Agricultural Knowledge Management Systems in Practice: The Ability to Support Wereda Knowledge Centers in Ethiopia

Research-in-Progress

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Abstract

Agriculture is the dominant sector in the Ethiopian economy but it is characterized by low productivity. Ethiopia is interested in creating access to agricultural knowledge through an agricultural knowledge management system (AKMS). Such a system has been developed using a web-based portal named Ethiopian Agriculture Portal (EAP). It is facilitated through Woreda Knowledge Centers (WKCs) which are in 10 Pilot Learning Woredas (PLW). Providing knowledge in the appropriate format, identification of affordable technological infrastructure, and integrating indigenous agricultural knowledge into the knowledge system is vital to empowering development agents (extension workers) in Ethiopia. This study addresses two research questions: 1) To what extent does the centralized AKMS support WKCs access and utilization of agricultural knowledge? 2) How can the existing AKMS support capturing and sharing of indigenous agricultural knowledge and best practices?

Key words: Agricultural Knowledge Management System, Ethiopian Agricultural Portal (EAP), Indigenous Knowledge, Wereda Knowledge Centers

INTRODUCTION

The twenty-first century marks the beginning of a knowledge-based economy, and knowledge has become the engine of economic development (Peng and Hsieh, 2006). For the agricultural sector this knowledge engine is used to develop new technologies to improve the quantity and quality of products it can produce. In Ethiopia much of the rural households rely on the agriculture sector for their survival. The economic welfare of rural households depends on the decisions they make about the use of non-physical resources (e.g., information, experience, knowledge and institutions) and physical resources (e.g., land and labour) (Mariam and Galaty, 2007). Agricultural knowledge is therefore, one of the critical inputs for the growth of the agricultural sector. This growing importance of agricultural knowledge together with the advancement of ICT has contributed to the development of Agricultural Knowledge Management Systems that support the rural community with the provision of knowledge. Agricultural development projects need to be fostered with the use of an Agricultural Knowledge Management System (AKMS) (Malekmohammadi, 2009).

Despite the reliance of the Ethiopian economy on the agricultural sector, it is characterized by low productivity of land and labor. Transformation of the agricultural sector in terms of employing advanced technology and achieving higher productivity and growth requires access to up-to-date agricultural knowledge. To attain this goal a web-based portal named Ethiopian Agriculture Portal (EAP) was initiated and developed by a project known as Improving Productivity & Market Success of Ethiopian Farmers (IPMS Ethiopia) that was started in 2005. EAP is used as a gateway to diverse agricultural resources in Ethiopia and elsewhere. The AKMS initiative started with a knowledge needs assessment and it targeted developing mechanisms for acquiring and sharing agricultural knowledge. For the purpose of knowledge sharing Woreda Knowledge Centers (WKCs) have been setup in the 10 Pilot Learning
Woredas (PLW). Farmers are expected to benefit from the knowledge management system by learning from the knowledge it contains and innovative ideas.

In most African countries, including Ethiopia, agricultural information have been largely confined to the public domain and obtained through Ministries of Agriculture or through parastatals supervised by the Ministry of Agriculture (Ha et al., 2008). According to Okigbo (1991 as cited by Ha et al., 2008) the problems of this highly centralized and top-down transfer of agricultural knowledge to the farmers include that “(a) farmers are treated as ignorant recipients of information rather than knowledgeable partners in technology transfer, (b) management systems are poor, so that there is little pressure on the staff or their managers to seek new knowledge or to serve farmers (c) the extension staff are poorly trained and know little more than the farmers know (d) in some cases, operating facilities, vehicles and bicycles are so rare that the few motivated and knowledgeable extension staff cannot systematically visit farmers even if they wanted to.”

The same situation stated above is true for Ethiopian. The lack of the exchange of knowledge among farmers, and those who produce farm-relevant knowledge, has often been regarded as a key challenge to agricultural development (Hartwich et al., 2007). Agricultural knowledge management systems are expected to produce accessible content in local languages and at the appropriate technical level that will satisfy most rural community needs (Islam, 2010). Localized knowledge systems represent information sources that are accessible to a farming family and generally include an understanding of the farmer’s specific context and needs through repeated and often reciprocal interactions. “Often there is a higher degree of trust between farmers and the entities in their local Agricultural Knowledge Systems than between farmers and more distant entities, such as national ministries or global organizations.” (Islam, 2010). This implies that the local Wereda Knowledge Centers (WKCs) are expected to provide content to local communities of farmers based on their specific context, needs, local language, and technical capability in order to build trust among farmers. But these knowledge centers depend on the centralized agricultural KMS for their content. The key concern is how the centralized AKMS framework supports the WKCs and how much it allows the involvement of farmers as knowledgeable partners in knowledge creation and transfer. We need to investigate whether the existing centralized AKMS framework allows WKCs to capture the feedback given by the end users (i.e. farmers) after the knowledge is transferred and implemented. This feedback can be integrated into the AKMS and used for further refinement and development of the knowledge content.

From the perspective of the small farmer, the key question is how to gain access to information and knowledge. These farmers need local support groups that will act as brokers between the available knowledge system and the individual needs of farming households (Islam, 2010). In the case of Ethiopia, this intermediary role is played by the agricultural development agents (extension workers). The technical as well as intellectual capability of development agents determine effective transfer of the agricultural knowledge to small farmers. The success of the implementation of new agricultural technology depends on the success of communication between the agricultural experts and the farmers (Islam, 2010). Therefore, it is important to assess the extent of support provided to development agents by the centralized AKMS in order to facilitate the communication and transfer of knowledge to the small farmers.

Another issue of concern is the provision of access to affordable ICT for the rural poor and ensuring appropriate content. The application of ICT can change the role of extension workers and other agents that closely work with farmers. Islam (2010) stated that “by taking advantage of ICT they can deliver the required knowledge to the rural poor who have no access to ICT infrastructure and their role will increasingly change from disseminating information sent to them by official knowledge sources to acting as knowledge brokers that search various sources to help clients find the information and knowledge they need and place that information or knowledge in a local context”. This enables farmers at the grassroots to share knowledge with national and global experts. In this case, it is important to assess the capacity of the existing technological infrastructure of AKMS in terms of allowing the extension workers and farmers to share knowledge with national and global experts.

The contribution of indigenous knowledge (IK) to development initiatives in developing countries has been highly recognized by many countries and donor agencies in terms of sustainable natural resource management practices and rural livelihoods (Dixon, 2005). Ethiopia has unexploited indigenous knowledge that may benefit AKMS. The absence of effective linkages between indigenous knowledge and scientific knowledge has been identified as one of the major problems that hinder the effectiveness of the development of agriculture in general and of agricultural research and extension systems in particular. Limited integration of agricultural practices and natural resource management practices of farmers into formal research is one factor that limits the effective implementation of the agricultural research outputs (Acullo and Kanzikwera, 2007). Integrating IK into the existing knowledge management system can facilitate the linkage between IK and scientific knowledge. The dominant knowledge
management system is based on codified knowledge which leaves little room for IK (which is most often in the form of tacit knowledge) of the local community. Therefore, how IK can be managed systematically like other forms of knowledge using the current knowledge management system is another major area of concern in most developing nations including Ethiopia.

The purpose of this study is therefore, to assess the ability of the centralized AKMS in Ethiopia to support WKCs in terms of the provision of appropriate knowledge content with appropriate format and language, empowering development agents (extension workers) who support farmers, the provision of affordable technological infrastructure and the integration of indigenous agricultural knowledge into the knowledge system. The goal of the study is to identify an appropriate AKMS framework that can facilitate capturing, transferring and utilization of agricultural knowledge pertinent to sustainable development of the agricultural sector of the country. Our extensive review of literature yielded little evidence of research activities done in this specific area. The study will address the following research questions: 1) To what extent does the centralized AKMS support WKCs access and utilization of agricultural knowledge? 2) How can the existing AKMS support capturing and sharing of indigenous agricultural knowledge and best practices?

STUDY BACKGROUND

Agriculture is the predominant sector of the Ethiopian economy. It provides employment opportunity for 85% of the population and contributes 90% of foreign exchange earning of the country. Although agriculture is the dominant sector in the Ethiopian economy, the sector is characterized by low productivity of land and labor and it fails to produce sufficient wealth that could serve as a basis for the development of other sectors of the economy and to ensure food self-sufficiency. The government gave priority to this sector. The current Ethiopian five year strategic plan, which began in 2010/2011 fiscal year, emphasizes the agriculture sector and it plans to double the current agriculture output by the end of the program year. Improving farmer’s access to knowledge and information is considered to be a key factor in the effort to increase the productivity of the country’s agriculture. Agricultural Development Agents are expected to focus on the transfer of knowledge to farmers. But the existing extension service in Ethiopia mainly follows a top-down and supply driven approach and focuses on input supply and delivery, instead of on improving the knowledge and skills of farmers (Gebremedhin et al., 2006). As a result, access to the research outputs and agricultural development models by farmers is limited (Sehai, 2006).

Improving Productivity & Market Success of Ethiopian Farmers (IPMS Ethiopia) is a project which was initiated by the International Livestock Research Institute (ILRI) with the long term goal of contributing to improved agricultural productivity and production through market-oriented agricultural development. One of the key components targeted in order to achieve this goal is knowledge management. The IPMS knowledge management initiative has focused on knowledge needs assessment, knowledge acquisition (capture, analysis, and synthesis of knowledge) and knowledge sharing to identify and utilize methods, tools, processes, and approaches geared towards leveraging knowledge acquired to fill the gaps identified. The outcomes are planned to be supported by developing National Agricultural Information Resources Center and developing ICT infrastructure (ILRI, 2010). The project embarked in a knowledge management initiative in 2005. As a result of this project a web-based portal named Ethiopian Agriculture Portal (EAP) was developed and used as a gateway to diverse agricultural resources in Ethiopia and elsewhere using ICT infrastructure of Ministry of Agriculture and Rural Development (MoARD) at the ministry’s headquarters data center. This portal is developed to leverage the collective knowledge of the various actors in Ethiopian agriculture. Woreda Knowledge Centers (WKCs) have also been setup in the 10 project Pilot Learning Woredas (PLW), functioning as venues for knowledge sharing. EAP provides access to online information sources, journals, etc. through the mirror sites/knowledge centers in the 18 regional, zonal, and Regional Agricultural Research Institutes (RARIs) info centers established by the project in the 2008/09 fiscal year. The project is working closely with MoARD, RARIs, NGOs, and international organizations to upgrade the content available on EAP. MoARD is involved in the institutionalization of EAP through assigning staff to oversee the EAP and mail systems, including operational expenses for these tools into MoARD ICT budget. Some of the PLWs have established communities of practice groups and are slowly developing a culture of deliberate knowledge sharing. The expected outcome from the project’s knowledge management component by the end of the project is the creation of a functional agricultural knowledge management system operationalized at Woreda, Regional & Federal levels, highlighting innovations and appropriate technologies.

The knowledge capturing process, according to the project’s plan, depends mainly on capturing lessons learned and creating new knowledge through synthesis of the lessons from various sources. As it is suggested by the project, exposure to new knowledge by project champions, policy makers and high level technocrats through participation in study tours, conferences, and exhibitions outside Ethiopia is considered as one mechanism for capturing appropriate
knowledge. Farmers and other relevant bodies are also expected to have exposure to new knowledge through participation in study tours and exhibitions in Ethiopia. Adoption of methods, processes, and tools for documenting lessons learned is planned. Major mechanisms of capturing knowledge by the WKCs are through the provision of books, CDs, DVDs, and the Internet. In the future it is planned to link WKCs with knowledge generating institutions with the intention of making the knowledge assets sustainable.

The project’s plan also includes the need to strengthen Knowledge sharing arrangements through community of practices and farmer to farmer knowledge sharing. EAP is also considered one instrument in the sharing of agricultural knowledge in the form of online and offline resources, and the summary of good agricultural practices and approaches developed by MoARD. EAP mirror sites in the 10 knowledge centers and the 18 info-centers mainly depend on Internet connection.

LITERATURE REVIEW

“Knowledge is defined as the combination of data and information, to which is added expert opinion, skills and experience. The result of knowing something is to have an actionable understanding (Sehai, 2006)”. Knowledge is the integration of information, ideas, experience, intuition, skill and lessons learned that creates added value for a firm (Dana et al., 2007). Knowledge includes information, understanding, insights, and other information that has been processed by individuals through learning and thought (Islam, 2010). Knowledge can be tacit or explicit. Tacit knowledge is embedded in people, their know-how, skills, practice, and experience. Explicit knowledge is formally held in the form of policies, procedures, systems, and historical and financial records (Lee and Yang, 2000; Takeuchi and Nonaka, 2000).

The dominant form of knowledge in the agricultural sector is indigenous knowledge (IK). IK is defined as “the unique, traditional, local knowledge existing within and developed around the specific conditions of men and women indigenous to a particular geographic area” (Grenier, 1998). IK includes ideas, beliefs, values, norms, and rituals, which are native and embedded in the minds of people (Acullo and Kanzikwera, 2007). It is acquired by local people through the accumulation of experiences, informal experiments and intimate understanding of the environment in a given culture. IK is the basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management, and a host of other activities in rural communities (Warren 1991). IK is stored in people’s memories and activities. It is expressed in stories, folklore, proverbs, myths, cultural values, beliefs, rituals, community laws, local languages, agricultural practices, equipment, materials, plant species and animal breeds (Acullo and Kanzikwera, 2007). IK is dynamic and it changes through creativity and innovativeness as well as through contact with other local and international knowledge systems (Warren, 1991 as cited in Acullo and Kanzikwera, 2007). IK demonstrates elements of sustainability since it is well adapted to particular environments, relies on local resources, is small-scale and decentralized, and tends to conserve the natural resource base (Acullo and Kanzikwera, 2007). The importance of indigenous knowledge is demonstrated by many studies as cost-effective and sustainable mechanisms for poverty alleviation that are locally manageable and locally meaningful. Several researchers have argued that peasants possess a wealth of information and knowledge that may excel the value of “modern” agricultural skills in solving crop and livestock production problems (Mariam and Galaty, 2007). It is believed that the indigenous knowledge together with scientific expertise has the potential to solve the major challenges of agricultural sector. In a document specifying rural development policies, strategies and instruments of Ethiopia the importance of properly preserving, registering and utilizing the indigenous knowledge and basing development movement on it and transferring the best of it to the next generation is clearly mentioned (Ministry of Information Press and Audiovisual Department, 2001). In the case of Ethiopia some of the problems include limited involvement of farmers in setting priorities and formulating research agendas, lack of an accountable and responsible institute for the linkage as well as ineffective linkage mechanisms and communication problems. By selecting the best traditional agricultural methods and disseminating, it is possible to assure production growth (Ministry of Information Press and Audiovisual Department, 2001).

Knowledge management (KM) can be defined as a systematic discipline of policies, processes, and activities which empower organizations to apply knowledge to improve effectiveness, innovation, and quality (Sehai, 2006). The concerted efforts and practices used by organizations and individuals to identify, create, accumulate, re-use, apply and distribute knowledge are commonly labeled as knowledge management (Hartwich et al., 2007). KM fosters better knowledge and experience sharing so that organizations can leverage their collective knowledge. KM focuses on how organizations identify, capture, share, create, and use knowledge.

There are two generations in knowledge management. The first generation KM is top-down and technological perspective. The basic assumption here is that agricultural science generates technology which extension experts transfer to users, ignoring local knowledge creation and sharing, as well as the relevance of articulating demands by
farmers and promoting their self-confidence and empowerment (Fliert, 1994 as cited by Hartwich et al., 2007). In the second generation of KM the argument is that relevant knowledge is created collectively, in groups, through mechanisms of networking and communication (Inkpen, 1996; Sveiby and Simons, 2002 as cited in Hartwich et al., 2007). Therefore, the second generation knowledge management emphasizes collaboration in KM. But authors indicated that this mechanism of knowledge creation is not easily achievable. According to Thompson and Scoones (1994 as cited in Hartwich et al., 2007), knowledge creation requires knowledge management practices capable of involving multiple agents, consistent with recent approaches to innovation based on the ideas of auto-organization of entrepreneurs (Miles et al. 1997), social R&D networks (Sorenson et al. 2006) and complex adaptive systems (Kauffman 1995).

Communitarian theory of development is a recent approach to involve the community in a collaborative way to succeed in economic development (Ha et al., 2008). This approach restores the community concept in the creation and transmission of knowledge which is believed to be appropriate for the African context. Instead of a top-down approach suggested by the other theories of development communication, communitarian theory emphasize a participatory process that involves the identification of community needs, constraints, and preparation for the execution of the solutions (Ha et al., 2008).

Agricultural Knowledge Management Systems (AKMS) consist of the organization’s sources of knowledge, methods of communication, and behaviours involved in the agricultural process (Islam, 2010). The agricultural KMS is expected to capture and share the lessons of experience so that the knowledge gained through this process can be embedded in the day to day activities of farmers and strengthen their performance. Specific types of knowledge that rural and farming communities are typically interested in include: cultural management practices; new agricultural technologies; diagnostic information about plant and animal disease and soil related problems; market information (prices, seller, buyers, retailers); market demand and quality of products required for these markets; and land records and government policies (Hartwich et al., 2007).

It is possible to use KM models to convert the intangible form of agricultural indigenous knowledge into tangible knowledge. Indigenous agricultural knowledge is considered as intangible since it is imbedded in the individual farmer’s mind and results from experience, informal experiments and intimate understanding of the environment in a given culture. The SECI model developed by Nonaka that deals with knowledge explication (conversion of tacit knowledge to explicit knowledge) is relevant for capturing IK in agriculture (Nonaka and Takeuchi, 1995). The organization of people into communities of practice (CoPs) can also be seen as one of the methods used for capturing, storing, sharing and managing IK which will be the basis of invention of more practices. Stewart (1997 as cited in Kok, 2005) defines a community of practice as a group that facilitates the transfer of knowledge and innovation in people. Wenger (1998 as cited by Kok, 2005) believes that these groups are the most versatile and dynamic sources of knowledge.

Sustainable agriculture and food security can be enhanced through improved process for knowledge access and exchange using ICT. However, best management practices for the transfer of sustainable technologies in developing countries are still evolving (Rochon, et al. 2009) and economical restrictions continue to pose problems with ICT adoption in developing nations (Tambulasi, 2009). The bridging of the digital divide in most developing countries can be potentially facilitated by the rapid advances in cellular telephony and wireless Internet technologies and the reduction in costs of these technologies. This can have a positive impact on knowledge transfer in rural communities and a channel for their feedback and experience. The illiteracy problem that predominate the rural community can be addressed using broadband connectivity for audio and visual information exchange. Mobile technology can handle both voice and data and it is possible to create access to these technologies at a declining cost for the illiterate rural people. Developing a web-portal is one mechanism to disseminate agricultural knowledge to farmers. Different kinds of portals can be used in KM applications to enable various users to interact and establish relationships in order to identify, conceptualize and develop, utilize, apply and evaluate the information and knowledge for shared learning (Malekmohammadi, 2009). In addition to the modern technologies, it is also economical to think in terms of integrating traditional communication channels (neighbors/family, local radio, announcement boards, etc.) to reach farmers by disseminating agricultural knowledge.

THEORETICAL FRAMEWORK

The research adopted a combination of a theoretical framework which was developed by two authors. The dimensions related to Agricultural Knowledge Management Process are partially taken from Karadsheh, et al. (2009) who developed a conceptual framework for knowledge management process. The remaining part of the theoretical framework is adopted from Islam (2010). The framework is presented as follows.
As it is indicated in the figure, relevant agricultural knowledge should be captured from the national and global knowledge sources. The knowledge which is captured should pass through processes including knowledge discovery and creation, understanding the body of knowledge created/discovered, knowledge combination, knowledge evaluation and knowledge filtering. The knowledge processed should be stored in the knowledge repository in the form of knowledge pertaining to technology, laws or regulations, natural resource base and geography and market. These knowledge need to be transferred to agricultural knowledge intermediaries through Wereda Knowledge Centers by using different technologies including Websites, CD ROM, E-mail, Cell Phone. The knowledge intermediaries contextualize the agricultural knowledge by communicating the knowledge to farmer groups and producer associations through face to face contact, community radio, handouts, cell phone, TV etc. The knowledge is then applied by the farming household for making decisions in various agricultural areas. Learning experience is derived from the actual impact of the implemented knowledge by the farmer groups and producer associations. The experience learned, feedbacks and the indigenous knowledge of the farmer groups and producer associations need to be gathered by agricultural knowledge intermediaries and delivered to the central AKMS for further processing and improvement.
METHODOLOGY

This study is mainly concerned with assessing the capacity of the centralized AKMS in Ethiopia to support WKCs in terms of the provision of appropriate knowledge content with appropriate format and language, empowering extension workers who support farmers, provision of affordable technological infrastructure and integrating indigenous agricultural knowledge into the knowledge system. A qualitative research approach is selected in order to conduct the study and to enable us to collect rich data from the respondents.

The study involves different stakeholders including professionals from International Livestock Research Institute (ILRI) who have been involved in the project that initiated and implemented AKMS, different research departments and their staff of the Ministry of Agriculture and Rural Development (MoARD), the ICT development unit of MoARD, staff of WKCs, concerned bodies of Regional Agricultural Research Institutes and their information centers, farmers who are the primary beneficiaries of the AKMS, NGOs and international organizations participating in the AKMS.

The study will follow a mixed-method approach of data collection, using an in-depth interview, focus group discussion, document analysis and observation of research sites. Interview questions will be developed in a way to provide sufficient flexibility to explore the phenomena in detail and to reflect relevance to the broader research questions. The questions will be derived from the review of relevant literature and the theoretical framework adopted. The interview questions will be piloted before the actual interviews are conducted. In the interview process probing techniques will be employed in order to get more in-depth data. Professionals and technical staff in the area who have significant contribution in the development and implementation of the AKMS and those who are involved in decision making and content contribution as well as farmers will be involved in the focus group discussion. Official plan and policy documents, implementation and performance reports and other relevant documents that contribute to the content of AKMS will be reviewed. Selected WKCs will be visited to gain a clear image of how the knowledge centers are organized and working. By applying the above techniques we will record data through field notes, audio recordings of interviews, video recordings of a focus group discussion and document analysis.

PROPOSED ANALYSIS

The data will be analyzed by means of axial, selective and open coding using qualitative data analysis software. The first step in data analysis is preparing the text for analysis. Results of interviews and focus group discussions will be transcribed, and all field notes will be electronically captured. We will use a combination of a theory driven coding technique but will also allow for the emergence of new codes we do not anticipate.

CONTRIBUTIONS OF THE STUDY

The study can provide a framework to policy makers on how to improve the existing AKMS which is at its infant stage and operating at a pilot phase. The purpose is building appropriate AKMS that can contribute to improved agricultural development processes.
References


15. Rochon, Gilbert L; Dev Niyogi; Souleymane Fall; Joseph E. Quansah; Larry Biehl; Bereket Araya ;Chetan Maringanti: Angel Torres Valcarcel; Lova Rakotomalala;Hildred S. Rochon ; Bertin Hilaire Mbongo ; Thierno Thiam (2010). Best management practices for corporate, academic and governmental transfer of sustainable technologies to developing countries. Clean Technology Environmental Policy. 12 pp. 19–30


