

Soil and Water Conservation Innovations to Address Food Security in Africa: Role of Knowledge Management Systems in Improving Adoption

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1.0 Background

Malawi's economy is predominantly agro-based with agriculture contributing to about 40% of the gross domestic product. With such heavy reliance on agriculture, increasing productivity in the sector to meet the food security demands of its 11 million people is a priority. Smallholder farmers play a big role in the production of most food crops despite the challenges they face in accessing reliable agricultural information for decisions making process. Studies have shown that smallholder farmers need diverse and complex information to support investment in modern agricultural technologies and production systems (World Bank, 1995). This is often scarce and varies tremendously with each agricultural enterprise and from one region to the other. In Malawi, the main source of agricultural knowledge for smallholders is primarily the local institutions such as neighbors, markets and community based organizations. A higher percentage of farmers (about 60%) rely on government extension service as an important source of information though the quality and frequency of information delivery is poor. NGOs are also becoming increasingly important sources of information in many areas of Malawi. Their strength lies in the ability to deliver concentrated and well packaged information related to specific enterprises to beneficiaries though in smaller sites (Rees *et al.* 2000). Additionally, the Malawi government has established a number of institutions to provide specialized information to farmers and other stakeholders. Two of these initiatives are the Malawi Agricultural Commodity Exchange (MACE) and the Famine Early Warning System (FEWS). The former provides farmers with market and price data on the

current food and cash crops across the country while the later disseminates information on the current food security situation across 27 districts of the country. Under the MACE, innovative channels have been developed to enable farmer's access market information for the purchase and sale of their produce and include use of radios, SMS, e-mails, market information centers, display boards and telephone. Despite the availability of such institutions in the country, dissemination and adoption of modern agricultural technologies continues to lag behind. Farmers have often complained that they do not get adequate information on technical details of the farming system as very few extension workers are available in their localities. Inadequate human resources for both government and non governmental extension and lack of resources to mobilize communities as well as poor linkages with research teams are seen as the most serious barriers to effective information flow across the spectrum (Polson *et al.*1991). Additionally, smallholder farmers are often times faced with poor roads and communication infrastructure which coupled with a weak network of farm input stockists and high illiteracy have denied most smallholder farmers opportunities to obtain adequate knowledge to maximize their farming potential. This has led to chronic food insecurity and unprofitable agricultural production systems.

2.0 Knowledge management for technology adoption in Southern Africa

Soil and water degradation is one of the fundamental problems confronting sub-Saharan Africa in its efforts to increase agricultural production, reduce poverty and alleviate food insecurity (Hailu *et al.*1993). Unfortunately, many conservation programs designed to address soil and water degradation in the traditional agricultural sector have fallen far short of expectations. Findings have showed that despite a number of potential soil and water management technologies developed, adoption by farmers is still very low. This has been due to a complex socio-economic and demographic factors that have affected the choice of land and water technology investment to improve food security. Gaps have been identified in the way researchers and extension workers have packaged research result to make them more user-friendly for the farmers. Knowledge sharing mechanisms have not been incorporated in the broader agricultural extension systems to help disseminate success stories emanating from research. Studies in

Malawi have shown that access to new information plays a big role in improving agricultural technology adoption among farmers. However, improved knowledge management systems have not worked to the benefit of many farmers who have generally not been able to access vital information on conservation technologies to adopt in their farming systems. Our study showed that farmer perceptions, choice and subsequent incorporation of improved technologies depends on the success of information, education and communication strategies employed and how these are packaged and delivered for use by farmers.

Furthermore, our study showed that smallholder farmers need diverse and complex information to support investment in modern agricultural technologies and production systems. This is often scarce and varies tremendously with each agricultural enterprise and from one region to the other. In Malawi, the main source of agricultural knowledge in soil and water conservation technologies for smallholders was found primarily to be the local institutions such as neighbors, markets and community based organizations. A higher percentage of farmers (about 60%) rely on government extension service as an important source of information though the quality and frequency of information delivery is poor. The major sources of knowledge for smallholders are local (neighbors, family, markets and community based organizations). NGOs are also important sources of information in those areas where they are active. Churches, community meetings and agricultural companies are significant information sources in some locations.

Most farmers considered that their most pressing information requirement which was not being adequately addressed was information on technical details of farming (e.g. chemical application rates, how to manage pest and diseases, where to get certified seed, the most appropriate varieties for a given location, housing and management of livestock, etc.). Inadequate human resources (government and non-government extension) and poor local leadership (particularly for CBOs) were seen as the most serious barriers to effective information flow by farmers, whereas government and NGO extensionists stressed lack of resources to mobilize communities, and poor communications with researchers leading to information distortion. Potential knowledge delivery systems and entry points for knowledge dissemination are crucial in effective

diffusion of innovations. Increased use of networking and pluralism in provision of extension information and research services are advocated to increase cost-effectiveness, equity and efficiency of agricultural development through making available user-friendly knowledge on many diverse farming systems present in Malawi and the whole of Southern Africa. The importance of participatory learning approaches was emphasized by many of the study participants. The production of teaching materials designed for facilitating participatory learning, and the production of 'basket-of-options' information material for farmers and extensionists is also critical if technologies or innovations are to be scaled up and out amongst the farming communities.

3.0 Role of extension and training in dissemination of innovation information

The study revealed that there was lack of regular interaction between farmers and agriculture extension staff who were the most reliable source of information to the farmers practicing these new technologies. This in turn contributed negatively to the adoption decision of farmers. Again, the study found that farmers did not participate regularly in field days that were organized specifically to address soil and water management/soil fertility issues. This was because of lack of regular interaction between the farmers and extension staff. Less than half (45.0%) of the surveyed households reported to have been participating in field days in their area, while the majority (55.0%) did not. Demonstration plots on new soil and water technologies were another important aspect in influencing farmers' decision to adopt a technology, as it offered practical experience of the technology. However, less than half of the survey population (23.5%) reported having a demonstration plot on soil and water conservation technologies mounted by extension workers in their area.

Using simple check lists, details of the organizations, institutions, groups and individuals considered active in agriculture extension and soil and water conservation activities were collected by the study teams and supplemented by the various district extension staff who participated in the study. From the public sector, between 3 and 5 government departments, parastatals and/or international agricultural research centers were active in agriculture extension in the study district. Comments throughout the study suggested

that the public sector was both centralized (i.e. decision-making in Lilongwe) and fragmented (i.e. poor coordination between ministries and departments within districts). As for the private sector organizations, institutions and individuals providing goods and services to farming communities included individual traders and stockists, trading companies, seed and livestock suppliers, agrochemical and veterinary goods providers of artificial insemination. The involvement of agribusiness in technology development and dissemination was largely limited to high-potential investments and cash crops such as tobacco and cotton. Though there were a number of both government and private sector institutions involved in agriculture extension, the majority of these institutions have not done much to develop extensive knowledge management systems in their working areas. The absence of clear “best practices” in soil and water innovations in place was a clear testimony of lack of documentation and management of information at both district and national level.

4.0 Institutional support for innovation dissemination pathway

Through the focus group discussions with farmers, an institutional and stakeholder analysis of the community institutions as well as soil and water conservation stakeholders operating in the area was done. This was to see how much contribution they had made towards promoting soil and water conservation and the challenges being faced in the communities. It was found out that the following government and non governmental organizations were already working in the area in the area of environmental and natural resources management. These institutions could also form part of the knowledge management network that would take a leading role in packaging the information for better use by farmers and other stakeholders. The Malawi Environment Endowment Trusts, World Vision International; Concern Worldwide, Village Development Committees, Community Action Coordinating Committee, CIMMYT Conservation Agriculture Project were all working on soil and water conservation issues. Previously, Government, through the Initiative for the Development of Equity Efficiency in Agriculture funded by the Rockefeller Foundation, ICRISAT, CIMMYT Risk Project had worked in the area on soil fertility management and soil &

water conservation. A government project known as PROSCARP funded by the European Union had also been implemented in the area for more than 5 years and had constructed a number of soil and water conservation structures which the farmers interviewed were still using. There were no any committees or organizations working specifically on afforestation in the area. The village headman had given go ahead to community members to form forestry committees for the village in order to facilitate afforestation activities which were crucial to the success of the soil and water conservation efforts. However, the current decentralization and community based natural resources management committees manly represented by the Village Development Committees were responsible for going around the surrounding villages gathering problems in the village on any environmental and natural resources management. These groups in turn reported the challenges to Community Action Coordinating Committees (CACCs) who in turn report to the District Assembly through the Area Development Committees. However, participants reported that the channel followed was not very effective as most communities normally did not get any feedback on the problems reported. Decentralization in Malawi has led to major coordination problems because district and local authorities continue to be supervised by their respective ministries. Village Development Committees also lack accountability and corruption. This has been reinforced by the primacy of political correctness over technical performance as a criterion for rewards. Corrupt and ineffective government institutions have led to the disappearance of those soil and water conservation practices dependent on the enforcement of the by-laws. The communities have also established some mechanisms of resolving conflicts related to land boundaries and water use. The chief manages and resolves all the conflict.

The considerable number of soil and water catchment conservation committees makes them attractive as potential uptake pathways for general crop and livestock practices, particularly those oriented towards conservation and/or reduced costs of production. When the soil and water conservation projects come to an end (after two or three years of external support), most of the committees become dormant. But it would be easy for other organizations to revive them as uptake pathways for agricultural information. The District Soil and Water Conservation Offices would be an ideal entry point to these

committees. Other committees such as the water committees, agroforestry committees and village committees were active in some districts/divisions and should be noted when delivery systems/uptake pathways are being inventoried. The traditional authority were mentioned by some respondents as potential delivery systems, but the authoritative nature of chiefs/assistant chiefs has been seen as a potential problem for the uptake of technical, as opposed to civic, information. However, chiefs are key stakeholders in all aspects of rural life and should be consulted or actively involved in any dissemination effort, particularly in low potential areas.

The larger scale agribusinesses with their networks of stockists, traders and farmers offer potential dissemination pathways as well, provided they are assured that the distribution of information would enhance the popularity of their outlets and that the information was consistent with their range of products. NGOs and church organizations which are also a potential information dissemination pathway are widespread throughout rural Malawi though each organization has limited coverage. Although there are some horizontal linkages between different churches and between churches and NGOs, the linkages are not strong enough to offer any particular entry points.

5.0 Conclusion and recommendations

The study showed that certain socio-economic and institutional variables affect the farmers' decision on soil and water conservation technology adoption and subsequent impact on yields, food security and the general livelihoods of communities. High on the list is the ability for smallholder farmers to access well packaged information and knowledge on the various technological innovations available within their reach for them to solve their soil and water conservation challenges. It can be concluded that farmers belonging to a local organization had higher probability of maintaining conservation structures compared to those not belonging to any organization. Membership in a local organization reflects some certain level of social capital a farmer possesses in the community. Farmers in organizations or clubs similarly have a higher chance of accessing useful information and knowledge either through friends or fellow farmers on recent technological breakthroughs. Furthermore, farmers with relatively larger land holdings had higher probability of maintaining conservation structures compared to the

smaller ones though this was not reflected in the analysis of the adoption model. To realize higher crop yields, farmers need to have good access to extension services, as well as a good supply of family labor and provision of farm inputs as starter up capital to invest in long-term soil and water conservation practices. Introduced soil conservation measures need also to be monitored regularly together with farmers so that challenges met in establishing them can easily be singled out and appropriate improvements put forward. By so doing farmer will learn from experience and encourage their fellow farmers to take proper care and maintenance of the structures even without incentives.

The adoption behavior of farmers is influenced mainly by demographic, socio-economic and institutional variables. These include family size which translates into adequate labor for the household; age of the farmer as relatively younger farmers were the ones mostly adopting these technologies; and family income which was critical for the purchase of inputs, such as seed, for some of the soil and water conservation technologies. From the descriptive analysis and the focused group discussion, it was clear that farmers' perceived risk of soil erosion in the future, distance of a field from the homestead, wealth status of the household and perception of benefits of conservation structure had a significant impact on farmers' technology retention behavior. Adequate consideration of these variables might greatly contribute to widespread adoption of introduced conservation structures and subsequent improvement in crop yields, food security, income and livelihoods in dry land areas of Malawi and the Southern Africa.

The paper recommends that both government and non-governmental organization should invest significant resources in training and creating awareness of both their staff and farmers in agricultural and food security knowledge management systems to improve agricultural productivity and raise farm incomes. There is an urgent need to identify and develop strong mechanisms to share knowledge with networks throughout Africa while making sure that the knowledge is stored and retrieved easily across the different geographical boundaries. Knowledge Management will succeed only if designed as a system for active learning rather than a static one.

6.0 References

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