RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security

CGIAR CCAFS

Info Note

Climate-smart villages and progress in achieving household food security in Lushoto, Tanzania

Preliminary results from climate change adaptation and mitigation initiatives in Lushoto climate-smart villages

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Key messages

- Collective action has led to increased investments and utilization of inputs in agriculture
- Farmers are increasingly using climate information through integration of indigenous knowledge with scientific seasonal forecasts to make on-farm decisions
- Farmers are adopting at least two crop innovations and incorporating agroforestry

Lushoto in north eastern Tanzania acts as a global hotspot for biodiversity with varied micro eco-zones within a relatively small area. Lushoto has a mountainous topography with an altitude ranging from 850 to 2,300 meters, making it one of the East African highland zones that suffer from land degradation. The population density is estimated to be over 134 persons per square kilometer. About 51% of the Lushoto people live below the poverty line. As of 2011, about 96% of the households had more than one food deficit month in a year (Lyamchai et al. 2011). Specifically, 62% of the households experience more than four hunger months in a year—a period when they depend on off-farm sources of food. About 26% of households experience three to four hunger months in a year, while another 7% of households experience one to two hunger months. Agriculture is the main source of livelihood for majority of households in Lushoto.

Climate related risks

Recurrent drought, prolonged dry spells, and variable rainfall patterns with intense storms are the main climate related risks in Lushoto. About two-thirds of the rainfall occurs in the long rainy season (*Masika*) from March to mid-June, with one-third occurring in the short rainy season (*Vuli*) from October to December. Mean annual rainfall ranges from 900 to 1,300 mm, with an average of 102 rainy days. Long term daily rainfall data for Lushoto (1922–2012) from the Tanzania Meteorological Agency (TMA) shows a decreasing trend (Figure 1). Between 1981 and 2010, the trends show a decrease in rainfall amounts during *Masika* season and increased amounts during *Vuli* compared to the previous 30 years.

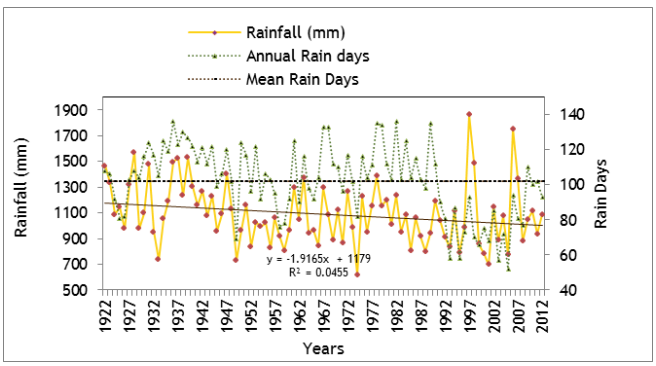

Figure 1: Lushoto long term annual rainfall trend and annual rain days

The risk of crop failure has increased, especially when farmers sow seeds before the actual onset of the rainy season. The smallholder farmers manage the risks of crop failure by growing traditional non-improved varieties of maize and beans. In 2011, only 12% of farmers were reported to have introduced one to two new crop varieties. Local livestock is largely kept under zero grazing, associated with tethering around the homestead due to small land sizes averaging about 0.3 hectares per household. Livestock feeding resources are mainly local

cultivated fodder and crop residues. Limited livestock feed resources often leads to malnutrition, slow growth rates, high susceptibility to pests and diseases, low livestock market value and poor milk production. Other challenges include extreme soil erosion, land degradation and declining soil fertility. The cultivated soils have lost about 50% of soil organic carbon, and 34% of nitrogen (Winowiecki et al. 2015). The high poverty levels increase the vulnerability of farming households to climate-related risks.

Collective action for adapting to changing climate

Since 2011, the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) has facilitated a partnership around collective action in seven villages in Lushoto. The partnership integrates a science approach based on a climate-smart village (CSV) model that focuses on improving local knowledge of climate risks to inform farming decisions. The goal is to respond to climate variability, reduce periodic hunger, ensure food security and improve household incomes. It involves participatory testing of resilient agricultural technologies, training to build the knowledge and capacity to change local practices and improve planning for adaptation to changing farming conditions.

Farmers in Lushoto during participatory testing of resilient potato varieties. Photo: S. Quinn (CIP).

The CCAFS partnership through action research approaches is facilitating the testing of improved crop production practices, land and water management that integrates agroforestry, and institutional innovations. From 2012, three vibrant community based organizations (CBOs) have been established, and are empowering their communities through collective action. The CBOs initially operated in seven villages and have now transitioned into three savings and credit cooperative organizations (SACCOs)—*Yaboga*, *Mbukwa* and *Kwamaga*—covering 29 villages in Lushoto. Tanzania's Ministry of Agriculture, Food Security and Cooperatives, and the Lushoto District Council are partnering with CCAFS to build the capacity of the SACCOs in use of improved agronomic practices and livestock management, which is particularly helping women farmers, who constitute about 55% of the membership. Services provided by the SACCOs to the local community include village savings, table banking, and loaning and acquisition of farm inputs. Currently, the three SACCOs have 1,089 active households, as compared to only 19 households who reported to belong to a group in 2011. Through this initiative of bringing the farmers together, the SACCOs have been able to save a total of USD 30,200. More than half of the members are borrowing from the SACCOS, mainly for investment in on-farm agricultural activities during the rainy seasons, food acquisition, and initiating small businesses.

Through the SACCOs, the farmers are now accessing certified agricultural inputs at more affordable prices and flexible repayment terms such as after harvesting. From 2013 to 2014, a significant amount of inputs like fertilizers, and improved maize and beans, were purchased by the farmers. About 71% of the resilient maize varieties and 74% of beans grown by the farmers were bred by scientists from International Maize and Wheat Improvement Center (CIMMYT) and International Center for Tropical Agriculture (*CIAT*) respectively, in partnership with the Selian Agricultural Research Institute (SARI). The resilient varieties are multiplied on the local farms, where community seed bulking is used by SACCOs to ensure more farmers access the improved seeds.

Integrating indigenous knowledge with scientific forecasts

Climate information is useful for on-farm decision making. Provision of climate information services in Lushoto has improved through the integration of indigenous knowledge with TMA scientific seasonal forecasts. Operating in the initial 7 villages; a team of traditional forecasters organized in three zones (humid, sub-humid and lower) compares notes with TMA and jointly provide seasonal and climate outlooks to farmers before the onset of the seasons. Through a multi-stakeholder partnership that involves the local SACCOs, Lushoto District Council and TMA, the weather forecasts are more reliable. Through the partnership, households who are members of the SACCOS are now accessing weather forecasts. Moreover, an information dissemination network has been constituted and seeks to embed weather forecasting

within the Lushoto District Agricultural Development programs.

Improved crop varieties address food and nutrition challenges

Households in Lushoto are diversifying their crop choices. In 2011, 78% of the households were already introducing at least one new crop variety. By 2014, about 90% of the households were introducing at least one new crop variety. The increased adoption and use of new resilient bean and maize varieties is attributed to the multiplication of the drought tolerant *Lyamungo-90* bean variety, and *Situka* and *Lishe* maize varieties through community seed bulking. In the 2012 long rainy season, for example, 140 farmers acquired 0.5 tons of *Lyamungo-90* bean seed. At the end of the season, there was a harvest of about 6.8 tons and 20% (1.4 tons) kept in the community seed banks for distribution to a different set of farmers the following season. The number of farmers using the resilient seed combined with improved agronomic practices has increased to 1,089 households who are members of the SACCOs. At this rate, about 95% of the farmers in the villages have planted new maize varieties, with 78% planting new bean varieties.

Ongoing on-farm trials led by the International Potato Centre (CIP) is working with more than 50 farmers to identify better adapted potato varieties that can grow all year round while increasing yields. Preliminary findings show that better performing varieties that include *Asante*, *Shangii* and *Obama* are more resistant to potato late blight disease compared to local varieties. By 2014, 61% of households reported to be using improved potato varieties, compared to 38% in 2013, with a threefold increase in potato yield. Similarly, the number of farmers planting resilient cassava varieties has increased from 12 to 33% over the same period. Preliminary results also show that farmers are adopting at least two crop innovations, and that in 2014, 10% of surveyed households were food secure all year round compared to 4% in 2011. A further reduction in households experiencing more than four hunger months from 62% in 2011 to 34% in 2014 was observed.

Farmers use trees to cushion farms from degradation

Over 80% of the land in Lushoto is hilly with a steep, eroded terrain. The farmers are working with CCAFS partners to turn this around, through agroforestry and improved land management. In 2011, only 59% of households reported to have made some tree and agroforestry management related changes and only 22% were producing or purchasing tree seedlings. This has since changed significantly after the establishment of three tree nurseries; each under the management of umbrella SACCOs, with a combined capacity of producing over 150,000 tree seedlings within six months. The varieties planted were developed through research by the World Agroforestry Centre (ICRAF) and the Tanzania Forestry Research Institute (TAFORI). By integrating trees on-farm, Lushoto farmers are diversifying their livelihoods and are responding to a policy by the Lushoto District Council of a 10% tree cover on all farms.

Farmers in Lushoto now have access to tree seedlings and are embracing better land management practices. Photo: S. Kilungu (CCAFS).

Apart from the SACCO owned tree nurseries, champion farmers with individual tree nurseries are teaching their peers within the communities. Individual farmers and groups, and schools have also participated in tree planting. There is an increasing demand for tree seedlings which are in short supply, and TAFORI is spearheading farmer capacity building and introduction of new tree varieties. The goal is to establish up to five more tree nurseries thereby boosting supply from the current 150,000 to 500,000 tree seedlings per six month season.

Sadick Selemani of Lushoto is a champion farmer. He has planted Albizzia and Grevillea trees species along the boundary and across contours on his 0.6 hectare farm.

"I recently harvested 10 trees for timber which I used for roofing my house. In addition, I sold five trees for 220,000 Tanzania Shillings (US$ 100) and used the money to pay school fees for my children," he said.

Another champion farmer, William Dennis has Grevillea, Casuarina and Pinus tree species on his 1.2 hectare farm.

"Climate variability will hasten degradation of soil and water resources. Therefore our local community members should use trees to cushion their farms from degradation and benefit from the income generated," says William.

Further Reading

- Lyamchai C, Yanda P, Sayula G, Kristjanson, P. 2011. Summary of Baseline Household Survey Results: Lushoto, Tanzania. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.
- Mahoo H, Mbungu W, Yonah I, Recha J, Radeny M, Kimeli P, Kinyangi J. 2015. Integrating Indigenous Knowledge with Scientific Seasonal Forecasts for Climate Risk Management in Lushoto District in Tanzania. CCAFS Working Paper no. 103. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org.
- Winowiecki L, Vagen T, Massawe B, Jelinski NA, , Lyamchai C, Sayula G, Msoka E. 2015. Landscape-scale variability of soil health indicators: effects of cultivation on soil organic carbon in the Usambara Mountains of Tanzania. *Nutrient Cycling in Agroecosystems* 1-12.

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