' access to agricultural information such as weather, good farming practices, pest management techniques and market information can help them in making informed decisions and hence improving their crops and animal production. In this review, it seemed imperative to the authors to explore about the accessibility of agricultural information and knowledge among the rural farmers so that the KCOs, AEOs and COKs can have a true picture of agricultural needs among small holder farmers in rural areas, important sources of agricultural knowledge and information accessibility, strengths and weaknesses of various knowledge and information sources and barriers in accessing agricultural knowledge and information among rural smallholder farmers in Tanzania. This is useful for bridging the gap that exist between agricultural knowledge creating organs and the consumers who are mainly farmers for increased information accessibility.

Agricultural knowledge and information needs

Information needs of an individual or group of people largely depends on their day to day activities, either for solving problems or for awareness. The need level may differ among different individuals or groups due to some factors such as geographical location, economic characteristics, education level, age, time, information source together with social (beliefs) and political (legal issues) factors (Kaniki, 2001; Msoffe and Ngulube, 2016). Information play an important role in decision making throughout human life (Achugbue, 2011; Edejer, 2000). In agriculture, information access is a powerful tool to increase farmers' awareness towards different agricultural developments and challenges and, in taking appropriate action for their livelihood (Ballantyne, 2005; Sarker and Itohara, 2009; Siyao, 2012). Timely and accurate information accessibility is capable of increasing efficiency as late or expired information will never affect performance (Durutan, 1999). Nevertheless, provision of information service should consider the need of the recipients and therefore, assessment of farmers' needs is necessary for provision of useful information. This will enable the policy makers, researchers and agricultural extension officers to meet the information needs of the farmers (Msoffe and Ngulube, 2016). Many efforts have been directed to agriculture sector including advanced scientific researches on various agricultural issues by the government and different NGOs (Yaseen, 2016) but this will never bear fruits unless the farmers are directly involved in the researches or through effective dissemination of the results (Fig. 1). Adomi *et al*., (2003) reported that most of the African countries have no efforts of disseminating agricultural knowledge and information to the rural areas where majority of the farmers are located. Farmers are not aware of much of the agricultural information that is

available in research institutions, universities, public offices and libraries due to weak linkages between KCOs, AEOs and COKs (Lwoga *et al.*, 2011). Despite the advancement of science and technology, current agricultural information needs by the rural farmers has increased compared with the past due to less government intervention in the sector and thus most of them are still under extreme poverty and live below poverty line (Elly and Silayo, 2013; Khan *et al.*, 2010; Shepherd, 2011).

Though information needs do differ among individuals or group of people, there are some agricultural information needs that are found to be common among the farming communities in Tanzania (Table 1). Pest and disease control together with production/farming methods, breeds/seed varieties and market information are the most demanded type of information by most of the farmers regardless of the farming type, whether crop farming or livestock keeping (Angello *et al.*, 2016; Elly and Silayo, 2013; Lwoga *et al.*, 2011; Msoffe and Ngulube, 2016; Mtega *et al.*, 2016; Ronald *et al.*, 2014). Table 1 also shows other agricultural needs reported by several researchers such as knowledge on climate/ weather conditions, use of agricultural inputs, soil conservation and irrigation, access to agricultural loans/credits and value addition. Other knowledge and information needs by small scale farmers (not included in the Table 1) include agricultural training, farming contract, outgrower's schemes, subsidies, ware house facilities (Elly and Silayo, 2013), weed control (Ronald *et al.*, 2014) and agricultural by-laws (Angello *et al.*, 2016). Similar agricultural knowledge and information needs have been reported by several studies from other counties. For example, a study by Odini, (2014) found about 80% of the farmers needed information about agricultural inputs, markets, good seed varieties, high yield crops, disease and pest control and fertilizer application methods. In Tanzania, the region where most of the studies to assess information needs by the smallholder farmers was conducted is Morogoro followed by Iringa (Table 1). In some regions, no such studies have been reported. It is obvious that farmers could have a better livelihood if they could access the needed agricultural information. Proper pest management and good farming practices using improved seed varieties can result unto high quality produce at large quantities and with good market information, farmers' income could raise tremendously (Kalusopa, 2005).

Table 1. Commonly preferred type of agricultural knowledge and information in Tanzania.

Study sites (Districts/ regions)	Agricultural knowledge and information needs										Reference
	Pest and disease control	Markets	Farming/ production methods	Breeds/ seed varieties	Climate/ weather conditions	Inputs use	Soil conservation	Irrigation system	Credit/ loans	Value addition	
Morogoro and Dar es Salaam	✓	✓	✓	✓					✓		Angello *et al.* (2016)
Karagwe, Kasulu, Kilosa Moshi rural, Mpwapwa and Songea rural	✓	✓	✓	✓			✓	✓	✓	✓	Lwoga *et al.* (2011)
Iringa rural, Mvomero, and Morogoro rural	✓	✓	✓	✓							Msoffe and Ngulube, (2016)
Kilombero	✓	✓	✓	✓		✓					Mtega *et al.* (2016)
Kilombero	✓	✓	✓	✓	✓	✓		✓	✓		Ronald *et al.* (2014)
Iringa rural	✓	✓	✓	✓	✓	✓	✓		✓	✓	Elly and Silayo, (2013)
Same		✓			✓	✓					Churi *et al.* (2012)

Sources used to access agricultural knowledge and information by rural farmers

Agricultural knowledge has a direct link to agricultural information through Data → Information → Knowledge hierarchy (Frické, 2009). This means that knowledge is filtered from information. In order to correctly reach clients, selection of an appropriate information source/channel is key for effective communication. However, some information sources regardless of their importance are not uniformly distributed throughout the country and hence some farming communities can be more privileged and become more knowledgeable compared with others (Mtega *et al.*, 2016). For instance, Adhiguru *et al.*, (2009) pointed out that small and marginal famers have poor access to agricultural knowledge and information from the few information sources available compared with farmers found in more accessed areas with many information sources.

There are different information sources that farmers can access. Lwoga *et al.* (2011) reported that the local sources such as friends, neighbor and family are predominantly used followed by public extension officers. This is also expanded by Elly and Silayo, (2013) who also reported interpersonal communication and social gathering to be the leading sources of communication, followed by farmers group and village leaders. Similar trends of findings have been observed in Tanzania by Magesa *et al.* (2014); Msoffe and Ngulube, (2016) and Ronald *et al.* (2014) where fellow farmers were found to be the most common source of information. From the literatures surveyed, most commonly used information sources with high percent of users (60-95%) were fellow farmers (family, friends, neighbours) and extension officers followed by printed media such as handouts, books, posters, newspaper and electronic media such as radio, television and mobile phones (Table 2). Interestingly, it seems clearly that this type of information source trend is not only so in Tanzania, but also in other countries, for instance Yaseen *et al.* (2016) also points neighbours, friends and relatives as the first primary source of information followed by agricultural extension officers.

Other studies by Olajide, (2011) and Soyemi, (2014) in Nigeria and Achia, (2002) in Uganda similarly found fellow farmers, extension agents, friends, and radio as the most commonly used information sources for farmers. A comprehensive summary of information sources originated from analysis by several authors in Tanzania is as shown in Table 2.

Table 2. Agricultural knowledge and information sources in Tanzania.

Location	Agricultural knowledge and information sources										
District/ region	FF	PEO/VL	FG/SG	VM/S	R/DP	PM	EM	L/IC	AE	AIS	References
Hai, Kilosa	✓	✓					✓			✓	Isaya *et al.* (2016)
Kilombero	✓	✓	✓		✓	✓	✓				Mtega *et al.* (2016)
Morogoro and Dar es Salaam	✓	✓		✓		✓			✓	✓	Angello *et al.* (2016)
Iringa rural	✓	✓	✓			✓	✓	✓	✓	✓	Elly and Silayo,(2013)
Karagwe, Kasulu, Kilosa Moshi rural, Mpwapwa and Songea rural	✓	✓	✓	✓	✓	✓	✓		✓	✓	Lwoga *et al.* (2011)
Iringa rural, Mvomero, and Morogoro rural	✓	✓			✓	✓	✓				Msoffe and Ngulube, (2016)
Kilombero	✓	✓	✓			✓	✓	✓			Ronald *et al.* (2014)
Kilosa, Mvomero and Hai				✓		✓	✓				Magesa *et al.* (2014)

Location	Agricultural knowledge and information sources										
District/ region	FF	PEO/VL	FG/SG	VM/S	R/DP	PM	EM	L/IC	AE	AIS	References
Kyela, Songea rural and Morogoro rural	✓	✓			✓						Daniel *et al.* (2013)
Same	✓	✓					✓				Churi *et al.* (2012)

KEY: FF = Fellow farmers, PEO/VL = Public extension officers/ village leaders, FG/SG = Farmer groups/ social gatherings, VM/S = Village meeting/ seminars, R/DP = Researchers/ demonstration plots, PM = Printed media, EM = Electronic media, L/IC = Library/ Information centres, AE = Agricultural exhibitions, AIS = Agricultural input supplier.

Table 3. Strength and weaknesses associated with various information sources in Tanzania.

Information source	Strength	Weakness	Reference
Printed materials	>Doesn't require power/ electricity, >Easy to handle >Effective to literacy people >Less expensive	>Not usually timely accessed (unavailable) >Inappropriate to illiteracy individuals >Language problem >Outdated, unreliable or inaccurate information >Common only in urban areas eg news paper	Aina, (2006); Dutta, (2009); Momodu, (2002); Ozowa, (1995); Lwoga *et al.* (2011); Mtega *et al.* (2016)
Electronic devices	>Quick to access eg cell phone >Effective at rising awareness eg radio, television	>Require electricity >Lack of adequate equipment and resources such as internet, computer, photocopier >Expensive >Lack of skill/ experts >Not interactive eg radio >Difficult in timing eg TV and radio	Aina, (1991); Dutta, (2009); Kalusopa, (2005); Lwoga *et al.* (2011)
Fellow farmers	>Cheap >Easily accessed >Interactive	>Sometimes may lead to irrelevant, outdated or wrong information	Churi *et al.* (2012); Lwoga *et al.* (2011); Olajide, (2011); Yaseen *et al.* 2016
Extension officers/ village leaders	>Familiarity with farmers >Interactive >Less expensive >Practical information	>Some are less responsible >Inadequate number of extension officers >Require frequent training for their efficiency	Aina, (2006); Sinika and Mdoe (2001); Lwoga *et al.* (2011); Siyao, (2012); Mtega and Benard, 2013
Village meeting or seminars	>Interactive and participatory >Organized at appropriate time >Information likely to be accurate	>Time consuming >Require commitment by each individual >Sometimes poorly attended and gender biased	Ozowa, (1995); Siyao, (2012)
Libraries/ Information centers	>Easily accessed regardless of individual status >Less expensive	>Distance factor >Inadequate, mostly found in regional headquarters >Poor information update >Inappropriate to illiteracy individuals	Siyao, (2012); Mtega and Benard, (2013); Mtega *et al.* (2016)
Input suppliers	>Give instructions on inputs use hence reduce language barriers to buyers	>May focus on selling/ profit rather than the reality	Elly and Silayo,(2013)

Barriers in accessing agricultural knowledge and information

One of the least expensive input for improved agricultural productivity in rural farmers is accessibility of accurate and timely agricultural knowledge and information (Blait, 1996). Many rural farmers lack access to useful knowledge and information that could help them to perform at high levels of success in terms of agricultural productivity, thereby improving their livelihood (Galadima, 2014). Consequently, they are not only groping in the dark but also unknowingly destructing the environment with the associated biodiversity (Moyo *et al.*, 2006; Prakash *et al.*, 2008). There are many technological information and innovations continuously happening in agriculture sector but many farmers are still relying

on older technologies which are poor and not environmental friendly as a result of poor knowledge and information. Despite the availability of so many information sources, there are several factors that limit the accessibility of agricultural knowledge and information in rural areas which requires research attention.

Illiteracy

Illiteracy that is accompanied with inability to read and write is among the major barrier in information accessibility especially through printed media (Tologbonse *et al.*, 2008; Mbozi, 2002). The percentage of illiteracy in Africa countries is very high compared with other countries in the world and therefore, using printed material as an information source among African famers such as those in Tanzania is a challenge (Dutta, 2009). Similarly Aina, (2006) found that some farmers cannot use printed materials due to inability to read and write. Even for literate people, printed information materials are still a challenge since they are not usually accessed at an appropriate time (Ozawa, 1995). Therefore, understanding the literacy level of the farmers is important in designing of information packages.

Cost and lack of resources

Some information sources are not accessible due to lack of resources such as electricity, batteries, computer, photocopier and internet together with the associated cost (Siyao, 2012). In addition, poor radio and television signals together with untimely broadcasting of information during working hours is reported to be among the challenges in information accessibility especially through these devices (Obidike, 2011). Apart from the poor signals, limited number of radio and television sets are sited as among the factors hindering flow of information among African farmers (Aina, 1991). A study by Mtega and Benard (2013) about the state of rural information and communication services in Tanzania found that, lack of electricity together with high cost of Information and Communications Technology (ICT) have limited the accessibility of information services among rural farmers.

Inadequate extension officers

Extension officers are reported by several researchers to be among the useful agricultural knowledge and information providers (Angello *et al.*, 2016; Elly and Silayo, 2013; Isaya *et al.*, 2016; Lwoga *et al.*, 2011; Msoffe and Ngulube, 2016; Mtega *et al.*, 2016; Ronald *et al.*, 2014). However, farmers are always dissatisfied by their service due to several factors, one being the inadequate number of them thus unable to provide the required service to all customers timely (Aina, 2006; Isinika and Mdoe, 2001; Mtega *et al.,* 2016; Siyao, 2012). Lwoga *et al.* (2011) also reported that farmers are usually dissatisfied with the frequency of interaction by the extension officers, the reason being low ratio of the extension officers to farmers. Daniel *et al.* (2013) reported extension-farmer ratio to be 1: 469 in Songea, 1: 617 in Kyela and 1: 1320 in Morogoro rural. It is obvious the extension officers do not meet the demands of their farmers in Tanzania.

Aina, (2006) pointed out that some farmers may stay even for five years without coming into contact with the extension officers, thus they are denied of getting information when required. Apart from fewer number of extension officers, the general observation is that some villages are completely lacking the extension services and even those with few extension officers, not all the farmers are reached (Daniel *et al.*, 2013). An alternative way to address the challenge of fewer extension officers is suggested by Sanga *et al.* (2013) who showed the possibility of using few extension officers to serve a larger group of farmers with minimum efforts by incorporating information and communication technologies (ICTs) in the conventional agricultural extension service system.

Another reason for the poor performance of the agricultural extension officers may be lack of in-service training to increase their knowledge and skills for effective transfer of information. Only few cases such as that of a study by Daniel *et al.* (2013) in Morogoro, Kyela and Songea who found that, the extension officers attained training on the new technologies through on-the-job training within and outside the districts.

Apart from in-service training, it has been reported that the extension officers have little relevant research findings to disseminate to the farmers (Due *et al.*, 1987) due to poor linkages between research institutions and extension agents. There is a need to bridge the gap that exist between the research institutions and extension agents for effective dissemination of the research findings to the farmers. An alternative way is to conduct the researches through an active involvement of the farmers as suggested in Fig. 1.

Inadequate libraries and information centers

Libraries and information centers are very few mostly located in regional headquarters far from farmers' vicinity (Siyao, 2012). In this case, distance factor is considered as the main barrier for accessing information from library and other information centers among most of the rural farmers. Despite the fact that the libraries are considered as public service agency in provision of information regardless of the individual status, there is still no evidence whether the libraries are either directly or indirectly providing information to farmers in Africa (Aina, 2006). A study conducted in Nigeria found that only 5% out of 258 farmers obtained agriculture information from library (Aina, 1985), a situation which might be similar in Tanzania. A study by Issak, (2000) found that most libraries in African countries except in South Africa and Botswana were stagnant and at deteriorating condition because of financial constraints. This is because most of these countries relied on donated material which in most cases are irrelevant in African settings (Niskala, 2008). Kantumoya, (1992) reported the need to form community information departments that will liaise with the ministry of agriculture and collect and repack the useful information for dissemination to farmers.

However, Niskala, (2008) reported that the strongest relationship between the public library users and socio economic characteristics was the individual education level. Other mentioned demographic factors to be among barriers of information accessibility are such as age, gender, marital status, occupation, income level and physical location (Niskala, (2008). This being the case, it is obvious most of the rural farmers in Tanzania will rarely use library as an information source since most of them have low level of education and less familiarized with libraries.

Lack of reading habits

Sometimes information sources may be there, but a challenge is how to get people use such type of information. For instance, even if libraries will be available in the vicinity of farmers, if the reading habit is lacking among them such information and knowledge resource will be useless. Niskala, (2008) pointed out that reading habit and library use depends much on the individual background, whether or not the individual used to access information from library before. Comparing this findings with the real situation of Tanzania rural farmers where reading resource centers like library are very rare, there is no doubt that these farmers will be less likely reading different information sources.

Lack of awareness of the existence of information sources

Some farmers are not aware of various agricultural knowledge and information sources available in their areas. A study by Tologbonse *et al.* (2008) found ignorance of information sources as among the constraints towards agricultural information accessibility. The other constraints are reliability of information sources, outdated information, relevance and usefulness of information, availability of information and presentation/poor format of information. Ronald *et al.* (2014) found major constraints in accessing agricultural information among the farmers to be poor information availability, poor reliability, lack of awareness of information sources available among farmers and untimely provision of information.

Gender

Women are denied of accessing agricultural knowledge and information due to social and family responsibilities. They are busy throughout the day thus unable to access some information sources such

as libraries, village meetings, seminar, and even the printed media due to time limit (Mtega *et al.*, 2016). Matovelo, (2008) pointed out that men and women have different knowledge and information needs and ability to access also differs among them. This is also associated with culture and religious taboos especially in African settings where women always fall under disadvantaged group. Gender biasness has also been observed when the extension agents visit farmers by focusing mainly to male farmers rather than women farmers who constitute a substantial proportion of agricultural labour force (Aina, 2006). It has been documented that female headed households which accounts about 30% of small holder faming households are never visited by male extension officers due to some traditional constraints (Due *et al.*, 1996). It is well stated in FAO (2010-2011) report that women have less access to agricultural knowledge and information, training, extension services, agricultural assets and to rural employment opportunities. It doesn't sound well to see women who are the main contributors to the rural economy of all developing countries have lesser access to agricultural knowledge and information compared with men (Isaya *et al.*, 2016; Oyeniyi and Olofinsawe, 2015). One of the strategies that was considered in the past years to overcome this challenge was to hire more female extension officers compared with male (Due *et al.*, 1987). However, there is no clear information to what extent this strategy has been successful. It is therefore necessary to think about gender issues when considering information accessibility among rural farmers.

Several other factors (Table 4) have been reported to be responsible in limiting information accessibility including institutional, societal, psychological, physical factors and intellectual factors (Ellen, 2000).

Table 4. Factors limiting information accessibility in rural communities in Tanzania.

Factors	Description	Way forward
Institutional factors	Unwillingness or poor information dissemination	Linkage between research institutions and farmers
Societal factors	Believes/ fear that block information needs within the society	Breaking societal barriers through education
Physical factors	Inability to contact the appropriate information providers due to some physical factors	Improving information infrastructure and extending information services
Psychological factors	Individual barriers to perceive information needs	Seminars, demonstration plots to stimulate individual awareness
Intellectual factors	Lack of necessary training and expertise to acquire information	Education provision

Source: Ellen, (2000).

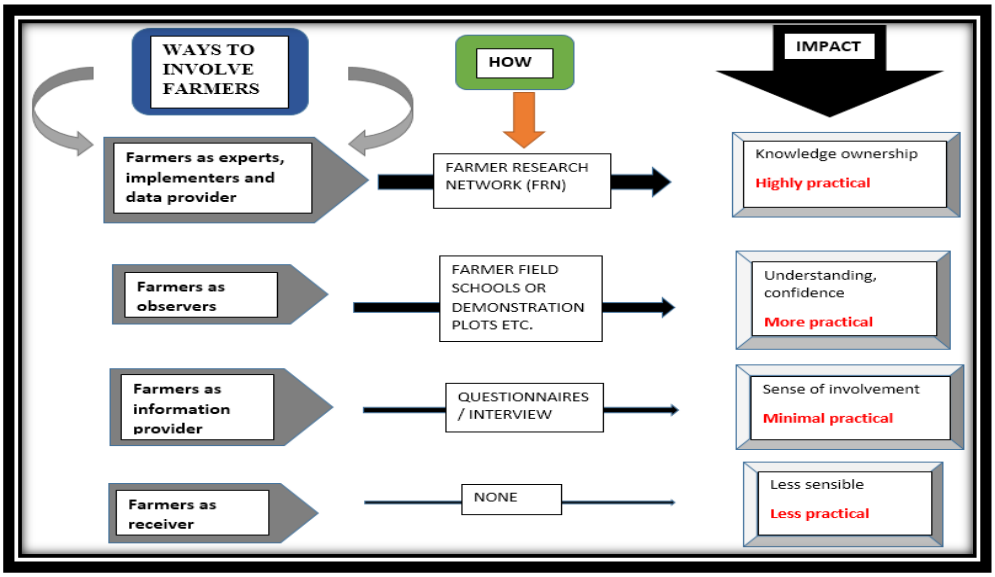

Fig. 1. Various ways to involve farmers in researches.

Effective research dissemination ways

There is lower application of various research findings which could otherwise have improved efficiency and productivity in agriculture sector. Lwoga *et al.* (2011) reported that much of the agricultural information that is available in research institutions, universities, public offices and libraries are not known to many farmers who are the main stakeholder in agriculture sector due to poor linkages between research, extension, and farmers together with separated research work from the actual farmers' needs. In this regard, several strategies have been established in order to break the existing gaps. Farmer Research Networks (FRN) approach is considered as a strategy for matching the diverse options and contexts in smallholder agriculture (Nelson *et al.*, 2016). FRN refers to the collection of farmer groups that engage directly in researches together with the researchers and development organizations. Fig. 1 below shows a gradual shift in the role of farmers from passive recipients to active participants in researches and associated impacts.

Traditional Communication Methods (TCMs)

Traditional communication methods (TCMs) refers to information dissemination ways through the use of material and nonmaterial means native to a particular local community (Olanrewaju and Farinde, 2014b). TCMs include various culturally oriented media employed in the exchange of information for mutual understanding between the communicating parties (Olanrewaju and Farinde, 2014a). Apart from FRN and FFS, the results from various researches can be communicated among the rural farmers through the local channels especially the TCMs. Currently, information dissemination have become digitalized with the use of Information Communication Technology which might not necessarily be useful to most of the rural farmers due to lack of internet facilities and power (Olanrewaju and Farinde, 2014b). However, there are various traditional songs and instruments which play an important role in information dissemination among the society including myths/tales, story-telling, songs, proverbs, riddles, religious rituals, drama, puppet show, poetry, dance and theatrical elements, as well as ornaments depicted on pottery, textiles and wood (Chiovoloni 2004; Haliso and Ajayi, 2014). The modes of communication include formal and informal, regular and irregular, ritualistic mode of communication, recreational and symbolic modes of communication and are normally passed down from one generation to the other. A study by Olanrewaju and Farinde (2014b) confirmed the use of songs and drums to pass on a wide range of messages in an entertaining way. This is in agreement with the findings by Ajayi (2004), who also found the use of drums in combination with songs and proverbs as effective ways of information dissemination in traditional society. The fact that TCMs are largely horizontal in nature and use oral rather than written cues, they are highly interactive cultural resources that can effectively deliver any agricultural knowledge and information to a particular community. Despite this possibility, there is inadequate attention to the use of TCMs for disseminating agricultural information among the rural farmers. There is a large pool of new agricultural knowledge and technologies which are yet to be disseminated to farmers in remote areas due to lack of appropriate information dissemination channels (Apata and Ogunrewo, 2010). The researchers and other agricultural officers should consider the potential of using TCMs in addition to FFS and FRN in order to accelerate the pace of disseminating the research findings and other agricultural information among rural farmer communities.

Conclusion and recommendations

Agricultural knowledge and information accessibility among farmers is one of the most important and least expensive input in agriculture sector. However, there is infrequent contact between extension agents and the farmers and in most cases the extension services are provided in verbal instructions rather than field practical. This review has outlined the strength and weaknesses associated with various information sources and recommends more innovative and effective ways of disseminating research information to the farmers including farmer field schools (FFS) and farmer research networks (FRN).

In addition, TCMs are other options of disseminating a wide range of information in an entertaining way to a particular local community. Awareness about good farming practices, disease and pest control, good seed/breed varieties together with other important information will increase the quality and quantity of the agricultural product among the farmers.

References

Achia R. 2002. Rural Women's Access to Agricultural Information in Uganda'. African Gender. Institute Newsletter 4**,** 11.

Adhiguru P, Birthal PS, Kumar BG. 2009. Strengthen pluralistic agricultural information delivery systems in India. Agricultural Economics Research Reviews **22,** 71- 79.

Adomi EE, Ogbomo MO, Inoni OE. 2003. Gender factor in crop farmers' access to agricultural information in rural areas of Delta State, Nigeria, Library Review **52,** 388-93.

Aina LO. 1985. The Use of Librarians and Other Information Related Professionals in the Dissemination of Agricultural Information to Farmers in Nigeria. Nigerian Library and Information Science Review **3,** 49 -53.

Aina LO. 1991. Information for successful agriculture. World Libraries **2,** 49-53.

Aina LO. 2006. Information provision to farmers in Africa: The library extension service linkage. In World Library and Information Congress **72,** 1-7.

Ajayi B. 2004. The talking drum. In Understanding Yoruba life and culture, ed. M.N.O. Sadiku and P.A. Dopamu, 576–592. Trenton, NJ: Africa World Press Inc.

Angello C, Msuya J, Matovelo D. 2016. Assessing the information needs and information sources of urban and peri-urban livestock keepers in Kinondoni and Morogoro Urban Districts, Tanzania. Library Philosophy and Practice 1.

Apata TG, Ogunrewo JO. 2010. Analysis of traditional information dissemination and communication method among rural farmers. Evidence from traditional communities in Nigeria. In IAALD 13th World Congress, Scientific and Technical Information and Rural Development: Highlights of Innovative Practices, Montpellier, France, April **15,** 1-8.

Balit S, Calvelo Rios M, Masias L. 1996. Communication for development for Latin America, a regional experience. FAO, Rome Italy.

Ballantyne P. 2005. Managing agricultural information for sustainable food security and improved livelihoods in Africa. INASP Newsletter No. 28 (March).

Chiovoloni M. 2004. The interactive power of local and traditional communication systems. Ileia Magazine ***28,*** 1-4.

Churi AJ, Mlozi MRS, Tumbo SD, Casmir R. 2012. Understanding farmers' information communication strategies for managing climate risks in rural semi-arid areas, Tanzania. International Journal of Information and Communication Technology Research **2,** 838-845.

Daniel E, Bastiaans L, Rodenburg J, Center AR, Schut M, Mohamed JK. 2013. Assessment of agricultural extension services in Tanzania: A case study of Kyela, Songea Rural and Morogoro Rural Districts. Internship Report 1-45.

Due JM, Magayane F, Temu AA, Masumba J, Mjunguli R, Mtenga N, Ramadhani A. 1996. Smallholder farmers' perception of extension by gender in Tanzania. Sokoine University of Agriculture and University of Illinois, Morogoro, Tanzania and Urbana IL 1-32.

Due JM, Mollel N, Malone V. 1987. Does the T & V system reach female-headed families? Some evidence from Tanzania. Agricultural Administration and Extension **26,** 209-217.

Dutta R. 2009. Information Needs and Information-Seeking Behaviour in Developing Countries: A Review of the Research. The International Information & Library Review **41,** 44-51.

Edejer TTT. 2000. Disseminating health information in developing countries; the role of the internet. British Medical Journal **321,** 797- 800.

Ellen D. 2000. Telecentres and the provision of community based access to electronic information in everyday life (Doctoral dissertation, Department of Information and Communications in the Faculty of Humanities and Social Sciences, Manchester Metropolitan University).

Elly T, Epafra Silayo E. 2013. Agricultural information needs and sources of the rural farmers in Tanzania: A case of Iringa rural district. Library review **62,** 547-566.

Frické M. 2009. 'The knowledge pyramid: A critique of the DIKW hierarchy'. Journal of Information Science **35,** 131-142.

Galadima. 2014. Constraints on Farmers access to agricultural information delivery: A survey of rural farmers in Yobe state, Nigeria. Journal of Agriculture and Veterinary Science **7,** 18-22.

Haliso Y, Ajayi TB. 2014. New Approach to Information Dissemination Methods to Female Crop Farmers in Lagos State. International Research: Journal of Library and Information Science **4,** 316-328.

Isaya EL, Agunga R, Sanga CA. 2016. Sources of agricultural information for women farmers in Tanzania. Information Development
DOI: 10.1177/ 0266666916675016.

Isinika AC, Mdoe NSY. 2001. Improving farm management skills for poverty alleviation. The case of Njombe district. Mkuki na Nyota Publishers.

Issak A. 2000. Public libraries in Africa: A report and annotated bibliography. Oxford: INASP. Available online: www.inasp.info/ldp/libraries/PublicLibrariesInAfrica.pdf.

Joel C. 2015. Contribution of agriculture sector to the Tanzanian economy. American Journal of Research Communication **3,** 57-70.

Kalusopa T. 2005. The Challenges of Utilizing Information Communication Technologies (ICTs) for the Small-Scale Farmers in Zambia. Library High Technology **23,** 414-424.

Kamanula J, Sileshi GW, Belmain SR, Sola P, Mvumi BM, Nyirenda GK, Nyirenda SP, Stevenson PC. 2010. Farmers' insect pest management practices and pesticidal plant use in the protection of stored maize and beans in Southern Africa. International Journal of Pest Management **57,** 41-49.

Kaniki AM. 2001. Community profiling and needs assessment. 2001). Knowledge, Information and Development: an African Perspective. Scottsville, South Africa: School of Human and Social Studies, University of Natal (Pietermaritzburg) 187-199.

Kantumoya A. 1992. Public libraries and community information services in Africa. African Journal of Library, Archives and Information Science **2,** 33-38.

Khan GA, Muhammad S, Chaudhry KM, Khan MA. 2010. Present status and future preferences of electronic media as agricultural information sources by the farmers. Pakistan Journal of Agricultural Sciences **47,** 166-172.

Koul O, Walia S, Dhaliwal G. 2008. Essential oils as green pesticides: potential and constraints. Biopesticides International **4,** 63-84.

Levira PW. 2009. Climate change impact in agriculture sector in Tanzania and its mitigation measure. In IOP Conference Series: Earth and Environmental Science **6,** 37-42. IOP Publishing.

Lwoga TE, Stilwell C, Ngulube P. 2011. Access and use of agricultural information and knowledge in Tanzania. Library Review **60**, 383-395.

Magesa MM, Michael K, Ko J. 2014. Access to Agricultural Market Information by Rural Farmers in Tanzania. International Journal of Information and Communication Technology Research **4,** 264-273.

Mbozi P. 2002. Ground Up: Facilitating Networking and Sharing in sub-Saharan Africa, LEISA **18,** 13-15.

Momodu MO. 2002. Information Needs and Information-Seeking Behaviour of Rural Dwellers in Nigeria: A Case Study of Ekpoma in Esan West Local Government Area of Edo State, Nigeria, Library Review Journal **51,** 406-410.

Msoffe GE, Ngulube P. 2016. Information needs of poultry farmers in selected rural areas of Tanzania. Information Development **32,** 1085-1096.

Mtega W, Benard R. 2013. The state of rural information and communication services in Tanzania: a meta-analysis. International Journal of Information and Communication Technology Research **3,** 64-73.

Mtega WP, Ngoepe M, Dube L. 2016. Factors influencing access to agricultural knowledge: the case of smallholder rice farmers in the Kilombero district of Tanzania: original research. South African Journal of Information Management **18,** 1-8.

Nelson R, Coe R, Haussmann BI. 2016. Farmer Research Networks as a strategy for Matching Diverse Options and Contexts in Smallholder Agriculture. Experimental Agriculture 1-20.

Niskala R. 2008. The need and use of community library services in Namibia. Master thesis, Department of Information studies, University of Tampere 92.

Nyirenda SP, Sileshi GW, Belmain SR, Kamanula JF, Mvumi BM, Sola P, Nyirenda GK, Stevenson PC. 2011. Farmers' ethno-ecological knowledge of vegetable pests and pesticidal plant use in Malawi and Zambia. African Journal of Agricultural Research **6,** 1525-1537.

Obidike NA. 2011. Rural farmers' problems accessing agricultural information: A case study of Nsukka local government area of Enugu State, Nigeria. http://unllib.unl.edu/LPP/.

Odini S. 2014. Access to and use of agricultural information by small scale women farmers in support of efforts to attain food security in Vihiga County, Kenya. Journal of Emerging Trends in Economics and Management Sciences **5,** 100.

Olajide BR. 2011. Assessment of farmers' access to agricultural information on selected food crops in Iddo District of Oyo State, Nigeria. Journal of Agricultural & Food Information **12,** 354-363.

Olanrewaju KO, Farinde AJ. 2014a. Factors influencing use of traditional communication methods in information dissemination among farmers in Osun State, Nigeria. Journal of Agricultural & Food Information **15,** 54-68.

Olanrewaju KO, Farinde AJ. 2014b. The potentials of traditional communication methods in information dissemination: A case study of farmers in Osun State, Nigeria. Communication **40,** 361-375.

Oyeniyi DA, Olofinsawe AA. 2015. Access and use of Agricultural Information Resources by Rural Women of Akure North and South Local Government areas of Ondo State Nigeria. International Journal of Academic Library and Information Science **3,** 132-138.

Ozowa VN. 1995. The nature of agricultural information needs of small scale farmers in Africa: the Nigerian example. Quarterly Bulletin of the International Association of Agricultural Information Specialists **40,** 15-20.

Rajashekar Y, Bakthavatsalam N, Shivanandappa T. 2012. Botanicals as grain protectants. Psyche: A Journal of Entomology 1-13.

Ronald B, Dulle F, Honesta N. 2014. Assessment of the Information Needs of Rice Farmers in Tanzania: A Case Study of Kilombero District, Morogoro. Library Philosophy and Practice 1-34.

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 **9,** 80-99.

Sarker A, Itohara Y. 2009. Farmers' perception about the extension services and extension workers: The case of organic agriculture extension program by PROSHIKA. American Journal of Agricultural and Biological Sciences **4,** 332-337.

Sarris A, Savastano S, Christiaensen L. 2006. The role of agriculture in reducing poverty in Tanzania: A household perspective from rural Kilimanjaro and Ruvuma. FAO Commodity and Trade Policy Research Working Paper **19.**

Siyao PO. 2012. Barriers in accessing agricultural information in Tanzania with a gender perspective: the case study of small-scale sugar cane growers in Kilombero District. The Electronic Journal of Information Systems in Developing Countries **51,** 1-19.

Soyemi OD. 2014. Women Farmers' Agricultural Information Need and Search Behaviour in North Central Nigeria. Women **4,** 39-45.

Talukder FA. 2006. Plant products as potential stored-product insect management agents- A mini review. Emirates Journal of Agricuture Science **18,** 17-32.

Tologbonse D, Fashola O, Obadiah M. 2008. Policy issues in meeting rice farmers' agricultural information needs in Niger State. Journal of Agricultural Extension **12(2).**

United Republic of Tanzania (URT). 2009. Accelerating Pro-Poor Growth in the Context of Kilimo Kwanza. URT, Dar es Salaam, Tanzania 13-23.

URT. 2013. Tanzanian Agricultural Budget Report for the year 2012/2013. Dar es Salaam: Tanzania Government Printer.

Yaseen M, Xu S, Yu W, Hassan S. 2016. Farmers' Access to Agricultural Information Sources: Evidences from Rural Pakistan. Journal of Agricultural Chemistry and Environment **5,** 12.