Knowledge Management & E-Learning
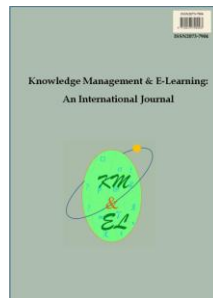
Awareness and use of Web 2.0 technologies in sharing of agricultural knowledge in Tanzania

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Abstract: The current study investigated the extent to which agricultural researchers and extension workers were aware of Web 2.0 technologies and put them into practice in their daily work. The study involved 107 respondents in the first phase and 148 in the second phase. Respondents were from agricultural research and training institutions as well as agricultural extension departments from selected districts across the country. Structured questionnaires were administered to selected respondents. Findings show that 43.9% of the respondents were aware of Web 2.0 while 56.1% knew nothing about this concept. Facebook and Wikipedia were found to be the most used Web 2.0 tools by many respondents while Delicious, Pbworks, Picasa and Digg were identified as among the less commonly used tools by majority of the respondents. The study recommends the need for providing appropriate Web 2.0 training packages to agricultural extension workers, researchers, trainers and other stakeholders in order to enhance knowledge sharing among them for improved agricultural productivity in the country.

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1. Introduction

Agriculture is regarded as the engine of development in most developing countries. The sector is known to employ majority of citizens, feed nations, and provide source of foreign currency. According to United Republic of Tanzania (URT, 2011), the agricultural sector in Tanzania employs 70-80 percent of the population and generates about 70% of rural household income. Moreover, URT (2011) describes the sector to account for 25.8% of Gross Domestic Product and 34% of exports.

In order to improve agricultural production, an edge on information related to efficient allocation of available resources, market and use of new or innovative farming practices is needed. Information is needed to help farmers to make decisions on input allocation; find appropriate markets for products; and determine the best post-harvest storage of products (Demiryurek, Erdem, Ceyhan, Atasever, & Uysal, 2008; Opara, 2008). Scholars (Chisenga, Entsua-Mensah, & Sam, 2007; Kalusopa, 2005; Ozowa, 1995) mention that agricultural information services needed by actors in the agricultural sector may include: agricultural innovations and developments; agricultural financial and marketing services; and extension services. When actors in the sector have adequate access to knowledge and information services, they usually have a potential to make rational decisions regarding agricultural production and post-harvest activities.

For creating a knowledge society, knowledge must be managed throughout the life cycle. The knowledge life cycle encompasses the capture, development, sharing and utilization of knowledge (Liao, Fei, & Chen, 2007). For knowledge to be useful, it must be transferred from where it is created or stored to where it is needed. For knowledge to be shared it must be understandable and available at a relevant time. Brachos, Kostopoulos, Soderquist, and Prastacos (2007) described knowledge sharing to be not limited to enhancing knowledge accessibility but rather being used by recipients leading into behavioural changes. Various communication channels and technologies facilitate knowledge sharing process.

In traditional communities, knowledge sharing fully relied on indigenous knowledge. This type of knowledge was generated by local communities and shared orally (Lwoga, 2010; Adam, 2007). To date, most Tanzanians depend on oral communication. Despite being useful, oral communication is known for message

distortion. Moreover, face to face communication cannot be used frequently for communicating research outputs as it is very expensive.

The print media was introduced to supplement oral communication. The history of the print media in Tanzania can be traced back to 1888 and 1890 when the newspapers were introduced (Sturmer, 1998). It was from them different information resources including research outputs were communicated through print media. Postal authorities were involved in transferring print resources to intended destinations. However, as stated by the Tanzania Posts Corporation (2013) the network of postal services in Tanzania is small and is limited to urban areas. This has limited most rural people from accessing agricultural research outputs through print resources.

The shortfalls of other technologies in communicating research outputs led to the use of Information and Communication Technologies (ICTs) in communicating research outputs. Currently, ICTs have gained a large dependency in information and knowledge management. To facilitate knowledge sharing, there must be a reliable and accessible Information and Communication Technology (ICT) infrastructure. ICTs used in knowledge sharing include telecommunications technologies such as telephone, cable, satellite and radio, mobile phones, as well as digital technologies, such as computers, information networks and software (Adam, 2007). When appropriately used, ICTs are known to facilitate linkages, collaboration and interactions among people thus enhancing gathering, storing, sharing and disseminating knowledge. However, attaining the fullest communication advantages of ICTs depends much on how the technologies are used.

ICTs are known to be suitable in linking agricultural research and other stakeholders. According to May, Karugia, and Ndokweni (2007), the technologies allow information to be accessed at any time during the week or day. The technologies can enhance participation and knowledge sharing among the poor; empower poor communities; and overcome social and economic exclusion. These technologies are also known to reduce costs associated with knowledge sharing. According to May, Karugia, and Ndokweni (2007), ICTs have a potential of replacing the traditional agricultural extension services' provision approach as it is expensive because it requires training staff, preparation, printing and dissemination of training material. Moreover, the approach is associated with the risk that messages may become distorted when they are eventually conveyed.

Currently, the Web 2.0 tools have changed the way knowledge is shared. According to Murphy (2010), the original internet applications represented a typically passive, uni-directional flow of information to users; the way in which contents were chosen, presented and deployed was driven by the developers. Murphy (2010) describes Web 2.0 tools to be user-centred, allow a high degree of customisation, allow users to quickly and easily add and remove content, contribute to the application's content, and facilitating social networking opportunities.

Despite the promising potential of Web 2.0 for facilitating knowledge creation, sharing and collaboration among various practitioners, little is known on the extent of awareness and usage of Web 2.0 in Tanzania. The study assessed the Web 2.0 tools awareness among agricultural researchers, tutors and extension workers; identified the commonly used Web 2.0 tools; investigated how the tools were used; assessed the roles and perceived usefulness of Web 2.0 tools in agricultural knowledge management; and assessed the impacts of the Web 2.0 training workshops on adoption and usage.

2. Literature review

2.1. Web 2.0 tools and social networking

Web 2.0 is the second generation of the World Wide Web. Web 2.0 is a site which encourages user generated content in the form of text, video, and photo postings along with comments, tags, and ratings (Cormode & Krishnamurthy, 2008). Through Web 2.0 tools, internet based virtual communities can collaborate and interact. It is through these tools people from some online social networks influenced by some social ties among community members. Kuss and Griffiths (2011) mention some of the important features of Web 2.0 including the users as first class entities in the system, ability to form connections between users and ability to post content in many forms. Moreover, Web 2.0 is both a platform on which innovative technologies have been built and a space where users are treated as first class objects.

Web 2.0 differs from Web 1.0 as the content creators were few in Web 1.0 with the vast majority of users simply acting as consumers of content while in Web 2.0 any participant can be a content creator (Cormode & Krishnamurthy, 2008; Murugesan, 2007; Kuss & Griffiths, 2011). Web 2.0 is a read and write web; it is not a static page as it facilitates sharing of contents, participation, collaboration and interactions.

Web 2.0 has various tools; some of the commonly used include Facebook, Wikis, Blogs, Google Docs, Flickr and Twitter (some few to mention). These tools carry the potential of complementing, improving and adding new collaborative dimensions to the many Web-based services (Tambouris et al., 2012; Boulos, Maramba, & Wheeler, 2006). Murugesan (2007) describes Web 2.0 tools to facilitate a two way Web-based communication process. The tools facilitate sharing of multimedia contents including graphics, texts and video files.

The Web 2.o tools also enhance the web-based collaborative-authoring (or content-management) thus facilitating creating and editing contents (Murugesan, 2007; Salajan & Mount, 2012). These technologies further allow for collaborative writing, content sharing, social networking, social bookmarking and syndication (Tyagi, 2012; O'Reilly, 2007). Among the Web 2.0 tools, social networks enhance the formation of online social communities and provide users with the technology to both produce and distribute information within communities of practice. Usluel and Mazman (2009) describe the networks to support collaboration, knowledge sharing, interaction and communication of users from different places who come together with a common interest, need or goal. Web 2.0 tools facilitate the media sharing and manipulation; data/Web mash ups; instant messaging; chat and conversational arenas; online games and virtual worlds; social networking; and blogging (Tripathi & Kumar, 2010). Generally, the tools have a potential of enhancing learning and teaching, collaborative authoring and marketing.

The uptake of Web 2.0 tools depends much on the level of awareness created to intended users. Usefulness and benefits associated with the use of these tools should be known for one to adopt a particular technology. According to Collins and Hide (2010), the awareness of Web 2.0 is related to scholarly communications practices. Extension workers, researchers and tutors who are used to do their tasks collaboratively are more likely to be aware of the tools than others. Collins and Hide (2010) found other factors influencing awareness on Web 2.0 to include age and sex of the user. Young people are likely to be more aware about the tools than the old ones. On the other hand, males are likely to be more aware about Web 2.0 tools than females. However, as described by

Usluel and Mazman (2009), the potential advantages and ease of use of Web 2.0 technologies facilitate the adoption and usage of these tools.

2.2. Web 2.0 tools in knowledge management

Knowledge management involve the creation, manipulation, storage and sharing of knowledge among people in a community of practice. Knowledge management manages the knowledge flows in an organization (Hislop, 2013). To enhance organizational performance, knowledge management strategies must be incorporated and implemented so that the organization attains a competitive edge. According to Paroutis and Saleh (2009), organizations are supposed to manage knowledge appropriately in order to easily meet their goals that the need for knowledge management technologies is important. Paroutis and Saleh (2009) point out further that among the technologies that can facilitate knowledge management are the Web 2.0 tools. These technologies enhance knowledge management and usually involve more people in knowledge creation process as they allow multiple people to collaborate when creating knowledge (Majchrzak, Wagner, & Yates, 2013).

Among the Web 2.0 tools mentioned to facilitate the knowledge creation process are the Wikis, Google Docs and Blogs. Wikis facilitate collaboration and participation in knowledge creation and is supported by an open model of knowledge creation and communication (Avci & Askar, 2012; Grace, 2009). The tool promotes co-authorship in knowledge creation process and limit costs associated with physical meetings as a group can work together within a virtual environment.

Wikis facilitate knowledge creation, storage and sharing. A wiki is a website that allows anyone to add content and allows users to freely create and edit web page content and facilitate collaborative authoring (Avci & Askar, 2012; Murphy, 2010). Among the commonly used wikis are the Wikidot, Mediawiki, PBWiki, Wikispaces, and the Wikipedia. Wikis are characterized by simplicity, accessibility, interoperability and having some functionality of a word processor and a web browser (Sajja & Akerkar, 2012; Chu & Kennedy, 2011). These features make wikis an appropriate online platform for knowledge creation through co-authoring and a suitable tool for knowledge sharing. Wikis provide online storage space and allows archiving of created documents that Wiki users may have access. They have features which support file upload and download thus facilitating sharing of knowledge. Moreover, wikis support discussions, allow moderators to add users and trace what is being shared.

Google Docs is another Web 2.0 tool for knowledge management. It is one of the services provided by Google. Scholars (Chu & Kennedy, 2011; Murphy, 2010) describe Google docs to allow users to create word-processing, spread sheet and presentation applications that are web-hosted and can be remotely accessed by any authorized user. Moreover, documents can be edited simultaneously by multiple users, stored in an online storage space and shared through some appropriate features.

Google forms allows production of a survey with a limited set of question types, immediately pushes survey responses into a Google spread sheet that can be published on the Internet (McLoughlin & Lee, 2007). Google forms may be very useful among researchers as they may contribute largely to knowledge creation as people's opinions and understanding can be collected and combined before being shared for use.

Blogging is another innovative and inexpensive form of ICT used internationally to improve public access to information and opinion (The World Bank, 2011). The tools provide space to express personal views or experiences and give readers the opportunity

to learn from first-hand accounts and edit or add contents thus contributing to knowledge creation. According to Merilehto (2010), blogs facilitate the spread and sharing of knowledge quickly.

Generally, Web 2.0 tools have the potential for knowledge management. They are suitable for electronic research, knowledge creation, storage, sharing and usage. They provide a suitable platform for sharing innovations and electronic learning. The tools can limit costs associated with physical meeting as they enhance virtual collaborations. However, usage of Web 2.0 tools requires skills and internet connectivity. Thus, Web 2.0 tools facilitates networking, sharing information, commenting on published outputs and documenting and sharing experiences.

2.3. Factors influencing adoption and usage of Web 2.0 tools in knowledge management

The adoption and usage of Web 2.0 tools depends on a number of factors. According to Procter et al. (2010), adoption and usage of Web 2.0 tools are much influenced by the age of potential users. Most young people can easily adopt and use Web 2.0 than adults. This is much contributed by the eagerness to learn new technologies the youth. Procter et al. (2010) point further that the extent to which researchers are engaged in collaborative research activities can also influence the rate of adoption and usage of Web 2.0 tools. Researchers from different locations working on the same project are more likely to adopt and use Web 2.0 tools. The tools will minimize some costs which could be incurred if the team could meet physically for discussions. However, as stated by Schlenkrich and Sewry (2012), some people avoid using Web 2.0 tools due to lack of privacy and security while others consider them to have information with low quality.

Adoption and usage of Web 2.0 also depends much on the literacy level of using the tools. Raeth, Urbach, Smolnik, Butler, and Königs (2010) describe adoption and usage of Web 2.0 to depend much on training, communication, and advocacy aiming at awareness creation on the usefulness of the tools. Collins and Hide (2010) further point out that gender has an influence on the rate of adoption and usage of Web 2.0 tools. Collins and Hide (2010) conducted a study which involved 12,000 researchers in the United Kingdom; they found that more males than females used the Web 2.0 tools. This was mentioned to be influenced by attitudes towards the tools and the availability of alternative ways to form networks. The same study identified that younger researchers adopted and used Web 2.0 tools more than the older ones. This was explained by the fact that old researchers already had some networks and rarely needed Web 2.0 tools for making one. Other factors including the technology self-efficacy, access to technology itself and the perceived usefulness can equally influence adoption and usage of Web 2.0 tools. However, some of the factors influencing adoption and usage of Web 2.0 tools in knowledge management may depend much on locality and field of study. This study was set to identify such factors and assess their impact in knowledge management.

3. Research methodology

This study was conducted in two phases: the baseline survey in the first phase and the impact assessment survey in the second phase. It involved five out of the seven agricultural zones in Tanzania. The five zones included in the study were randomly selected while regions and districts closer to research institutes were purposively selected. The selected zones included the Eastern, Northern, Lake, Southern Highlands and the

Southern zones. Arusha, Mbeya, Morogoro, Mtwara and Mwanza regions were purposively selected because each hosted an agricultural research institute. As used in this study a "zone", is comprised of several administrative "regions", and regions are comprised of several "districts".

The baseline study in the first phase intended to determine the Web 2.0 awareness and level of usage among agricultural research and extension staff. The study was conducted for identifying the Web 2.0 training needs among agricultural researchers and extension staff. A survey was employed in investigating the awareness and usage of Web 2.0 tools for knowledge management among agricultural researchers and extension agents in Tanzania. A convenient non-probability sampling was used in selecting agricultural researchers and extension workers to be included in the study. The choice of this sampling technique based on the fact that agricultural researchers and extension workers were hardly found in their job stations. This is due to the nature of the jobs. Therefore, the study involved all respondents who were found in their work stations and were ready to participate in the survey. Using self-administered questionnaire data was collected from a total of 33 (30.84%) agricultural extension staff and 74 (69.16%) researchers. Of all the respondents, there were 34 (31.8%) females and 73 (68.2%) males.

After the baseline study, a series of training workshops were arranged and conducted to meet the identified Web 2.0 training needs. This was followed by the impact assessment study in the second phase which aimed at assessing the impacts of training workshops on usage of Web 2.0 tools for sharing agricultural knowledge. The impact assessment was conducted six months after the training workshops; it involved all 148 respondents who attended the training. The survey employed purposive random sampling technique as only workshop beneficiaries were involved in the study. Structured questionnaires were used for data collection.

Data collected were analysed by the Statistical Package for Social Sciences (SPSS version 18) where descriptive analysis was run to show how some factors that influenced adoption and usage of Web 2.0 tools in knowledge management among agricultural researchers and extension staff. Moreover, descriptive statistics (frequency distribution and cross tabulation) was used to determine the awareness of Web 2.0 among respondents and most used tools for knowledge management. Frequency distribution and cross tabulation tables were used for presenting results.

4.   Findings and discussion

The study involved both male and female agricultural extension staff and researchers (see Table 1 for details). Among them, majority were in the 45 to 54 age group. This reflected that these people have been working in agricultural research institutes and extension services for some years. It can also be seen that majority of the respondents were graduates with bachelors, masters or PhDs. This shows the potential these people have for developing new innovations and technologies needed for transforming the agricultural sector and rural livelihoods in Tanzania.

It was found that majority of the respondents (60.7%) had more than 10 years in service. Others (26.2%) had less than five years in service while 13.1% had working for five to 10 years. This implies that majority of the respondents have been involved in either creation of new agricultural knowledge and innovations or communication of created knowledge for some years. It equally implies that those who have worked for more years are more likely to have developed some networks they have been using in creating and communicating knowledge over the years.

Table 1
Profile of the respondents

Sex	Frequency	Percent
Female	34	31.8
Male	73	68.2
Age (years)		
25-34	25	23.4
35-44	19	17.6
45-54	46	43.0
55 and above	17	15.9
Education level		
Diploma	29	27.1
Bachelor degree	35	32.7
Master degree	35	32.7
PhD	8	7.5

4.1. Use of Internet services among agricultural researchers and extension staff

Respondents were asked whether they have been using internet services. It was found that almost all respondents (96.3%) have been using internet services (see Table 2 for details). This indicates that internet services have been spread throughout the country as the respondents came from different agricultural zones. It also indicates that internet services can be used for knowledge creation and sharing.

Table 2
Usage of internet services

Response	Have used internet	
	Frequency	**Percent**
Yes	103	96.3
No	4	3.7
Total	**107**	**100.0**

Respondents were further asked on where they accessed internet services. It was found that majority of the respondents (68.2%) used laptop modem. Among the services provided by mobile phone service providers was the internet service was accessed through internet bundles. Most of those who used internet services accessed such services through mobile phone providers because of the fast growing mobile phone infrastructure in Tanzania. Others, 59.8% accessed internet services from their offices while 54.2% had to visit internet cafes for accessing the service. Most agricultural research and extension institutions in Tanzania are located in urban area where most internet cafés are found. It was in the cafés they accessed different types of internet services. Moreover, few others (29.9%) accessed internet services through their mobile phones.

The availability of multiple internet access points among agricultural researchers and extension staff explained the potential of internet services in knowledge creation and sharing. The same status was found in Vietnam where Nguyen and Barrett (2006) discovered access to internet services promoted knowledge creation and sharing. Based on Nguyen and Barret (2006) findings, it is evident that most internet users use this to access electronic resources and electronic mailing services on top of others who use it for entertainment purposes.

Respondents were also asked if they ever heard or used Web 2.0 tools. Findings show that only 47 respondents (43.9%) of Web 2.0 tools and among them 46 (43%) have used the tools (see Table 3 for details).

Table 3
Web 2.0 awareness

Response	Have ever heard of Web 2.0		Have used Web 2.0 tools	
	Frequency	**Percent**	**Frequency**	**Percentage**
Yes	47	43.9	46	43.0
No	60	56.1	61	57.0
Total	**107**	**100.0**	**107**	**100.0**

Generally, the Web 2.0 awareness was very low compared to that of internet. The low usage of the Web 2.0 tools is explained by the limited awareness of the tools among agricultural researchers and extension staff. This is explained by the fact that among the 47 respondents who have heard of Web 2.0 only one of them did not use the tools.

4.2. Commonly used Web 2.0 tools by agricultural researchers and extension staff

Respondents who used Web 2.0 preferred some of the Web 2.0 tools more than others (see Table 4 for details). Findings show that Facebook and Wikis were used more (see Table 4 for details).

Table 4
Use of Web 2.0 tools

Web 2.0 tools	Number of Users	Percentage
Blogger	14	13.1
Wikis	29	27.1
Facebook	34	31.8
Twitter	11	10.3
Youtube	15	14
Google Drive	16	15
Google +	19	17.8
Referencing tools	2	1.9
Slideshare	4	3.7
Other podcasting tools	4	3.7

Respondents mentioned that they used Web 2.0 tools which were easy to use, common and knew them. Facebook and Wikis were believed to have simple architectural designs and user friendly features that more of users used them. Other tools like referencing tools, slide share and podcasting tools (Picasa and Flickr) were less known such that very few users used them. These findings are supported by those of Ponte and Simon (2010) who assessed the use of Web 2.0 in scientific publishing and found that the adoption, usage and preference of Web 2.0 was determined by the ease of use and awareness of the tools among potential users.

4.3. Types of usage of Web 2.0 tools among agricultural researchers and extension staff

Respondents were asked on how they used Web 2.0 tools. It was found that 29.9% of the respondents used the tools for socialisation; 19.6% for downloading materials; 18.7% for knowledge sharing and teaching; and 18.7% for learning (See Table 5 for details). These findings align with those presented in Table 4 above which show that more respondents used Facebook which is basically a socialising tool.

Table 5
Usage of Web 2.0 tools

Web 2.0 tool usage	Number of Users	Percentage
Knowledge sharing	20	18.7
Socialising	32	29.9
Teaching and learning	20	18.7
Downloading materials	21	19.6
Data collection	17	15.9

Respondents who mentioned to have been using the tools for knowledge sharing were further asked to whom they shared the knowledge. It was found that 35.5% of them shared knowledge with friends, 24.3% with co-researchers; and 20.6% with co-workers.

The findings above show the potential of Web 2.0 tools in knowledge management. Knowledge can be created through socialisation, internalization, externalization and combination (Nonaka & Takeuchi, 1995). Thus, as agricultural extension staff and researchers they may create and share knowledge through socialisation.

4.4. The influence of social demographic characteristics on usage of Web 2.0 tools

It was identified that the use of Web 2.0 tools differed among respondents; the differences were caused by respondents' social demographic characteristics. It was found that the use of the tools differed by sex, age, education, years in employment and current job position. It was established that more males than females used the tools. It was also found that those with 45 to 54 years old used the tools more than others followed by those in 25 to34 age group. It was seen that very few respondents with 55 and above years of age used the tools (see Table 6 for details).

Table 6
The influence of social demographic characteristics on usage of Web 2.0

Sex and usage of Web 2.0 tools			
Gender	Number of users	Percentage of users by sex	
		Within same sex	Within total
Female	12	35.3	11.2
Male	34	46.6	31.8
Age and usage of Web 2.0 tools			
Age group	Number of users	Percentage of users by age	
		Within same age group	Within total
25 – 34	17	68.0	15.9
35 – 44	6	31.6	5.6
45 – 54	19	27	17.8
55 and above	4	23.5	3.5
Education level and usage of Web 2.0 tools			
Education level	Number of users	Percentage of users in an educational level	
		Within education level	Within total
Diploma	11	37.9	10.3
Bachelor	17	48.6	15.9
Master	15	42.9	14
PhD	3	37.5	2.8

Usage of Web2.0 tools by years in service			
	Responses		**Total**
Years in service	**Yes**	**No**	
Less than 5 years	17 (60.7%)	11 (39.3%)	28 (100%)
5 years	4 (80%)	1 (20%)	5 (100%)
5-10 years	2 (22.2%)	7 (77.8%)	9 (100%)
More than 10 years	23 (54.8%)	42 (45.2%)	65 (100%)
Total	**46 (43%)**	**61 (57%)**	**107 (100%)**

It was identified that among the 46 respondents using Web 2.0 tools, 69.6% were those with bachelor and master degree. This can be explained by the fact that most of these staff were fresh graduates who possibly had opportunities to formally or informally learn on how to use Web 2.0 tools while they were in universities.

The findings further show that the use of Web 2.0 tools varied by the position held by a staff. The newly employed staff and those with new posts after completion of studies used the tools more than others (See Table 6 for details). These findings are in line with those of Dwivedi, Williams, Ramdani, Niranjan, and Weerakkody (2011) who found that most graduates and staff employed soon after graduation are good users of Web 2.0 tools. This can equally be explained by the formal and informal Web 2.0

training one might have attended while pursuing studies in any of the tertiary education institutes.

4.5. Adoption, perceived usefulness and ease of use of Web 2.0 training in agricultural knowledge management

A series of training workshops were arranged after the identifying the Web 2.0 training needs. The training workshops conducted in each of the five agricultural zones aimed at raising Web 2.0 awareness and level of usage of the tools among agricultural researchers and extension staff. The training workshops involved 148 participants. A training module with six topics namely: "Introduction to knowledge sharing; Wikis for knowledge management; Google-drive in knowledge management; General information searching; Macro and micro blogging; and Zotero for referencing" was prepared and used in trainings. The trainings were dominated by hands-on sessions were participants had to learn by doing.

Table 7
Perceived usefulness of Web 2.0 training for agricultural knowledge creation and sharing

Web 2.0 training component	Rating (%)			
	Very useful	**Useful**	**Somehow useful**	**Not useful**
Introduction to Web 2.0 applications	61.5	32.4	6.1	0.0
Blogs and micro blogs	63.5	26.4	6.8	2.0
Wikis	70.3	23.0	4.7	2.0
Google docs	54.	35.1	4.7	4.7
Online reference management	60.1	27.0	8.8	4.1

The impact assessment conducted after the training workshops showed that there was an increase in level of adoption and usage of the tools. It was found that after the training workshops 98.6% expected to continue using the tools. Respondents were then asked on the usefulness of the tools for creation and sharing of agricultural knowledge. They were also asked on the tools they preferred to use for knowledge management. Findings show different perceptions on the usefulness of Web 2.0 tools for agricultural knowledge creation and sharing. Among the four tools covered, the majority (70.3%) perceived Wikis to be very useful tools for agricultural knowledge creation and sharing. Others (63.5%) perceived macro and micro blogs to be very useful for the purpose followed by 60.1% and 54% who mentioned online reference management tools and Google Drive to be very useful for knowledge management respectively (see Table 7 for details). The perceptions were much influenced by the perceived ease of use and perceived appropriateness of the tools in creation and sharing agricultural knowledge.

Generally, majority of the respondents acknowledged that the tools were very useful for agricultural knowledge creation and sharing. The training workshops conducted enhanced understanding on how to use the tools thus influencing the usage of the tools for agricultural knowledge creation and sharing. It is through the training majority of the respondents mentioned that is was now easy to use the tools in their day to day agricultural knowledge creation and sharing. As described by other studies (de

Veer, Fleuren, Bekkema, & Francke, 2011; Umrani-Khan & Iyer, 2009), understanding how the Web 2.0 tools can be used is major determinant of one's intention to use a We 2.0 tools for knowledge management.

5.   Conclusion and recommendations

The findings of the study show that the use of Web 2.0 tools for agricultural knowledge creation and sharing in Tanzania was still at a very low level. Limited awareness and inadequate skills on Web 2.0 tools for knowledge sharing among some agricultural researchers and extension staff were some of the reasons for the low usage. However, there was a very high level of positive perceptions particularly after the training workshops. This indicated that the level of usage of the tools could increase in the near future if awareness creation and Web 2.0 trainings could be propagated. Thus, it is important to develop appropriate Web 2.0 training packages for extension workers, researchers, trainers and other stakeholders in the agricultural sector. In the long run, agricultural knowledge management courses should be introduced in all levels of agricultural trainings. Moreover, developing adequate and affordable ICT infrastructure is important for agricultural researchers and extensions officers/staff to have opportunities of using the tools to create and share agricultural knowledge.

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