NILE RIVER BASIN

Enhancing communities' adaptive capacity to Climate Change in drought-prone hotspots of the Blue Nile Basin in Ethiopia

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NILE BASIN INITIATIVE
Initiative du Bassin du Nil

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Acronyms & abbreviations

ARARI	Amhara Region Agricultural Research Institute
CCF-E	Climate Change Forum – Ethiopia
CIMMYT	International Maize and Wheat Improvement Center
CSD	Commission on Sustainable Development
DAP	Diammonium Phosphate
GDP	Growth Domestic Product
ICRAF	International Center for Research in Agroforestry
ILRI	International Livestock Research Institute
IWMI	International Water Management Institute
LOSOFT	Location Specific On-farm Fertilizer Trial
LWM	Land and Water Management
m.a.s.l	Meter Above Sea Level
MoA	Ministry of Agriculture
NBDC	Nile Basin Development Challenge
NGO	Non-Governmental Organization
N	Nitrogen
P	Phosphorus
R&D	Research and Development
RCD	Root Collar Diameter
SARC	Sirinka Agricultural Research Center
SWC	Soil and Water Conservation
SWM	Soil and Water Management
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WU	Wollo University

Executive summary

The Nile Basin region is vulnerable to climatic variability as its economies are largely based on weather-sensitive crop and livestock production systems. A pilot project on ''Enhancing communities' adaptive capacity to climate change in drought-prone hotspots of the Blue Nile Basin in Ethiopia'' was implemented in Woreilu Wereda, South Wollo of Ethiopia from Oct 2011 to Feb 2013. The objectives of the project were (1) to understand key socio-economic factors of dry land communities affecting adoption, collective action and effective utilization of land and water management (LWM) interventions; (2) create a knowledge base forum at local level to share best practices; (3) assemble knowledge base to integrate LWM interventions and approaches, and improve local climate adaptation capacity; and (4) generate local scientific evidence that may contribute to the regional and global policy debate on climate change issues. The pilot project had seven major activities to fulfill the project objectives. The activities included stakeholder workshops to initially introduce the project ideas and at the end of the project share key insights and to effect policy influence. Furthermore surveys were undertaken to assemble knowledge on factors influencing adoption of climate adaptation strategies. Capacity building activities were undertaken for local partners. Mapping and targeting LWM related interventions in the landscape was carried out. Action research was undertaken on climate change adaptation interventions. Finally, information materials were developed and disseminated to upscale lessons learnt from the project interventions.

The project operated in Kabe watershed (Worreilu district), which is part of the Jemma sub-basin of the Blue Nile, Amhara Region, Ethiopia. Upstream to downstream interactions at Kabe watershed are very strong. Altitude range is 2822-3837m. The mean annual rainfall is 840 mm per annum. Main and short rainy seasons are the two crop growing seasons in the watershed. Climate variability in the area has pushed farmers to abandon the small rainy season for cropping. The watershed is characterized by a mixed crop-livestock system. A total of seven land use systems can be identified in the watershed. The dominant land use is agricultural land that covers 71% of the watershed area. Major crops grown in the watershed include cereals (barley, wheat), pulses (faba bean and field pea) and horticultural crops (cabbage and potato). Small ruminants such as sheep, and cattle and equines are abundant in the watershed and also play significant economic and cultural roles for the communities. Natural vegetation is declining from time to time. The soil classes in the watershed are Glyic Cambisols, Vertic Cambsols, Eutric Regosols and Eutric Nitisols. The upstream part of the watershed is less fertile due to nutrient depletion. Generally, land degradation is apparent because of soil erosion and the extractive farming system. Over all, the watershed has more than 18 watering points or stream heads that could be developed and potentially used for drinking as well as supplemental irrigation and dry season high value crops production.

The partners for the project were composed of ILRI, UNEP, Wollo University, ARARI (Sirinka Agricultural Research Centre), Woreilu Wereda Office of Agriculture, Woreilu Wereda Administration and Kabi Kebele Administration. These institutions collaborated and implemented the project interventions. The project also employed a local community facilitator to promote collective action, integrate new interventions, upgrade the existing ones and enable regular learning and sharing among farmers through cross-farm visits, community meetings, demonstration fields and collective action engagements. Surveys were conducted to characterize the watershed constraints, opportunities and communities' climate change adaption strategies. Watershed resources mapping and a training program on making digital stories were sub-contracted to consultants.

ILRI and Wollo University organized a stakeholder workshop in Dessie, Northern Ethiopia from 24-25 Nov 2011. A wide range of partners participated in the workshop to share their experiences and to engage in this project. Key challenges encountered by most watershed management initiatives include: negotiations and convincing farmers are time-consuming and sometimes challenging activities; some initiatives do not sustain after the completion of projects due to lack of ownership; poor exit strategy by donor-supported projects; duplication of initiatives and institutions; and lack of landscape scale planning - delineation commonly based on project objectives and available budgets.

The survey on assemblage of communities' knowledge in relation to the factors affecting adoption

of climate adaptation strategies demonstrated the following major challenges for crop production: erratic and insufficient rainfall particularly during the short rainy season, lack of improved crop varieties, poor farming practices, land degradation and crop diseases (yellow rust on wheat, root rot on garlic). Furthermore, poor performance of local breeds, lack of animal fodder and prevalence of animal diseases constrained livestock productivity. As a result of the challenges related to biophysical and socio-economic issues, farmers are not able to produce enough to satisfy their annual food requirement. The national Safety Net Programme supported the majority of the community to complement their livelihoods.

As part of the capacity building scheme undertaken by the project, the project trained 160 farmers and 120 extension workers. The training focused on physical and biological soil and water conservation (SWC), crop and livestock production, water, forestry/agroforestry, livestock management, horticulture technologies and community mobilization, and supported by training manuals. The importance of needs assessment to identify training topics, the comprehensive nature of the training to address different topics, the participatory nature of the training program, and the involvement of experts from different fields for enhancing cross learning are important lessons from the capacity building schemes.

A significant number of interventions were considered to address the constraints related to water, crop, livestock and feed, forestry/agroforestry, home-garden development and collective action. The project team in collaboration with the communities of the watershed improved two springs, and used them as source of drinking water for more than 60 beneficiaries. Similarly, three hands dug wells, and one water harvesting dam were constructed at a household level. The water stored during the rainy season served as a source of supplementary irrigation for the home-garden grown vegetables. Utilization of clean water for drinking contributed to the communities' health and to the productivity of their farming activities.

Crop related activities focused on selection/ evaluation of already released crop varieties and demonstration of varieties with recommended fertilizer rates for scaling up purposes. The wheat variety (Dinkinesh), barley variety (Estayish) and field pea variety (Adi) performed better in terms of grain and biomass yield as well as preference by the local farmers. Grain and straw/biomass yield of the improved barely and field pea varieties was 3 and 3.8 t ha^{-1} and 2.8 and 1.3 t ha^{-1} over the grain and biomass yield of the respective local varieties. About 80 farmers participated in crop varietal evaluation and scaling up activities. It was expected that farmers can easily get these improved seeds of the varieties either through exchange in kind or in cash for wider utilization.

The project introduced 13 improved Awassi breed rams to 13 groups of farmers in cluster/ village based approach within the watershed to improve the potential productivity of local sheep breed. So far, local ewes mated with the improved rams have produced more than 80 lambs. The quality of the improved sheep in terms of selling price and increased birth weight attracted farmers as these benefits help them generate more income and enable them cope with the effect of rainfall variability. In line with the introduction of improved sheep breed, the project introduced forage plants at the watershed. The forage plants and grass species were planted on SWC structures and around the homesteads (backyards). Survival after 3 month of planting was 70% for Desho grass and less than 50% for Phalaris, Sesbania and Tree Lucerne.

Different species of tree seedlings were raised and planted on bench terraces with integration of moisture conservation practices around Mount Yewol through the project support. The planted species include *Erica arborea, Arundinaria alpine, Acacia decurrens, Acacia saligna, Acacia abyssinica, Cuppresus lusitanica, Sesbania sesban* and *Chameacytisus palmensis*. Survival after 3 months of planting was more than 65% for *Erica arborea* and *Acacia saligna*. In addition to Mount Yewel, a hilly landscape was identified and used to plant *A. decurrens, A. saligna, C. lusitanica, Shinus mollie* and *C. palmensis*. Mean survival rate of seedlings 3 months after planting was above 87% with Ibro water conservation basin and 76% with normal pit. This was achieved due to the implementation of appropriate physical SWC conservation measures, introduction of niche compatible tree species, improved tree plantation and seedling management practices and controlled free grazing systems.

The home-garden initiative has been found attractive to farmers as it helps them produce and consume vegetables and root crops, and generate income within a short period of time. Most of the participating farmers planted cabbage, swiss chard, lettuce, carrot, shallot, garlic and potato and high land fruits such as apple and plum in their respective home-gardens. However, the performance of potato and garlic was poor due to the incidence of diseases like late blight and root rot. Problems in relation to lack of application of proper cultural practice

(spacing, watering, weeding and cultivation) were apparent in some of the home-garden development efforts.

The Wereilu Wereda facilitated the implementation of different physical and biological SWC practices, plantation of tree and forage seedlings on hillsides and farmlands and around the homesteads. The local communities voluntarily participated in the watershed management activities for 60 days to support the recent government NRM initiatives. Stone faced soil bunds and stone terraces covered 33.6 and 37.7% of the physical SWC measures. Survival of the indigenous plant species such as *Erica arborea, Juniperus procera* and Festuca species was promising under the extreme high altitude (upstream watershed) conditions. The physical and biological SWC measures are expected to contribute to the maintenance of soil fertility and halt soil and water erosion, and finally improve water infiltration and ground water recharging. In addition to the soil improving and protection role, the grasses and shrub species provided forage to animals.

Privately owned but collectively managed grazing lands cover 82 ha of land in the watershed. In addition to crop residues and other locally available feeds, grazing lands served the community as important sources of feed for different livestock species both during the dry and rainy seasons. Farming communities in the watershed closed grazing lands, harvested the biomass and fed to their animals. Farmers believed that the current arrangement and management of grazing lands enhanced productivity of grazing lands in terms of quantity and frequency of biomass production. The cut and carry system also improved livestock productivity as a result of controlled feeding and avoidance of long distance movement of animals.

The project used field-day and digital photo stories as important tools to advocate and up scale the lessons from the project implementation activities. Project personnel also produced and released online three digital stories focusing on grazing land management, improved crop varieties and water harvesting. A field-day was organized at

Kabe watershed and involved 96 participants from various institutions. Implementers of the project demonstrated selected climate change adaption interventions to the field day participants. Identified strengths of the project included the ability of the project to enhance partnerships at local level, the integrated approach of the project and the focus of the project in alignment with the government development agenda. On the other hand, low effort to prevent disease and provide technical support on home garden crops, low effort to use local materials for gully rehabilitation and weak exit strategy to ensure sustainability were identified as limitations of the project. The participants also recommended that a sense of ownership has to be ensured for the developed springs, the Woreda has to take over the project activities to ensure their sustainability, and the project has to scale up its success stories to a wider scale.

ILRI in collaboration with UNEP, Wollo University, ARARI and Woreilu Office of Agriculture organized a two day workshop on "Lessons and success stories from a pilot project on climate change adaptation interventions in Kabe watershed, south Wollo, Ethiopia". The workshop took place from 11-12 February 2013 at ILRI campus. The total number of participants was 49. Presentations, demonstration of digital stories, and group discussions on possible strategies of scale out/up of success stories/lessons and possibilities for the second phase of the project were part of the workshop sessions. Establishment of strong partnerships among partners, creation of demand for research and development, production of baseline information, building of capacity of some farmers and extension workers through training and site visits, and identification and introduction of some potential technologies and practices that can enable communities' capacity to adapt to climate change/ variability impacts were some of the project successes. Technologies, practices and concerns of low income, landless and poor women households. Value chain approaches will receive much attention to address gaps both at supply and demand side. The project is also assumed to have a stakeholders' forum, and strengthen partnership among government development institutions, universities and research organizations.

In conclusion, partnership among farmers and partner institutions was strengthened because of the operationalization of the project at Kabe watershed. Meetings, trainings, workshops and field evaluation forums enhanced the knowledge of farmers and other local extension workers on climate change effects and possible adaptation intervention measures. A number of climate change adaptation interventions were implemented at the watershed and sub-watershed level, and benefited the communities. Although the life span of the project was very short, the interventions on spring water development, shallow wells, drought resistant and early maturing crop varieties, improved sheep breeds and home-garden high value fruit and vegetable plants and the NRM activities are evidence of the possible avenues for communities to adapt the effects of climate change.

Some of the issues and the R&D gaps that need a follow up action at the watershed include: more area coverage and involvement of more farmers, technology coverage beyond entry points, backyard forage development, use of locally available feed resources, R&D on income generating activities, off-farm income, capacity building of researchers, market linkage activities, detailed studies on collective actions for grazing land management, gully rehabilitation and landscape/ watershed based SWC, studies on technological options/ agronomic practices that improve the productivity of collectively managed grazing lands, the potential contribution of watering points and the positive and negative impact of Eucalyptus species for adapting effects to climate