RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security

CGIAR CCAFS

Info Note

Progress in achieving household food security in Climate-Smart Villages in the Albertine Rift, western Uganda

Preliminary results from climate change adaptation and mitigation initiatives in Hoima Climate-Smart Villages

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Key messages

- Collective action has spurred agricultural investments especially in horticultural crops
- Integration of indigenous knowledge with scientific weather forecasts has improved on-farm decision making
- Farmers are expanding their crop choices and varieties for higher productivity
- Farmers are incorporating agroforestry in soil and water conservation practices

Hoima in western Uganda is located to the east of Lake Albert. The landscape is generally undulating with relatively flat low lying area alternating with broad hills, with land degradation and declining soil fertility as key challenges. The population density is about 160 persons per square kilometer, with 22% of the people living below the poverty line.

Agriculture is the main source of livelihood. Crops grown include cassava, beans, sweet potatoes, and maize. Livestock is also an important source of food and income and include chicken, pigs, cattle and goats. Most households get their food supplies from their own farms throughout the year. March and April are food deficit months, when more than 20% of households get their food mainly from off-farm sources. March and April also marks the beginning of the long rains after several months of dry season. About one-third of households are food secure throughout the year, with two-thirds having food deficits for at least one month in a year.

Climate related risks

Farmers in Hoima are increasingly facing a wide range of climate-related risks. Rainfall patterns are highly variable, both within and between seasons. Onset and cessation of rains are erratic, making it increasingly difficult for farmers to plan and take advantage of early season planting of crops. Average annual rainfall is about 1,400 mm, while average monthly rainfall and number of rainy days shows a decreasing trend, especially during the critical months of crop growth (April–June and September–November). Figure 1 shows the trend in average annual rainfall, with the slope of the graph indicating a general decline.

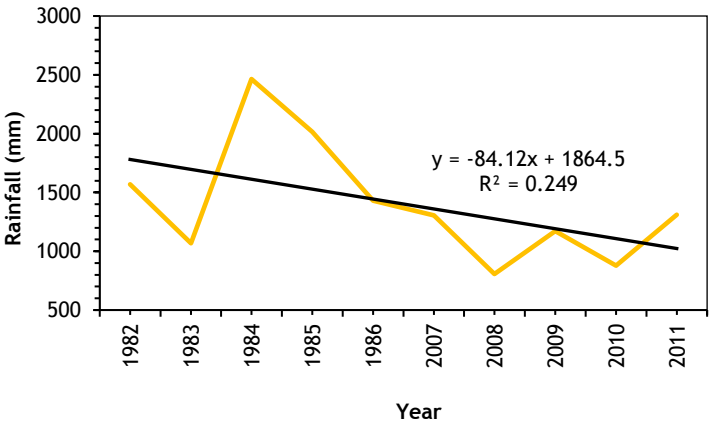

Figure 1: Annual rainfall in Hoima district

Soil erosion is widespread, affecting 20% of the landscape. Incidences of pests and diseases are also increasing, affecting crops and livestock. Rising temperatures and increasing rainfall variability have affected crop and livestock productivity, resulting in declining food security.

Collective action for adapting to changing climate

Since 2012, The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) in collaboration with National Agricultural Research Organization (NARO) centre in Hoima—Bulindi Zonal and Agricultural Research and Development Institute (Bulindi ZARDI)—facilitated a partnership around collective action. Initially covering seven villages, the partnership aims at responding to climate change and variability in order to reduce periodic hunger, improve food security and household incomes. This is achieved through integration of a science approach based on the Climate-Smart Villages (CSVs) model, focusing on improving local knowledge of climate risks to inform farming decisions.

Starting 2014, two community based organizations (CBOs), *Bagonza-Kukora* and *Kyabigambire Farmers Organizations* were established to empower communities in Hoima through collective action. The CBOs initially covered 140 households in seven villages and have now expanded to 21 villages. Bulindi ZARDI has partnered with CCAFS to build the capacity of the CBOs through training improved agronomic practices and livestock management for improved productivity. Other initiatives by the CBOs include village savings through table banking and loaning, acquisition of farm inputs and marketing of farm produce. Currently, the CBOs have expanded their membership to 1,670 active households. The groups comprise of 60% women members. By bringing the farmers together, the CBOs have mobilized a total of USD 55,000 in a community innovation fund. Majority of the members are borrowing from the fund, mainly for investing in agricultural activities, including horticulture, food purchase, and off-farm activities such as small businesses.

The CBOs have enabled farmers to access certified agricultural inputs at more affordable prices through flexible repayment terms (such as after harvesting) and affordable interests rates. Over the last three years (2014-2016), a significant amount of inputs such as fertilizers, improved varieties of maize, beans, cassava and potatoes were purchased by the farmers who are now producing in large scale. Over 70% of these resilient varieties were bred by International Maize and Wheat Improvement Center (CIMMYT), International Center for Tropical Agriculture (CIAT), International Centre for Tropical Agriculture (IITA), and International Potato Center (CIP) in partnership with NARO. The resilient varieties are multiplied on the local community farms, enabling more farmers to access improved seeds through community seed and planting material (for cassava and sweet potato) bulking.

Integrating indigenous knowledge with scientific seasonal forecasts

Climate information services (CIS) is useful for improving on-farm decision making. In Hoima, farmers have largely been depending on indigenous knowledge (IK) for weather forecasts. Beginning 2012, Bulindi ZARDI has partnered with farmers to integrate IK with scientific weather forecasts for better on-farm decision making and management of climate related risks. Through the partnership, farmers are actively involved in collecting rainfall data, using rain gauges that were installed in selected farms. The farmers take daily readings of rainfall and send to Bulindi ZARDI for analysis by experts. Before the onset of every season, IK forecasters and meteorologists from Uganda National Metrological Agency (UNMA) and Bulindi ZARDI meet to compare their forecasts, to provide a joint consensus seasonal weather outlook to the farmers. Through the local CBOs, Bulindi ZARDI, IK forecasting and UNMA, the weather forecasts are more reliable. Households that are members of the CBOs are now accessing weather information through mobile phones, with over 620 households now using climate information services, enhancing their ability to manage climate risks and make farming decisions on planting dates and types of crops to plant.

More suitable sweet potato varieties are planted by Hoima farmers. Photo: J. Recha (CCAFS)

Improved crop varieties address food security and nutrition challenges

Households in Hoima are diversifying their crop choices, including improved crop varieties. As of 2011, 67% of the households were already adopting higher yielding and/or better quality varieties, 50% were already introducing shorter cycle, drought tolerant, and/or disease-resistant varieties, while a third of the households had introduced improved agronomic practices such as intercropping, crop rotation and early land preparation. By 2016, over 90% of the households had introduced at least one new crop variety. Increased uptake and use of improved resilient crop varieties of maize and beans is attributed to the

partnership facilitated by CCAFS, Bulindi ZARDI, CIP, CIMMYT and CIAT. For example, NARO in partnership with CIP have developed improved sweet potato varieties that are high yielding, early maturing, drought tolerant and with high levels of β-Carotene (a precursor of Vitamin A). Similarly, NARO in partnership with IITA have developed an improved cassava variety that is drought tolerant, resistant to pests and diseases, and high yielding with high levels of proteins and vitamin A. Through participatory action research, these improved varieties of sweet potatoes and cassava were introduced to farmers in Hoima beginning 2013. By end of 2016 more than 1,200 households had planted these improved cassava and sweet potatoes varieties. The two local CBOs have been instrumental in advancing the scaling out and uptake of the improved varieties to more farmers in neighbouring villages. Some of the strategies used by the CBOs to promote uptake of the new varieties include village demonstrations, field days and multiplication of planting material. The new improved sweet potato varieties yield about 30 tons per hectare per season compared with 5 tons for the local varieties.

Alice Nyangoma, a sweet potato farmer in Kasinina village in Hoima attests of a good harvest with the newly introduced varieties. "*I have observed higher pest tolerance and disease resistance capabilities and shorter maturity period of 3 months for the new varieties compared to local varieties which take 4 to 5 months,*" says Alice.

"*The new NASE-14 cassava variety matures in seven months compared to the local cassava variety that takes about a year to mature. Besides, the improved cassava variety can be harvested for more than three years continuously, while the local type lasts for less than two years on the farms*," says Godfrey Kairagura, a member of Kyabigambire Farmers Organization.

Cassava and sweet potatoes are the two most important root crops and also among the staple foods for most communities in Hoima. Crop diversification, therefore, improves risk management and ensures household nutritional needs are met.

Fruit trees for soil conservation and improved nutrition

Farmers in Hoima are integrating agroforestry into their farming that includes mango and pawpaw fruit trees. The trees are planted across contours and on terrace ridges to conserve soil by reducing erosion. The fruit trees are intercropped with other food crops such as maize, sorghum, cassava, sweet potatoes, and indigenous vegetables.

Farmers in Hoima are planting more fruit trees. Photo: J. Recha (CCAFS)

Farmer Yabes Tibwerindwa from Kasinina village says "*Planting a mango tree is like killing two birds with a single stone. The mango tree is a source of fruit which ultimately contributes to improved nutrition for families, while the tree roots help protect the soil from physical erosion. The mango tree is also less affected by water stress and therefore can survive the dry seasons*."

In 2013, 40 farmers were initially selected from seven villages by Bulindi ZARDI scientists and trained on how to manage the fruit trees. This also involved training on other land management practices such as soil erosion control, and planting of cover crops and leguminous shrubs for restoring soil fertility. Later, each farmer established a demonstration site of about 0.1 hectares of land where three different varieties of mangoes—*Tommy Artikins*, *Bire* and *Boribo*—were introduced alongside cover crops (*Calliandra calothyrsus*, *Lueceana leucocephala* and *Mucuna*). Demand for fruit trees and cover crops has now increased with more than 400 farmers affiliated to the two CBOs involved in 2015, with a further 1,200 households on board in 2016.

The improved mangoes take 2.5 to 3 years to produce the first fruits compared to local varieties which take 5 to 6 years to produce first fruits. In addition, the improved mango varieties produce bigger, more delicious fruits with less fibre compared with the local varieties. In a year, each improved mango tree produces between 1,000 and 1,500 fruits while the local varieties yield about 250 mangoes annually. Improved mango fruits also fetch higher prices in the market (about US$ 0.5 each). To maximize the benefits, farmers in Hoima are intercropping mango and pawpaw trees with nitrogen fixing legumes such as beans from the CIAT Pan African Bean Research Alliance (CIAT-PABRA) and ground nuts. Farmers are advised to intercrop mangoes with sweet potatoes in the first one and a half years. Ultimately, in this agroforestry setting, farmers are able to reap the benefits of intercropping while at the same time conserving soils and water. In addition to planting fruit trees, the pioneer group

of farmers has also been introduced to other soil and water conservation technologies that enhance water retention like the water harvesting ditches. Farmers are encouraged to dig the ditches to a depth of 0.6m around the farming plots where they have the mango and pawpaw trees.

Further Reading

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This Note presents preliminary results from participatory action research activities conducted by CCAFS and partners in the Hoima climate-smart villages in Uganda.

The titles of the INFO NOTE series seek to disseminate research findings on climate change, agriculture and food security, as well as stimulate feedback from the science community. This INFO NOTE was prepared by the following authors

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