RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security

CGIAR CCAFS

Info Note

Influence of social networks on the adoption of climate smart technologies in East Africa

Findings from two surveys and participatory exercises with farmers and local experts

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FEBRUARY 2016

Key messages

- CSTs, including practices, are critical enablers of climate-informed agricultural practices that enhance food security.
- Network analysis can be used to understand how the interactions between farmers and experts, and other factors such as gender, policies, and institutions contribute to the adoption and diffusion of CSTs.
- Farmers with larger networks in the study sites grow more crops, have more land, obtain greater crop volumes, and report greater economic value for the crops sold.
- Social networks between and among farmers and local experts in the study sites are very weak.
- Women in the study sites generally have smaller networks with respect to farming techniques and practices, have fewer connections to farmers or experts with whom they discuss agricultural issues, and are less likely than men to attend a farmer field day or a training workshop or to receive advice from extension officers.
- There is a need to promote the creation of learning alliances and other spaces whereby networks of farmers and technology providers can be created and strengthened.

As part of the Policy Action for Climate Change Adaptation (PACCA) project, this info note summarizes findings of a project activity entitled "Influencing and linking policies and institutions from national to local level for the development and adoption of climate-resilient food systems in East Africa" undertaken by researchers from Bioversity International and Arizona State University. By conducting a network analysis and participatory exercises with district officials and farmers in Lushoto (Tanzania) and Rakai (Uganda), the study assesses the extent to which farmers are adopting agricultural practices and correlates the findings about the size and "make up" of the networks in which the farmers are embedded.

The importance of social networks on the adoption of climate smart technologies

Climate smart technologies (CSTs) and practices contribute to the adaptation of farmers to the effects of climate change. The adoption of CSTs by farmers is influenced by several factors, one of which is social networks. Social networks are the relationships that connect people and that consequently affect the diffusion of information, technology, and knowledge. Therefore, social networks might affect the diffusion of innovations through social learning, joint evaluation, social influence and collective action processes. In shedding light on the factors influencing the diffusion and uptake of CSTs for adapting the agricultural sector to climate change in Rakai (Uganda) and Lushoto (Tanzania) and in providing an evidentiary basis for identifying policy interventions so that the flow of CSTs can be facilitated, this study assesses how technologies move along the chain of different actors and identifies which actors influence and determine the adoption, or non-adoption, of CSTs in the studied sites. Improved knowledge about communication networks and knowledge flows can improve farmer access to new farming technologies and practices and enables them to find the best ways to address the climate change-related challenges in their agricultural production systems. Therefore, this study is interested in communication among farmers and between farmers and other organizations.

This info note is based on surveys designed to gather information on the communication networks of farmers, farming practices and technologies, and climate change perceptions. Additionally, two surveys were designed to analyze the existing networks among farmers and experts and the patterns of information flow and influence within

and between them. The study also involved the identification of crops grown and animals raised by farmers, the use and management of natural resources, the awareness of government programs associated with new agricultural practices, and the weather changes occurring in the study areas. Additional data analyses were conducted, including descriptive analyses to understand the size of the communication network, the kinds of crops grown and the animals raised, the use and maintenance of natural resources, and the awareness of government programs. Such analyses also included bivariate correlation to understand the relationship between communication networks and several farm characteristics, analyses by gender to understand the gender differences in network size, in the adoption of farming practices, in the involvement of local organizations, and in the access to farming expertise through training workshops and advice by extension officers. However, the results presented in this brief are limited to the areas specified above.

Although the findings presented here are site specific, the authors believe that they have the potential to contribute to the identification of ways to increase farmers' capacity to adopt new practices and technologies in the future as part of their strategies to adapt to climate change.

Crops grown, animals raised, and the adoption of CSTs in Rakai and Lushoto: pre-survey working sessions

In May and October 2014, participatory exercises were conducted in Rakai and Lushoto, respectively. These exercises were designed to learn how farmers perceive climate change, what impact climate change has had on their farming systems and potential adaptation options, what crops are grown and what animals are raised on their farms, and what changes they have experienced in the status of the natural resource base. Simultaneously, locally based experts were consulted to identify the CSTs that they thought were the most important in the study sites. Different sections of the survey were analyzed in detail with these experts, putting special emphasis on the sections dedicated to CSTs, traditional weather prediction, and local formal and informal institutions that are working on activities related to agriculture. The consultations with the local experts led to the identification of 39 CSTs. For the purposes of this study, the 39 CSTs were grouped into six sub-categories: crop pest and disease, soil fertility, diversity on the farm, water and water use, animal/livestock management, and improved and traditional crop varieties (Table 1).

Insights from a network analysis: Social networks in Rakai and Lushoto

Two surveys were developed in order to analyze the existing networks among two levels of actors and the patterns of information, technologies, incentives, guidance, and influence within and between them. Using a micro-level or community-level analysis, the horizontal flows concerning CSTs within representative sample groups of farmers and farming communities were examined. This research contributed to a better understanding of the flows of information and resources between farmers. Thereafter, a macro-level or meso-level analysis was conducted to identify the range of actors, organizations, and institutions involved in the development and supply of agricultural CSTs at the national level and the horizontal flows of information, influence, resources, and so on between them. Finally, the existent links between these two groups of local actors were analyzed. Perceptions on policies, constraints, and incentives were also examined in order to shed some light on the kinds of policy initiatives or reforms that would lead to the adoption of more CSTs. The surveys were administered to 298 farmers and 70 experts between November 2014 and March 2015 in Rakai and to 302 farmers and 85 experts between July and August 2015 in Lushoto.

Table 1. Climate Smart Technologies (CSTs) existing in the study sites according to local experts

Crop Pest and Disease Management	**Soil Fertility Management**		**Managing Diversity on Farm**
Use herbicides and pesticides	Check dams	Mulching	Monocropping
Crop rotation	Grass strips/bands	Composting/residues	Strip cropping
Traps and killing physically	Applying both artificial and organic fertilizer	Artificial fertilizers	Introducing new crops and animals
Intercropping	Minimum tillage	Digging trenches	Intercropping
Planting date	Intercropping	Manure use	Mixed cropping
Biological control	Agroforestry	Fallowing	Crop rotation
Push and pull mechanisms	Contour ploughing	Cover crops	Mixed farming
Planting of natural barriers			
Animal/Livestock Management	**Water and Water Use Management**		**Improved and Traditional Crop Varieties**
Zero grazing	Water harvesting tanks	Planting and maintaining trees along water channel	Introducing improved crop varieties
Introducing improved breeds	Channel irrigation and di-version	Growing water efficient crops	Introducing traditional crop varieties
Introducing local breeds	Catchment ditches	Reservoirs for crops	
	Contour bands	Drip irrigation	
	Micro irrigation		

Analyses of the existing connections among and between farmers and local experts in the study sites revealed that, overall, the connections among and between these groups of local actors were rather weak in both countries. In total, 25% of the surveyed farmers in Rakai and 29% of those from Lushoto reported that they do not go to any other farmer for information about farming techniques or practices. Further analyses revealed that 60% and 49% of the respondents from Rakai and Lushoto, respectively, had no direct connection with any experts inside or outside of their villages. In line with this last finding, only 35% of the respondents from Rakai and 12% of those from Lushoto were aware of the existence of governmental or other programs designed to assist them with learning about, and access to, technologies.

In both Rakai and Lushoto, the farmers that had introduced more improved and traditional varieties of crops had larger networks. The results of the meso-level survey on the connections between experts and farmers revealed that in Rakai only 18 non-farmer experts were named by the 298 interviewed farmers. These results are particularly interesting because more than half of the non-farmer experts who were not named by farmers (28 out of 52) happened to be affiliated with local organizations, and they reported to have worked in the Rakai district during the previous five years and had been particularly involved in communication or information dissemination to farmers as well as in other outreach activities such as training and field demonstrations of agricultural technologies and practices. Similarly, the communication among experts in Rakai was found to be minimal, with only 10% of the possible connections between local organizations actually existing.

In Lushoto, only 14 non-farmer experts were named by the 302 interviewed farmers. The remaining 68 were not named by farmers, and three were missing. Among the 14 experts named by farmers, seven experts were affiliated with local-level organizations. Among the 68 experts not named by farmers, 11 were affiliated with local organizations. In other words, 16% of the non-farmer experts that were not named by farmers (11 out of 68) happened to be affiliated with local organizations. All experts affiliated with local organizations that were not named by farmers reported to have worked in the Lushoto district during the previous five years and also reported being particularly involved in communication or information dissemination to farmers and other outreach activities such as training and field demonstrations of agricultural technologies and practices. Compared to Rakai, the experts named by farmers in Lushoto were also the ones that were prominent in the network. Lastly, the communication among experts in Lushoto was found to be slightly better than what was found in Rakai, with 26% of the possible connections among local organizations actually existing.

The existence of a rather weak degree of connectivity among local actors should not be overlooked since the network analyses also provide evidence that farmers with larger networks were those growing more crops, having more land, obtaining greater crop volumes, and reporting greater economic value for the crops that sold. Likewise, farmers that had introduced more improved and traditional varieties as well as new crops had larger networks.

Follow up workshops: the views of local experts and farmers

The same farmers and experts from Rakai and Lushoto were gathered together one year later. In October and December 2015, respectively, follow up workshops were conducted to present to the same farmers and experts from both countries the survey findings and to investigate the relatively smaller or larger networks that were found to exist between and among the different local actors.

In both countries, the farmers' lack of confidence towards the local experts and their perception of the extension agents' insufficient presence on the ground was corroborated by the farmers during the follow up meetings. The district officials agreed with this sentiment, and they recognized the lack of means of the current extension system to meet farmers' needs sufficiently. During the follow up meeting, the district officials also recognized that there was a great need to increase the use of participatory approaches and to encourage the formation of farmers' groups to strengthen the communication networks. However, the lack of qualified personnel and necessary resources was identified as the primary hindrance.

- **Gender aspects**

The network analysis provided an opportunity to explore whether certain actors have structural or relational disadvantages (based on social and gender variables) that limit their access to information or other types of resources that enable access to, and capacity for, the use of CSTs. In this regard, the survey was used to examine whether women had different networks than men and if women's network were particularly advantaged or disadvantaged for the adoption of CSTs. The results from both Rakai and Lushoto revealed that women have smaller networks compared to men. Specifically, women have fewer ties with whom they discuss farming techniques and practices than men (Figures 1 and 2). The results revealed that even though women were more active in farming organizations than men in the study sites in both Rakai and Lushoto, and were as active in farming as men, they generally had less access to expertise since they were found to be less likely to attend farmer field

days and/or training workshops and were less often advised by extension officers than men. Cultural reasons were also given by both farmers and district officials during the follow up meetings to explain these gender differences.

In addition, the extension officers' lack of knowledge on how to address gender-related issues was also raised by the district officials as a key factor that hindered the effective inclusion of women in the training sessions.

Figure 1. Frequency of Network Sizes, Total and by Gender (Rakai, Uganda)

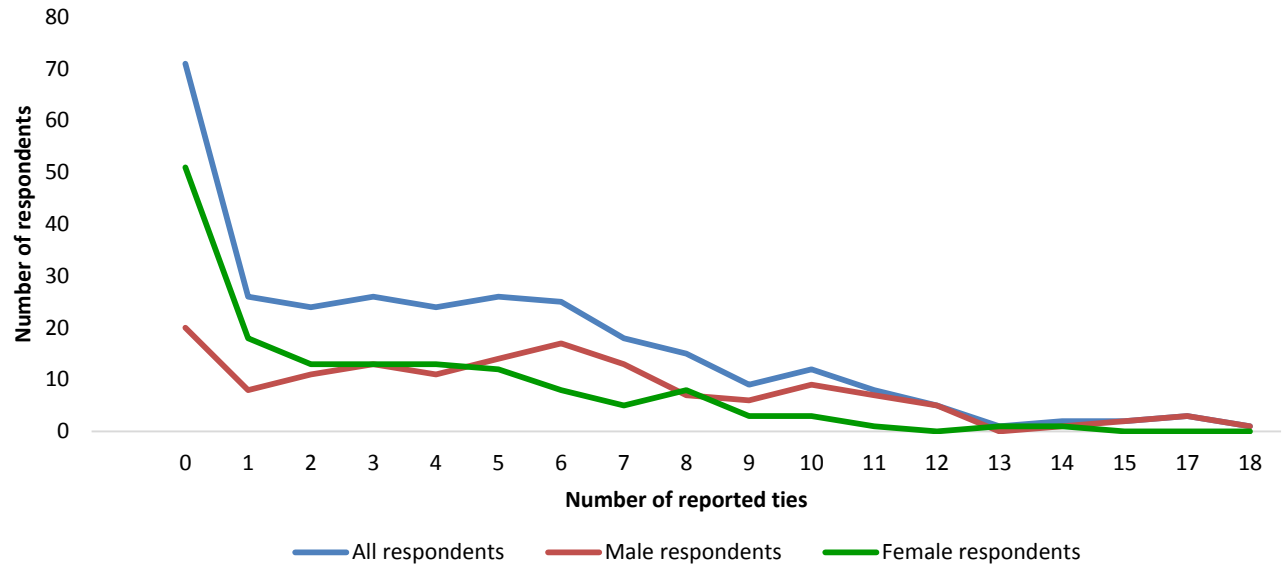
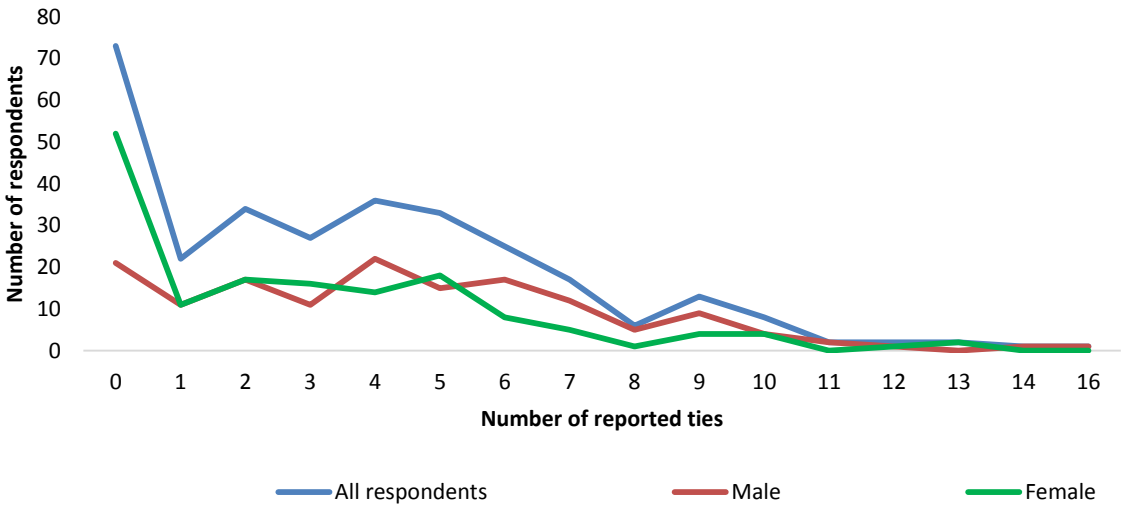


Figure 2. Frequency of network sizes, total and by gender (Lushoto, Tanzania)



Conclusions and policy implications

The insights provided by this study suggest particular aspects that could strengthen the levels of communication among small-hold farmers as well as between the farmers and the different local actors who are contributing to the farmers' adoption of CSTs and, therefore, to the better adaptation of the agricultural sector in Rakai and Lushoto to climate change. There is clearly a need to promote the creation of learning alliances and other spaces whereby farmers and local experts can be created and strengthened strengthen farmers' networks related to climate and agricultural information and technology access (farmer to farmer and farmer to expert). While doing this, gender should be taken into consideration, making sure, among other things, that training sessions and expert visits take place at times when women are also available. Along the same lines, local experts that have knowledge about agricultural technology need to be better connected and coordinated. Moreover, there is a strong need for strengthening the extension system. The study areas would benefit from more demonstrations to teach farmers how to implement certain practices, from the establishment and improvement of farmer field schools, and from the formation of more farmer groups.

Further Reading

- Monge M., Hartwich F, Halgin D (2008). *How change agents and social capital influence the adoption of innovations among small farmers: Evidence from social networks in rural Bolivia*. Intl Food Policy Res Inst.
- Sanginga P. C (2009). *Innovation Africa: enriching farmers' livelihoods*. Earthscan.
- Wossen T, Berger T, Mequaninte T, Alamirew B (2013). *Social network effects on the adoption of sustainable natural resource management practices in Ethiopia*. International Journal of Sustainable Development & World Ecology, 20(6), 477-483.

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Correct citation*: Bedmar Villanueva A, Jha Y, Ogwal-Omara R, Welch E, Seyoum Wejadoo A, Halewood M (2015). Influence of social networks on the adoption of climate smart technologies in East Africa: Findings from two surveys and participatory exercises with farmers and local experts. CCAFS Info Note. Copenhagen, Denmark. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).*

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CCAFS is supported by: