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Beyond Diffusion of Improved Technologies to Promoting Innovation Creation and Information Sharing for Increased Agricultural Productivity: A Case Study of Malawi and Kenya

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Abstract

For several decades, various sub-Saharan Africa governments have been proactive in revamping their agricultural extension service delivery systems through establishment and revisions of their agricultural extension policies. Despite the existence and implementation of these policies, productivity in small holder farms in these countries is still low several years later. The need to enhance agricultural production is still cited as a challenge, with low adoption of improved technologies being found as the major contributing factor. This study used a qualitative approach to examine farmers' perceptions regarding the role of extension agents in the diffusion of innovations and its implications on sustainable agricultural development in Malawi and Kenya. Increased focus on using agricultural extension as an improved technology dissemination tool was found to be one of the factors contributing to low agricultural productivity. This among others was as result of failure by extension to tap valuable information, useful knowledge, skills and resources which was found to be available among farmers in both countries. The findings imply farmers no longer value their local knowledge and are uncomfortable sharing it amongst themselves. However, addressing the challenge of low agricultural productivity (heavily impacted by climate change) in these countries requires a shift in approach when delivering agricultural extension services. These changes include the use of interactive Information and Communication Technologies (ICTs) to solicit feedback and input from farmers and to enhance the two-way communication process.

Keywords: diffusion of innovations; extension education; improved technologies; policy

Introduction

Agriculture plays a critical role in the development of many countries in Sub-Saharan Africa, as it constitutes a very important sector for these countries' economies (Dethier & Effenberger, 2012). However, for most developing countries, including Malawi and Kenya, agricultural productivity is very low - to the extent that most of these countries fail to feed themselves (Van Ittersum et al., 2016). The low agricultural productivity is primarily due to the limited adoption of advanced agricultural technologies (Dethier & Effenberger, 2012). In an attempt to improve productivity, several sub-Saharan African governments have been proactive in revamping their agricultural extension service delivery systems by establishing and revising agricultural extension policies (Abdu-Raheem & Worth, 2016). Agricultural extension is known to play a very critical role in disseminating agricultural information in these countries. Therefore, it is believed that by supporting extension efforts the diffusion of improved technologies to farmers will occur, assisting farmers in improving the productivity of their farms (Gido, Sibiko, Ayuya, & Mwangi, 2015; Kibet, 2011).

The Malawi government started implementing a pluralistic demand-driven agricultural extension policy in the early 2000s. The objective was to ensure the availability of multiple players in service delivery to meet their farmers' needs (Chowa, Garfoth & Cardey, 2013). The policy emphasized a need for decentralization of extension services provision as one way of improving effectiveness and efficiency (Masangano & Mnthinda, 2012).

The Kenyan government started implementing a decentralized extension delivery system in 2006 that was followed by structural reforms to enable the provision

of extension services in order to improve accountability as well as meet farmers' demands (Nambiro, Omiti & Mugunieri, 2006). Alongside implementation of the decentralized extension system, the Kenyan government also introduced a pluralistic demand-driven extension policy. It was aimed at ensuring that demand-driven extension services and participatory approaches were made available and started the process of commercializing extension service delivery (National Agricultural Sector Extension Policy, 2012).

Unfortunately, the low productivity of small farms is still cited as a challenge in these countries (as well as other developing countries) despite the existence and implementation of new extension policies due to the low adoption rates of improved technologies (Lunduka, Fisher & Snapp, 2012). A closer look at the role of extension in these countries reveals extension is still used for improved technology promotion and as a message dissemination tool with extension workers serving as technology promoters and farmers as passive recipients (Chowa et al., 2013; Gido et al., 2015; Masangano & Mnthinda 2012). The dissemination approach limits a feedback loop for incorporation of farmers' knowledge and experiences which is crucial to the development and dissemination of improved technologies, resulting in technologies that do not address farmers' needs (Atela, Tonui & Glover, 2018).

Unlike in the past, the presence of emerging issues such as climate change, has necessitated the need for a shift in extension service provision from being an information dissemination tool to a mechanism for promoting dialogue and innovation creation among and between farmers, policy makers and researchers (Kiptot & Franzel, 2015). Addressing the issue of limited productivity among the small farmers in developing countries calls for the need for collective

innovation and technology development that empowers farmers not only to demand technologies but to be engaged directly in technology development (Kirsten, Mapila, Okello & De, 2013).

Theoretical Framework

The study was guided by Rogers' (2003) diffusion of innovation theory which examines peoples' decision-making process regarding a new idea that is spread or accepted by people in a social system. Rogers (1976) defined an innovation as an object or idea that is perceived as new by a given society or group of people and diffusion as "the process by which an innovation, perceived as a new idea, spreads via certain communication channels over time among the members of a social system" (p.13). In this definition the role of communication channels in diffusing innovations is central. However, effectiveness of each communication channel varies depending on the stage at which the individual is in relation to the adoption process. Rogers (2004) identified five states an individual goes through in the decision-making process when decided to adopt or reject a technology; "knowledge, persuasion, decision, implementation, and confirmation" (p. 20).

Interpersonal communication channels have been known to be influential in enhancing diffusion and the adoption of scientifically proven technologies (Rogers, 1988). In this regard, extension agents have been known to play an important role in diffusing innovations, especially during the persuasive stage. Extension agents often refer to themselves as promoters of improved technologies (Anderson & Feder, 2004; Masangano, Kambewa, Bosscher & Fatch, 2017).

When extension agents identify themselves as promoters they unintentionally distance themselves from the

scientists and researchers who reside outside the farmers' social system (Dagron, 2009). Instead they are viewed as aligned with the farmer, given their personal contact, and viewed as the most effective way of communicating new innovations. Moreover, a positive correlation has been reported between the frequency that extension agents visit a farmer and the farmer's ability to adopt improved technologies (Malawi Government, 2015; Nkonya, Schroeder & Norman, 1999).

Unfortunately, the emphasis on the role of extension agents as technology promoters limits the co-creation of new knowledge and inhibits farmers' ability to work together to fully employ the diffusion of innovations (Moriba, Kandeh, & Edwards, 2011). In the past, the main challenges limiting the adoption of improved technologies was resistance to change, lack of resources and lack of opportunities to adopt new and improved technologies (Röling, Ascroft, & Chege, 1976). Now, the availability of information regarding improved technologies is no longer a challenge but rather the availability of quality technologies that address farmers' needs (Elias, Nohmi, & Yasunobu, 2016).

Purpose & Research Questions

The purpose of this study was to examine farmers' perceptions regarding the role of extension agents in the diffusion of innovations in Malawi and Kenya. The following questions guided the research:

- 1) How do farmers' perceptions about the role of agricultural extension agents influence their innovativeness?
- 2) What are farmers opinions regarding the information provided by extension agents?

Methods

Using a constructivism approach, this study sought to examine farmers' perceptions regarding the role of extension agents in the diffusion of innovations in Malawi and Kenya. This was done in an effort to empower marginalized individuals to share their stories and experiences, therefore, a holistic stance was employed (Creswell & Poth, 2016). Data was collected on site using qualitative methods which included direct observations and key informant interviews with farmers from Kenya and Malawi.

Data Collection in Malawi

With support from the headquarters for extension in Malawi, a list of all the districts in the country based on their ecological zones was obtained. From this list three districts were randomly sampled representing each ecological zone. Following this a list of Extension Planning Areas (EPAs) in each district was also obtained from which one EPA was selected. After selecting the EPAs, one village in each EPA was randomly selected. Convenience sampling was used to recruit participants, specifically, extension workers for each area communicated with a representative of the farmers about the researchers' visit a day prior to the meetings. The village representatives then mobilized farmers who were available at that time the researcher was onsite to meet at a central place such as a church, community ground or school.

A semi-structured interview guide pilot tested with farmers from the state of Ohio in the United States was used for data collection through face-to-face interviews in Malawi. The interview guide included questions about farmers' information sources, their experiences using various information sources, and their experiences using information obtained from the various sources. All the interviews were conducted

in Chichewa, the vernacular language for Malawi and lasted for about one hour 30 minutes.

Data Collection in Kenya

The Seed Savers Network (SSN) was identified by the Kenya Forum for Agricultural Advisory Services (KeFAAS) as an ideal partner for this research in Kenya based on their engagement with multiple small holder farmers as well as farmer organizations. The SSN was identified as an organization that has emerged based on the rural advisory service, or extension, needs of clientele in the region. Semi-structured interviews with three representatives from the SSN were conducted while visiting their facilities located in the Rift Valley region of the country.

The semi-structured interview guide for the Kenya portion of the study was based on a larger set of research and evaluation objectives associated with the Framework for African Agricultural Productivity (FAAP) principles framed within the larger Comprehensive African Agriculture Development Programme (CAADP, 2015) issued by the African Union's New Partnership for African Development (NEPAD). A subset of items specifically related to extension services and diffusion of innovations to farmers were analyzed as part of the present study. Additional questions were also included in the interviews and observations on site as part of a larger evaluation project.

Data Analysis

Participants were given a pseudonym as a way of covering their actual identities and protecting their privacy. The pseudonyms were based on the gender of the respondents with female participants being assigned full first names, such as Maria, and male participants assigned initials, such as KK.

The research design allowed for incorporation of emerging issues within an interview and between interviews (Morse, Barrett, Mayan, Olson, & Spiers, 2002). Therefore, data analysis was conducted during and after the data collection process. During the data collection process, the researchers made observations, took field notes after each interview, and analyzed the emerging themes which were then followed up in subsequent interviews. In addition, case-oriented analysis, which involves analyzing data case-by-case by comparing the researcher's ideas with the data in order to develop an in-depth understanding of a given concept or context, was employed (Della Porta, 2008).

After transcribing the data, member checking was conducted. Finally, the primary researcher and another qualitative researcher who was not familiar with the study, analyzed the data using NVivo Pro, where themes and subthemes were generated and compared. When analyzing the data both inductive and deductive data analysis approaches were employed (Thomas, 2006). Inductive analysis involves the interpretation of the data by the researcher in order to generate themes and concepts while deductive analysis involved the interpretation of data by the researcher in order to compare if the data was consistent with assumptions or objectives that guided the research (Thomas, 2006). After analyzing the data, a third person who was familiar with the study reviewed the generated themes and sub-themes against the raw data as a form of peer debriefing (Lincoln & Guba, 1985).

Reflexivity Statement

As with all qualitative research, there is always an introduction of researcher bias. Therefore, it is important to share that, the primary and secondary researchers' experience and knowledge may have

influenced data analysis and interpretation. The primary researcher is a Malawian who had worked as a communication officer in the Department of Agricultural Extension for the Ministry of Agriculture in Malawi for several years. She was a doctoral student at a U.S. institution at the time of data collection and analysis. In addition, during this research, the primary researcher introduced herself as an extension agent to the farmers as it was easier for them to understand her role as compared to indicating that she was a communications officer. At the time data were collected and analyzed the other researchers were conducting an evaluation of the continental African Forum for Agricultural Advisory Services (AFAAS) network as part of a larger study. Furthermore, the other researchers had previous experience working with extension networks in over 50 countries from all six permanently inhabited continents.

Results

Farmers' Perceptions About the Role of Agricultural Extension Agents

The participants were asked to describe their opinions regarding the role of agricultural extension agents. The main theme that was identified from their responses was that agricultural extension agents are there to provide *information on improved technologies*. In addition, as the farmers described the role of agricultural extension agents, the following sub-themes emerged: increased dependency on information provided by extension agents, poor regard for local and indigenous knowledge as well as resources, and failure of farmers to share local knowledge and innovations.

Increased dependency on information provided by extension agents.

Through the interviews and observations, farmers indicated they rely too much on

information provided by the extension agents to the extent that they wait for the extension workers to tell them what to do. For example, Maria stated,

At one time they brought in this technology, we used to have mango tree that we were supposed to plant but we saw that the extension worker was not clear enough as to how we should plant the trees. So, it took a very long time before the extension worker came to tell us as to how we should plant the trees and by the time that they told us what to do most of the trees had dried and died.

In addition, when the participants were asked if they feel comfortable sharing their experience using various improved technologies in terms of the advantages and disadvantages, they indicated they depend on the extension agents to provide such information. For example, KK stated, “I cannot say much on that because you are the extension agent and you are the one who know the advantages and disadvantages because you advise us on what farming practices to follow.”

Poor regard for local and indigenous knowledge as well as resources. It was also observed that due to increased emphasis on the promotion of improved technologies, in some cases farmers consider the information delivered by extension agents as being superior. As a result, they are completely abandoning their local and traditional knowledge as summarized in the following response from Maria.

We completely left aside the traditional practices so that we follow the improved ones... We saw that the traditional and improved farming practices are different so we were not sure as to how we should go about it... We were like since they have

brought new varieties so may be these require modern ways of planting due to effects of climate change since things have changed from the way they used to be in the past because of climate change.

In addition, other farmers also indicated they prefer getting information from technical experts as opposed to their fellow farmers as summarized in the following interview with TK.

“I prefer having access to information from a technical expert or government officials as opposed to another farmer because the farmer also learned from these officials or experts. Because even though the expert does not farm directly their messages are clear because the farmers can never be successful without the experts or officials... Therefore, we cannot take the farmer's sentiments seriously if they are not backed up by the officials or experts.”

Inability of farmers to share local knowledge and innovations. Additionally, in cases where farmers are still using or following traditional practices, they do not openly share such information unless they have established trust and feel safe as stated by TK.

I don't vaccinate them, ever since I started raising them, I do not vaccinate them. I have my own way. When the cow is sick, I get some leaves called “ndegere”...so when the cow is sick, I warm up some water with the leaves and I rub the leaves around the cow's legs and my cows never die.

However, when this farmer was asked about their farming prior to this question,

they had indicated they follow improved practices and make sure they vaccinate their animals as indicated in the following response from KK.

I do, I raise cattle and vaccinate them often and they do not die. When some people say that there is an outbreak, my cattle are never affected...: The extension worker told me about it and said that I should be vaccinating my cattle and I follow that.

Moreover, the feeling of inferiority complex and fear of the consequences in cases where things might go wrong tend to make it hard for these farmers to share their knowledge with others even in cases where they are beneficial as stated by KK.

...If they approach me I would share with them..., but you can't go to someone's yard and ask them to vaccinate their animals and use what I follow what happens when their cattle die? They will blame you for killing them or casting a spell on them so that is what am afraid of sure.

Despite increased focus on dissemination of information on improved varieties, observations from Malawi and Kenya have shown that farmers still value their traditional and indigenous species. For example, Kenyan farmers are responding positively to a project aimed at promoting diverse seed access to farming communities. In Kenya the SSN has emphasized that it is their mission to conserve agro-biodiversity by strengthening community seed systems for improved seed access and enhanced food sovereignty. According to representatives from the SSN there is significant interest from small holder farmers to learn how to clean and reuse seeds from season to season, thus reducing their dependence on seed

salespeople. Additionally, there is interest in re-introducing indigenous vegetable varieties that had been previously removed from production in accordance with extension personnel recommendations. The indigenous varieties tend to be more climate adaptable and less reliant on inputs such as fertilizer.

Through the SSN in Gilgil, Nakuru County a variety of local crops are being grown which include maize, millets, fruits, carrots, kales, spinach and other vegetables. Through support from KeFAAS and some international funding organisations, SSN had initiated a project to catalogue local seed varieties. Moreover, the group conducts trainings for farmers and has also developed extension manuals and supporting documentation specifically directed at seed saving.

Farmers' Opinions Regarding Information Delivered by Extension Agents

When the participants were asked about their opinions regarding the information that is delivered by extension agents; a number of themes emerged: inaccurate messages, one sided information and the inability of the information to address farmers' needs.

Inaccurate messages. The participants indicated that in some cases the information the extension agents provided was inaccurate, which end up costing them resources and time. One example is summarized in the following response from WB:

I was told to grow maize using Kanyani seed and under conservation agriculture, I grew that crop and followed all the proper management practices and applied all the required inputs but when the crop was about to germinate the rains stopped and when the rains stopped all the maize

was damaged the whole acre. As such I had to remove the maize and ended up growing sweet potatoes however, I realized that all the fertilizer that I had applied and the seed that I had bought was just wasted all the money that I used to prepare the land was just wasted while some farmers who grew other varieties of seeds and I realized that all my friends were able to harvest something that year and yet I was not able to harvest and was hurt a lot because I am a small farmer and I struggle to get inputs and get fertilizer and that all the resources were wasted and I ended up growing sweet potatoes. All this happened because I accepted the advice that I should grow Kanyani variety and I did not benefit from it.

When asked about the impact of such experiences, the participants had the following to say:

Ever since that happened I never rush to grow these newly released varieties, right now I only plant a little bit of each variety so that if one fails I should be able to get something from the other one and right now I can't tell you that I grow one variety if I say that then I will lie to you I stopped doing that.

However, despite facing such bad experiences, farmers do not provide feedback to the extension agents as indicated in the following statement from AB; “We did not tell the extension worker about our negative experiences. We only followed it for one year then abandoned it. So, the extension agent just brought another type of farming.”

One-sided information. The farmers' expressed concern regarding the approach that was used when delivering messages on improved technologies. Among others, the farmers complained that in most cases such information only covers positive aspects of the technologies without providing any information about the setbacks as indicated in the following response Emma, “We are not able to get information on the negatives or challenges so that we are aware of the setbacks as well as the challenges that one can face from implementing a given technology or practice.” This was echoed by WB's statement:

I should say that as a parent you are supposed to advise your child about the advantages and disadvantages of different options that if you follow this way you meet problems but follow this one. In the same way extension workers should be able to tell farmers that in this area when you grow this variety you do not benefit but grow this one that way the extension worker has provided guidance to us but if I just rush and grow the seed then I am the cause of the problem but if am advised and a told about the advantages and disadvantages then am able to know. Therefore, in that case it is important that the extension worker provides the information on the technologies that they promoting.

Information provided is unable to address farmers' needs. The farmers were then asked to share their experiences in terms of the extent to which the information provided by the extension workers assisted them in addressing their needs. The farmers indicated that in some cases the extension agents did not provide them with any useful

information necessary as indicated in the statement from TK.

That time my garden had been infested with worms which were destroying the leaves in my garden and when I called the extension worker she came... And I said madam extension worker look at my garden, she went around and was like Mr. this is really bad alright, I will go and report to the office. I thought that at the office they will rush and address the problem because if they will not handle it with care it would end up being a disaster but we just saw that they were silent.

As a result of the frustration, farmers have resorted to implementing local and traditional practices as summarized in the following response Maria.

We just decided to follow the traditional methods because we saw that they were useful in areas where the improved methods were failing. So, we still use a portion of land and practice our traditional methods while another piece we practice the improved ones but we have seen that our traditional methods still work.

Conclusions, Implications & Recommendations

The findings indicated there was a focus on improved technology dissemination as the major role of the agricultural extension agents in both countries contributing to farmers' inability to be innovative; promoting a dependency syndrome among the farmers. Farmers are not making use of their indigenous knowledge and skills and waiting to get advice from extension agents, even in situations where the farmers are aware extension agents are not knowledgeable.

Rich and valuable indigenous resources and knowledge that could have contributed to promoting agricultural development is left untapped as farmers fear sharing knowledge with their colleagues. There is a need for deliberate efforts aimed at integrating farmers' indigenous knowledge and resources into the dissemination of new technologies as well as strengthening the peer-to-peer network among farmers in both countries (Šūmane et al., 2018).

Within the study frame the findings also imply the role of the extension agent should shift from being improved technology promoters to facilitators of dialogue around technology development and dissemination (Abdu-Raheem & Worth, 2016; Masangano et al., 2017). However, for that change to take place there is need for governments to revisit their priorities and shift their policies from focusing on the need to increase adoption of improved technologies to promoting knowledge and experience sharing among and between farmers, policy makers and scientists. This can be done by promoting initiatives like the one being implemented in Kenya where KeFAAS and SSN are working together with farmers to promote biodiversity as well as provide extension and advisory services to farmers.

On the other hand, there is also a need to promote investments in Information and Communication Technologies (ICTs) aimed at improving farmers' participation and ability to provide feedback through the creation of interactive ICT platforms that enable farmers to share their local knowledge, experiences and skills (Hudson, Leclair, Pelletier & Sullivan, 2017). An increased investment in ICTs in most developing countries could provide the support needed for agricultural information dissemination (Ajani, 2014; Okediran, Ganiyu & Badmus, 2018). Currently, most ICT-oriented projects and initiatives give

little to no consideration to strengthening knowledge sharing among farmers as well as feedback provision through a two-way communication model.

Moreover, the results of the study indicated that in some cases extension agents seem to be lacking relevant competencies crucial to responding to farmers' needs. This implies there is a need to improve professionalization among extension agents, so they are fully equipped to address the challenges that farmers in sub-Saharan Africa and worldwide are facing as a result of the negative impacts of grand challenges, such as climate change (Afful, 2016). The knowledge and skills required for extension agents to go beyond the provision of technical information to provision of moral support to farmers during times when they may be lacking technical expertise is a theme within the present study (Mangheni, Shimali, & Kabahenda, 2016; Umbara, Sulistyowati, Noor & Setiawan, 2019). For example, it may be more appropriate to act as a connector between local small holders and facilitator of conversation to share indigenous knowledge than it is to provide technical advice that may not be appropriate, or worse yet detrimental.

Furthermore, based on the study results there may be a need for the introduction and establishment of capacity building opportunities for extension providers that focus on social skills such as emotional intelligence in the various agricultural contexts. This skill set, when complimented by technical expertise, may be especially valuable during times of duress such as outbreaks and natural disasters. When natural disasters and outbreaks leave farmers financially and emotionally devastated, extension agents who are emotionally intelligent may be better able to provide support even in cases where they may not have the technical expertise.

Additionally, there is need for providers of agricultural extension services to take advantage of the available ICTs and use them to provide real time feedback and information to extension agents so they have adequate technical support whenever needed (Lamm, Lamm, Davis, Swaroop, & Edgar, In Press).

The results of the study are consistent with previous studies which indicated extension agents somehow dictate the technologies that farmers are supposed to adopt as opposed to providing them with technology options (Anderson & Feder, 2004; Masangano et al., 2017). This limits farmers' ability to make independent decisions regarding which technologies to adopt or reject as well as take responsibility for their actions. Therefore, there is a need to ensure extension agents present farmers with technology options as opposed to dictating technologies. However, for this to be achieved, extension agents must not be evaluated based on the number of technologies they have promoted but rather on their ability to reach out to farmers, work with them to identify their needs, and develop solutions. This is the case because the current reporting system for extension agents in countries like Malawi requires the extension agents report the number of technologies they have promoted as well as number of farmers who have adopted the technologies. This perpetuates the desire among extension agents to dictate these technologies to farmers so they appear to be working.

The results of the study also indicated that contrary to what was purported in the Diffusion of Innovations theory (Rogers, 2003), where the people were supposed to be provided with information about the advantages and disadvantages of an innovation (Sahin, 2006), extension agents only tended to focus on positive attributes. This denies the

farmers access to information regarding the negative attributes of the innovations, hence their failure to prepare for setbacks as they make decisions to adopt a technology. In order to ensure farmers are fully prepared and capable of making informed choices on whether to adopt a technology or not there is need to make sure information on the negative attributes of the technologies is included as extension agents disseminate information on these technologies to farmers.

It is important to note the intent of this study was not to generalize findings beyond the experience and observations with small holder farmers and extension provisioners in two countries. However, the results of the present study provide intriguing contradictions to expectations associated with theory, therefore a recommendation is to replicate the present study in other countries using mixed methods. Although limited in scope, the findings provide valuable insights that are useful in providing direction especially when it comes to agricultural extension policy reforms. This is the case because in order to address the emerging issues such as climate smart agriculture that have greatly impacted countries in sub Saharan Africa and worldwide, there is need to make sure that agricultural extension policies include dissemination of indigenous and local innovations and knowledge and not only scientifically proposed technologies (Rivera, 2011).

The importance of policy reform, when it comes to addressing extension challenges, cannot be overemphasized. This is evidenced in countries like the United States where agricultural productivity is high and extension agents' responsibilities goes beyond transfer of improved technologies to facilitators of dialogue between and among farmers and scientists so that research and technology generation

incorporates farmers' opinions, experiences and knowledge (Cash, 2001). Between, and even within, countries there is a tremendous amount of contextual variability. Adopting a one-size-fits-all approach may not be the most appropriate way to address the local realities faced by small holder farmers and supporting extension personnel. Finding the right balance between standardization and customization with the provision of extension services is a delicate balance; however, continued research in multiple contexts is necessary to ensure ongoing awareness and focus.

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