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Review

Turning challenges into opportunity: Potential for adoption of e-extension in Lesotho

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Farmers in Lesotho mostly depend on rain-fed agriculture and are in need of access to agricultural information and knowledge in a timely, complete and quality manner. The traditional practice for delivering agricultural information has mainly relied on agricultural extension staff visiting farmers in order to provide advisory services. Due to the limited number of extension staff and other challenges, the delivery of agricultural extension services through the traditional farm and home visits has been ineffective. This paper presents challenges that the agricultural extension system in Lesotho faces, which necessitate the adoption of information and communication technologies (ICTs) as a basis for improving access of farmers to extension services. The advent of ICTs has given rise to e-extension, which is the delivery of extension services using web tools that allow online sharing, collaboration and networking. A recent study has revealed that agricultural extension professionals in Lesotho recognize the potential and use of e-extension in the country and are well positioned to embrace its introduction. The paper, therefore, recommends that efforts should be made to gradually introduce e-extension in the country, capitalizing on the existing enthusiasm among extension professionals and lessons of best practice from elsewhere.

Key words: Agricultural extension, e-extension, information and communication technology (ICT).

INTRODUCTION

Information is becoming a major input in agriculture, whilst, knowledge and information plays a central role for farmers to respond to opportunities that could improve their agricultural productivity (Nzonzo and Mogambi, 2016). Improved information and knowledge flow to, from and within the agricultural sector constitutes a key component in efforts to improve small-scale agricultural production and link increased production to remunerative markets, leading to improved rural livelihoods, quality and yield, food security and national economies (Dankwah and Hawa, 2014).

Information and communication technologies (ICTs), therefore, represent the best hope for developing countries to accelerate their agricultural development processes and initiatives (Nyambam and Mlozi, 2012). Given that information is essential for facilitating agricultural and rural development and bringing about social and economic change, Oladele (2006) opined that ICTs can enhance the integration and efficiency of agricultural systems by opening new communication pathways and reducing transaction costs. Unfortunately, most African countries have not devoted adequate

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attention to providing their citizens with access to information, especially in rural areas, where 70 to 80% of the population lives (Nzonzo and Mogambi, 2016).

The ICTs facilitate exchange of information among stakeholders, allowing rapid access to both technical and business expertise needed (Agu, 2013). Information is regarded as an important factor for increasing agricultural development and improving marketing and distribution strategies (Oladele, 2006). This is because it opens windows for sharing experiences and best practices, as well as information on sources of financial aid and new markets. Nzonzo and Mogambi (2016) stated that the availability of ICTs offers farmers the opportunity to collect, gather, share and disseminate information on emerging production techniques, markets and new varieties which enhance their production levels.

Although agriculture accounts for just 6% of Lesotho's Gross Domestic Product (GDP), the sector is important for the livelihoods of 80% of the country's population (CIAT and World Bank, 2018). Agricultural extension plays an important role in agricultural development and can contribute to improving the livelihoods of the farmers and other rural dwellers. According to Richardson (2006), extension is typically seen as a service, public or private, that responds to the needs of farmers and rural people for knowledge they can use to improve their productivity, income and welfare, and to manage the natural resources on which they depend in a sustainable way. Thus, extension brings information and new technologies to farming communities, allowing them to improve their production, income and standard of living. In Lesotho, extension is seen, largely, as a public service, institutionalized and organized by the government through the Department of Field Services (DFS) of the Ministry of Agriculture and Food Security (MAFS).

The problem is that, despite agricultural extension services having been offered in Lesotho for decades, there is little to show about its success. Experience has shown that it continues to be inefficient, ineffective and irrelevant. It has generally failed to build the necessary capacity and ability of farmers to manage their resources effectively and efficiently (Worth and Molomo, 2016). Thus, this paper explores the opportunity for improved information-exchange that ICTs can bring through integration of available technologies and diverse institutional and knowledge landscapes that exist.

CHALLENGES FACING AGRICULTURAL EXTENSION IN LESOTHO

There is growing recognition that farmers have needs for agricultural information and appropriate learning methods, which are not yet being met. The public extension services do not seem to have the capacity to reach all smallholder farmers, let alone provide up-to-date and tailored information to meet their needs (Bell, 2015). The difficulty in reaching all farmers arises from lack of extension staff to cover all areas of jurisdiction and physically meet clientele. The ratio of extension staff to farmers, as estimated at 1:750, is a far cry from the recommended 1:200-300 (Ministry of Agriculture, 2002). As a result, extension workers have large areas of jurisdiction, each with a narrow range of activities, which is less effective (Meera et al., 2004). This is exacerbated by the fact that farmers are sparsely populated across large areas and often isolated. Effective public extension services only manage to directly reach about 10% of the farming population, and this is even less if operating funds are limited (Bell, 2015). This situation, which prevails in Lesotho, implies that extension workers cannot be effective in disseminating agricultural information through personal contact that largely relies on the commonly embraced farm and home visits.

The prevailing notion that the delivery of agricultural extension services in Lesotho is the purview of the public sector implies that the government is the single most important player. In this context, as noted by Saravanan (2010), the public sector is expected to assume the responsibility of providing authentic and relevant information and services to farmers. The private sector and non-governmental organisations (NGOs), which are known to have many innovative and participatory approaches, are often left out of extension initiatives despite the recognition of their importance (Daniso et al., 2017). Besides, lack of coordination leads to duplication of efforts by service providers, low coverage of farmers and obsolete and irrelevant information. While the Agricultural Policy and Capacity Building Project aimed at putting in place, among others, institutional and policy arrangements for sustainable and efficient management and delivery of public and private agricultural services, in the country (World Bank, 2004), no agricultural extension policy was developed as part of this effort. The lack of such a policy in Lesotho implies that there is no mechanism to govern the manner in which the public sector and other providers could come on board in extension service provision.

One of the most striking constraints associated with public sector extension services in Lesotho is poor funding for research and extension services leading to loss of qualified human capital and underperformance (Worth and Molomo, 2016; Canca and Ranthimo, 2017). Due to poor funding, there are few opportunities for continuing professional education and hardly any allowances to support field operations. This is a disincentive to its professionals, who are beginning to perceive themselves as irrelevant even when and where their role is so vital.

Barber et al. (2016) identified another limitation of public extension services as the nonrecurring character of information and knowledge provision to farmers. In situations where extension is well-linked to research and farmers, the information delivered ought to be updated

and renewed by means of regular exchanges between extension workers and farmers and input from research. However, restrictions of financial resources and personnel mean that there are wide intervals with little or no interaction with farmers and researchers in between.

According to Qamar (2014), the Department of Agricultural Research (DAR) that is responsible for adapting and generating improved agricultural technologies, has been rendered largely dysfunctional by incessant financial constraints and other factors. Besides, the research-extension-farmer linkage in the country has been generally weak (Mojaki et al., 2017; Worth and Molomo, 2016). This limits the flow of information, knowledge, useful new technologies and resources among actors in the technology-delivery-utilization system. Sewnet et al. (2016) identified this state of affairs as a major drawback to the generation, wider testing, dissemination and adoption of improved agricultural technologies. In the same light, Eneyew (2013) indicated that the lack of strong linkage causes disruption in technology flow and low adoption rates, increased time lags between development and adoption of new technology, reduced efficiency in the use of resources, unnecessary competition and duplication of efforts, and increased cost of agricultural research and extension activities.

In summary, the provision of quality agricultural extension services in Lesotho is constrained by an unfavourable extension staff-to-farmer ratio, weak research-extension-farmers linkage, restricted budget, large areas of jurisdiction that are sparsely populated and isolated, and lack of agricultural extension policy. It can be inferred from these challenges that the net effect, over the years, has been the inability of the extension service to reach out effectively to its intended clientele. The situation has been further exaggerated by excessive, if not total, reliance on traditional face-to-face extension methods for communicating and sharing agricultural information and knowledge with clientele. It is clear that the time has come for adoption of more innovative ways of reaching out to clientele in an efficient and cost-effective way.

POTENTIAL FOR UTILIZATION OF E-EXTENSION

The advancements in ICTs provide an opportunity for developing countries, including Lesotho, to harness and utilize information and knowledge to improve agriculture (Anyoha et al., 2018). Aker (2011) stated that the rapid spread of ICT in developing countries offers a unique opportunity to transfer knowledge via private and public information systems. Advances in technology are producing more powerful computing devices to create a dynamic virtual network that allows people all over the world to communicate and share information with each other (Perron et al., 2010).

Given that the challenges associated with poor funding, unfavourable extension staff-to-farmer ratio, lack of transport and having cover large areas will not be wiped away any time soon in Lesotho, the need to explore ways of incorporating ICTs in the conventional agricultural extension services system cannot be overemphasized (Bell, 2015). Indeed, according to Barber et al. (2016), a promising solution for these shortcomings may be found in the increasing prevalence of ICT in extension delivery systems. Daniso et al. (2017) described ICTs as all technologies used for the widespread transfer and sharing of information. The ICTs promote and distribute new and existing farming information and knowledge which is communicated within the agricultural sector since information is essential for facilitating agricultural and rural development and bringing about social and economic changes (Swanson and Rajalahti, 2010).

According to Renwick (2012), e-extension is the delivery of extension services using web tools, which allow online sharing, collaboration and networking. The advent of ICTs has given rise to e-extension, which Saravanan (2010) described as a network of institutions that provides a more efficient alternative to the traditional extension system of agriculture, as it focuses on creating an electronic and interactive bridge where farmers and other stakeholders meet and transact to enhance productivity, profitability and global competitiveness. E-extension, as a modern mode of communication, can be used to improve the effectiveness and efficiency of extension services (Ramjattan et al., 2017).

The use of ICTs in extension can lead to a multi-stakeholder, people-centric, cross-sectoral system that brings together all stakeholders, especially farmers, to enable them to access timely and relevant information, and exchange opinions, experiences, good practices and resources related to agriculture (Bore et al., 2015). With the aim of improving communication and learning processes between various actors, an ICT-based extension system can also ensure integration of technology with multimedia, knowledge and culture (Saravanan, 2010).

The use of ICTs has generated new opportunities to address the challenges faced by agriculture. According to Aker (2011), the advancement of mobile technology and the rapid growth of mobile phone coverage moved many of ICT-based initiatives from “traditional” ICTs to mobile telephony, including voice, SMS and internet-based services. FAO (2015) has noted that increasing use of mobile phones for information exchange, such as disease surveillance and pest tracking, is now common practice. Linking knowledge to innovation is also crucial to addressing the information and knowledge gaps in the agriculture sector. This new technology offers several advantages over other alternatives in terms of cost, geographic coverage and ease of use. This is besides offering different advantages, like improved access to market information and coordination among agents’

increased job creation, improved communication among social networks, and the development of new services, such as mobile banking services, among others (Aker, 2011; Aker and Mbiti, 2010).

Mobile phones have become especially pervasive, as evidenced by 78.7% of Lesotho residents owning a mobile phone (Lesotho Communications Authority [LCA] and International Telecommunication Union [ITU], 2017). In addition, among the 14 SADC countries, Lesotho is ranked fifth, having a mobile subscription rate of 100.94 and 45% of mobile phone owners having access to a smart device. Thus, mobile phones provide a unique opportunity for agricultural extension service delivery to farmers without having to rely on the traditional farm and home visits that are, currently, prone to many challenges. This opportunity is favourable to the use of local and context-specific information. According to Elly and Silayo (2013), context-specific information has potential to close the information gap between service providers and farmers, thereby enhancing relevance of extension services.

The existence of web portals also provides unique opportunities for information-sharing and linking with other stakeholders and e-learning is specifically interesting for educational purposes (Barber et al., 2016). Web portals have some combination of online resources, multimedia (usually in the local language), and question and answer services with experts (Parikh et al., 2007).

An important and unique opportunity that has emerged in recent years is communication through social media, the use of websites and applications that enable users to create and share content or to participate in social networking. Through social media, users are able to access services using web-based technologies on desktops and laptops or download services which provide social media functionality to mobile devices, such as smart phones and tablets. These electronic services have led to the creation of highly interactive platforms through which individuals, communities and organizations can share, co-create, discuss and even modify user-generated content. As noted by Gonte (2018), social media has developed significantly in the past few years, creating opportunities for rural farmers to obtain information and knowledge about agriculture. By changing the way groups of people interact, which is different from traditional paper-based media (such as newspapers and posters) and electronic media (such as television broadcasting), social media has enhanced quality, reach, frequency, interactivity, usability, immediacy and performance.

Barber et al. (2016) viewed social media as integrating all functions; from providing advice and sharing knowledge to creating awareness, linking with other actors, and technology transfer. One key feature of the innovation systems perspective is that many actors are involved. It follows that many different sources, types and forms of knowledge and information need to be circulated, communicated and aggregated to support 'new-style' agricultural research and innovation for development (Ballantyne, 2010). This conforms very well to the strength of social media whose outlets operate in a dialogic transmission system involving many sources targeting many receivers, as opposed to traditional media that operates under a monologic transmission model involving one source targeting many receivers.

According to Bohloa (2016) and Ministry of Communications, Science and Technology (MCST) (2015), there is convincing evidence that ICTs can revitalize research-extension interactions in ways that respond to farmers' demands. This is possible by using ICTs as one element in the wider transformation of a traditional, top-down, technology-driven extension system into a more pluralistic, decentralized, farmer-led and market-driven one.

The role of ICTs is also to contribute to urgently needed reforms to empower and support small-scale farmers to respond to food security, market development and climate change challenges (Barakabitze et al., 2015). Throughout the developing world, ICTs are being integrated into classic rural advisory services, through radio, SMS, television, video, internet, libraries, the media and mobile services. In this way, ICTs are opening up new channels for farmers to document and share experiences with each other and with experts. It is clear that ICTs, when thoughtfully and effectively used, can improve the various practice methods of social work, such as delivery of services, education and research (Perron et al., 2010).

According to Bell (2015), ICTs can fill the information gap left by public extension since they have the capacity to dramatically increase both person-to-person connections and their access to information. This is, particularly, useful because most of the farmers are often resource-poor and there are not enough extension workers to reach out to all of them. For instance, ICTs, such as mobile technology, can be harnessed to extend the reach of agricultural extension services by enabling farmers to contact hotlines for technical agricultural advice or to receive market information, such as market locations and prices (Aker and Mbiti, 2010; Bell, 2015). The growth of ICT in developing countries offers a new technology and new opportunities to empower users to communicate and access vital information, especially for remotely located individuals and communities (Aker, 2011).

Social media can offer amazing opportunities to farmers, including helping them to seek information on farm operations and clarify their doubts on plants or livestock disease symptoms. They can provide farmers with immediate access to market-related information. However, Naruka et al. (2017) affirmed that this can be possible only when farmers are socially networked with human resources: agricultural researchers, extension agents, veterinarians, progressive farmers, sellers and

other buyers in virtual space.

EXAMPLES OF SUCCESS STORIES FROM OTHER COUNTRIES

A number of success stories reflecting the potential for adoption of e-extension in the delivery of services to farmers can be identified. Examples include: Grameen Foundation Community Knowledge Worker (GCKW) initiative in Uganda, Indian Kisan Sanchar Limited (IKSL) in India, Farmers Helpline in Kenya, Reuters Market Light in India, Department of Agricultural Extension (DAE) and Department of Agricultural Marketing (DAM) in Blangladesh, “e-Pak Ag” in Pakistan and ‘e-Choupal’ initiative in India.

The Grameen Foundation Community Knowledge Worker initiative in Uganda was aimed at reaching farmers in remote communities through a network of peer advisors by providing free agricultural information and advice to rural farmers via a content database (including crop information, market prices, and inputs) on their smart phones (USAID, 2010). The initiative combines ICT, such as mobile technology and farmer networks, to aid smallholder farmers by improving their access to accurate, timely information which can improve their agricultural activities, businesses and livelihoods. The services provided by GCKW reach the most isolated rural villages by utilising a network of local advisors, who are also farmers chosen by their peers. Through the use of smart phone applications, the GCKWs give other farmers information on weather and marketing prices and advice on treating pests and diseases (Van Campenhout, 2017).

The Indian Kisan Sanchar Limited is a mobile information provider to rural farmers through 38,000 Indian Farmers Fertiliser Co-operative (IFFCO) societies throughout the country and provides farmers with real-time agricultural information through a call centre and daily voice messages. In Kenya, the Farmers Helpline operated by KenCall, a for-profit call centre, is a real time call service staffed by agricultural experts that provides agricultural information, advice and support to smallholder farmers over the phone, using voice and voice call-back to farmers, not SMS (USAID, 2010).

The Reuters Market Light provides information on market prices, weather conditions, agricultural policy news and tips on farming cycles via SMS to fee-paying subscribers in India. Information is personalized, based on the type of crop, region of the country and local language. The service employs a staff of 300 full-time content professionals to provide news and data on more than 250 crop types, some 1,000 markets, and weather forecasts for 2,500 locations (USAID, 2010).

In Bangladesh, the Department of Agricultural Extension (DAE) and Department of Agricultural Marketing (DAM) started harnessing ICTs more effectively to deliver information and services to farmers. Government and non-government players introduced interactive programmes, such as phone-in sessions and talk shows to farmers and extension workers for interacting with policy makers and experts. Specifically, the DAM disseminates web-based commodity price information to the regional office, which then displays information on the notice board of a local market. Agriculture-focused tele-centres are planned around farmers’ clubs for more timely and cost-effective dissemination of critical information on inputs, weather and marketing channels. The initiatives have not only created possibility for public-private-partnerships in extension and marketing, but also set the platform for farmer-oriented policy reform. Extension agents (whether, public, private input providers and NGO staff), as intermediaries between farmers and other actors in the agricultural knowledge and information system (AKIS), are placed to make use of ICTs to access expert knowledge or other types of information (Saravanan, 2010).

In Pakistan, the ICT initiative called “e-Pak Ag” was undertaken by the University of California, Davis to look at how ICT could better help farmers, through the support of the Agricultural Innovation Programme for Pakistan (AIP). The initiative aimed to enhance the use of ICT to make credible, relevant information more available to those helping farmers in Pakistan. The e-Pak Ag involves, among other things, stakeholder consultations, reviews and studies and best practice identification and sharing. The initiative engages farmers, private sector, public organizations (extension, research and academia) and civil society. In general, though, farmers get information from a range of sources, including: farmers’ meetings, individual contact with extension or input providers, banners, and advertisements in electronic and print media (Bell and Shabaz, 2016).

In India, the ICT ‘e-Choupal’ initiative makes use of the physical transmission capabilities of current intermediaries - aggregation, logistics, counter-party risk and bridge financing with a judicious blend of click and mortar capabilities, village internet kiosks managed by farmers called *sanchalaks*. They enable the agricultural community to access ready information in their local language on the weather and market prices, disseminate knowledge on scientific farm practices and risk management, facilitate the sale of farm inputs and purchase farm produce from the farmers’ doorsteps. The aggregation of the demand for farm inputs from individual farmers gives them access to high quality inputs from established and reputed manufacturers at fair prices. As a direct marketing channel, ‘e-Choupal’ eliminates wasteful intermediation and multiple handling, thereby reducing transaction costs significantly. Launched in June 2000, 'e-Choupal', has already become the largest initiative among all internet-based interventions in rural India. The 'e-Choupal' services today reach out to more than 3.5 million farmers growing a range of crops in more

than 38,000 villages through nearly 6500 kiosks across nine states (Behera et al., 2015).

IMPLICATIONS FOR LESOTHO

The examples of success from various countries present useful lessons for Lesotho and demonstrate that DFS can harness the power of social media for the benefit of farming communities (Gonte, 2018). Incorporating ICTs can play a very important role in bridging information gaps, implying that, even with few extension workers, a large number of farmers can be reached. Social media is a new forum that brings people to exchange ideas; connect with, relate to, and mobilize for a cause; seek advice, and offer guidance. Social media has removed communication barriers and created decentralized communication channels and opened the door for all to have a voice and participate in a democratic fashion (Thakur and Chander, 2018).

A recently completed study by Mojaki (2016) has revealed that great potential does exist for the adoption of e-extension in Lesotho. The study established that agricultural extension professionals in the country see the potential for e-extension to transform them from mere agents of extension into knowledge workers, engaged in bottom-up, demand-driven, pluralistic approaches to technology generation, assessment, refinement and transfer. The agricultural extension professionals possess a wide range of competencies in the use of ICT which could become handy in the introduction of e-extension. They are, in fact, already technologically savvy and only require minimal training to enable them to use such expertise in e-extension.

The study also revealed that agricultural extension professionals are aware of the utility of ICT in extension service delivery and are personally ready to integrate ICT applications in extension, if some training is offered. While acknowledging that there is already some basic ICT infrastructure which could support the introduction and integration of e-extension in the country, the extension professionals underscored the need for more investment. They consider the management of agricultural extension services in the country to be generally ready to support the introduction of e-extension; understand the prudent use of ICTs in agricultural extension work; and are receptive to introduction of e-extension in Lesotho (Mojaki, 2016).

It is evident that agricultural extension professionals in Lesotho recognize the potential and use of e-extension in the country and are well positioned to embrace its introduction. A useful starting point, therefore, could be to sensitize them to start using selected ICT applications to deliver extension messages to farmers electronically. In a workshop organized in Leribe by the Food and Agriculture Organization in December 2017, senior extension officers were introduced to aspects of e-extension and they showed great enthusiasm to get further involved.

CONCLUSIONS AND RECOMMENDATIONS

The paper concludes that there are numerous, well established challenges to improving information exchange. The low ratio of extension workers to farmers, lack of funds for extension and research operations and weak research-extension-farmers linkage adversely affect equitable distribution of information. In agricultural extension, information is power and ICTs have been increasingly recognized as important elements in promoting connectivity among key players in what has come to be known as e-extension. In light of the prevailing challenges that have constrained effective access of farmers to extension services in the country, the adoption of e-extension could open up new opportunities in service delivery.

Given that agricultural extension practitioners are, by and large, ready and willing to venture into e-extension service delivery, the need to capitalize on existing enthusiasm cannot be overemphasized. This implies stepping up advocacy for the use of ICTs in delivery of e-extension services in the country. The involvement of the Faculty of Agriculture of the National University of Lesotho, in reviewing its undergraduate and postgraduate curricula to include e-extension and in the ongoing pilot project to assess the effectiveness of selected social media platforms in extension service delivery in selected villages in Roma Valley, constitutes a step in the right direction. Experiences from this endeavour will be used as a springboard to wider utilization of e-extension in the country.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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