Participatory identification of indicators for assessing options for climate compatible development of smallholder farmers in the Central Rift Valley of Ethiopia

Field report of community workshop, 27-31 June 2011

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Terminology

Adaptation: Practices of farmers that reduce the vulnerability to actual or expected climate change effects. They can be spontaneous or planned responses to actual or expected conditions (Regmi et al. ,2010).

Adaptive capacity: The ability of a social system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (Regmi et al. ,2010).

Climate compatible development: are developments that are safeguarded from climate impacts (climate resilient development) and reduce or keep emissions low without compromising development goals (low emissions development) (CDKN,2010).

Climatic hazard: The harmful effects of climate change on livelihoods and ecosystems. These can be caused by both gradual changes in climate, as well as sudden and discrete changes(Regmi et al. ,2010).

Climate vulnerability: The degree to which a community is susceptible to, and unable to cope with, the adverse effects of climate change (Regmi et al. ,2010).

Maladaptation: Practices of farmers that make use of the existing resources to achieve desired goals during and directly after a climatic hazard and refer to an action or intervention that increases vulnerability to climate change (Regmi et al. ,2010).

Mitigation: An anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases (IPCC,2007).

Resilience: The amount of change a social system can undergo and maintain the same function and structure while retaining options to develop in desired directions. Communities are resistant to climate change if they can withstand climate hazards and rebuild themselves (Regmi et al. ,2010).

Triple win options: policy options that contribute to 1) rural development, 2) adaptation to climate change and 3) a low carbon footprint (CDKN,2010).

1. Introduction

Existing options for climate change adaptation in African agriculture are numerous and divers. They include for example, crop diversification, intensification, conservation agriculture, agro forestry and water harvesting. But how do we gain an insight into the conditions under which these options work best? In order for policy makers to effectively build on the potential that these adaptation options offer, careful identification and assessment of agricultural practices is required. The challenge of a climate compatible development requires a change ranging from global, national and area-specific development, environmental and agricultural policies to strategic and operational farm management. Farmers simply do not adopt practices that 'experts' think are good for them. To develop (and disseminate climate compatible development options due attention should be given to farmers' practices, knowledge, resources and aspirations. Planning at the national level should be linked to tailor-made solutions at the local level, and promising local innovative practices need to be facilitated and supported by national policies. Therefore, climate compatible development requires an approach that is embedded in a multi- stakeholder dialogue in which farmers, scientists, development practitioners and policy makers to identify effective, innovative and socially equitable options. Creating climate resilient and low emission agricultural practices imply not only finding options to overcome the challenges that a changing climate provide, but also ensuring that those options contribute to sustainable development, taking into account the most vulnerable, i.e. the rural poor.

The BO-009-107 "Development of feasible sustainable agriculture strategies in a climate change context in Ethiopia" focuses on the development of a Triple Win assessment framework to assist Ethiopian and Dutch policy makers in evaluating the contribution of interventions to development, adaptation and mitigation objectives as well as to identify synergies and trade-offs between options. Within this case study major decision factors of smallholder farmers in selecting agricultural practices in respond to climatic stress are central. By gaining insight in the choices made by smallholder farmers to deal with current climate stresses we will be able to provide locally relevant indicators for assessing triple-win interventions to the region.

This case study aims to assess which factors are crucial in the decisions of smallholder farmers who typically operate under climatic stress. This data has been gathered by participatory research tools that have been applied in a three day community workshop. This workshop took place from May 25-27, 2011 and the information was complemented by on site key informant interviews on May30 and 31. The selected site for this study is the community of Korme Bujure Kebele, which is part of the Adami Tullu Jido Kombolcha woreda in the Oromia district.

Chapter 2 further describes the conceptual framework and Chapter 3 the research methodology. In chapter 4 the research area is presented on the basis of a review of current climatic stresses, natural resource management issues and policy developments in the area. The results of the participatory research are presented in chapter 5 and the discussion and conclusions in chapter 6.

Objectives

- Gain insight into the crucial decision factors of smallholder (rain fed)farmers for the selection of options to deal with climatic stress.
- Identification of locally relevant indicators for the policy assessment of triple win options for smallholder rain fed farmers.

To reach these objectives the following information has been gathered in the community workshop and key informant interviews:

- Identification and prioritising problems related to climatic stress for smallholder rain fed farmers.
- Identification of adaptation options to prioritized problems and the underlying reasons.
- Identification of constraints of the further development of current adaptation options to deal with climate variability and extremes.

2. Conceptual framework

There is a rapidly growing domain of knowledge and experience on climate change adaptation (CCA). This is a dynamic and contested domain, in which new evidence is brought in and needs to be contextualized for each situation. Climate change has long been discussed in terms of scientific evidence for climate change, in which climate experts have fiercely fought over the hockey stick graph of time versus temperature increase, as represented in figure 1. Now it is commonly agreed that climate change is happening (IPCC, AR4, 2007). Second were the explorations of climate change impacts on different ecosystems and land uses of which became clear that besides mitigating climate change adaptation to its impacts is inevitable(IPCC, AR4, 2007). Climate change adaptation requires changes in current livelihood strategies and set priority on the most vulnerable social groups and land uses. Therefore climate change adaptation needs to be in line with efforts that are made to achieve sustainable development (Terwisscha van Scheltinga and van Geene, 2011). Climate adaptation options should be assessed on their (potential) impacts on social, environmental and economic development, also referred to as the triple bottom line: people, planet, profit. The way to approach CCA in sustainable development has to be a process of change, as it is a highly complex matter with many uncertainties (ibid.). The combination of technological and social change processes makes it even more complex because it also involves issues of power and politics. In order to achieve climate compatible development trade –offs will be made between different economic sectors. This change process therefore includes decision makers, science and private actors on from a local community level to the national policy level. By learning from each other's experiences, knowledge and perspectives, solutions are found to local contexts to which stakeholders can commit themselves. Or as Kuriakose (Worldbank, 2009) describes: "*While global models can project climate impacts and estimate costs of expected investments, developing country decision-makers also require national and regional assessments that take a bottom-up, pro-poor perspective, integrate across sectors, and reflect local stakeholders' experiences and values, in order to determine appropriate climate responses."* The case study described is limited to a three day workshop in a single community (kebele). However its theoretical and methodological approach is build on research that has been done in other parts of Ethiopia recently (Worldbank 2010, Troëger et al, 2010, Terwisscha van Scheltinga and van Geene, 2011).

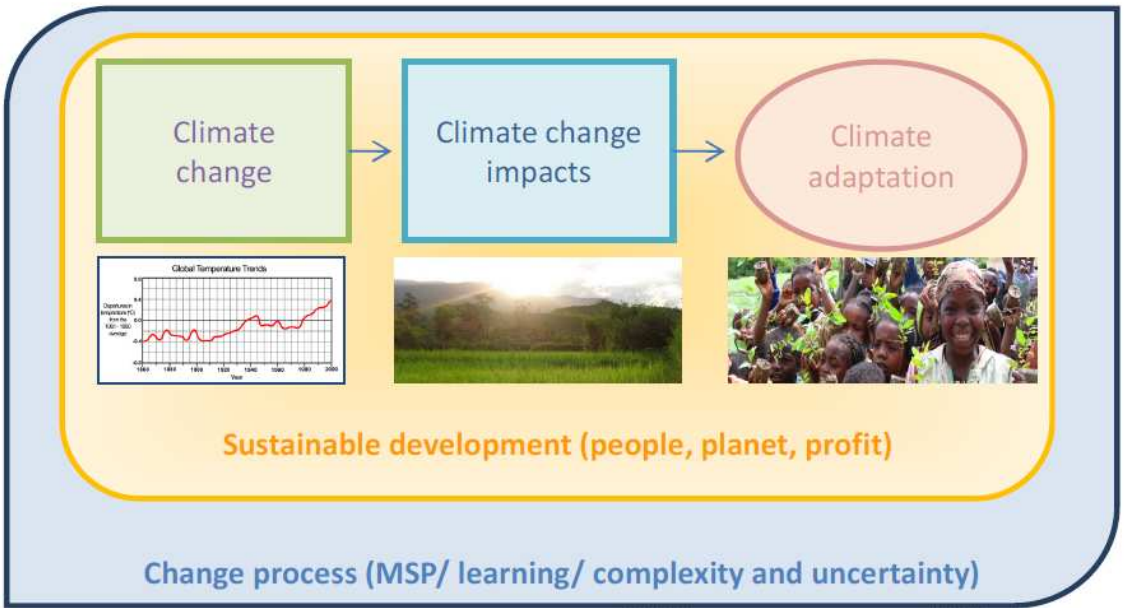


Figure 1. Climate change adaptation as a change process in the framework of sustainable development[1]

On the basis of this thinking as summarized in Figure 1, this case study on climate adaptation in the central rift valley has started with the identification of climate change and its impacts in a local context, which is found in chapter 2. Secondly on the basis of literature we have identified key issues with regard to sustainable development. Finally we have looked at of planned Ethiopian policies. These findings based on a review of scientific literature and policy documents is complemented by a participatory field study to uncover the factors that influence decisions taken in the development of climate adaptation options by rain fed farmers. Together these results give insight into the locally relevant indicators for the assessment of policy options that lead to a climate compatible development in agriculture.

1 As explained in Chapter 5. "Linking training, research and policy advice" by CTHM Terrwischa van Scheltinga and J. Van Geene, in the book: *A.van Paassen, J. van den Berg, E. Steingrover, R. Werkman and B. Pedroli (forthcoming)* Knowledge in action.The search for collaborative research for sustainable landscape development. *Wageningen Academic Publishers, Mansholt Series, Volume 11, Wageningen*

3. Methodology

In 2008/09, within this project, i.e. during the course on climate change adaptation in agriculture and NRM and stakeholder meetings with policy makers, hotspots for climate change adaptation were identified. These are the catchment of Lake Ziway in the Central Rift Valley and coffee production in the south-west of Ethiopia. In 2010 literature studies were done on both hotspots. This document is based on the literature review executed in 2010 and the participatory research executed in 2011.The methodology used in the 2011 research component, of which this case study is part, is based on the organisation of a 3 day participatory community workshop in combination with key-informant interviews. The principles and tools used during the participatory workshop are based on the work of the Socio- Economic and Gender analysis Programme of the FAO (1995). By making use of this method we maximize the use of local knowledge and experience, limiting the imposition of researchers' preconceptions on local conditions. Local people are given the opportunity to describe how they do things, what they know and what they want. The participatory tools are complemented with other research methods, such as a review of secondary data and key-informant interviews, direct observation and participant observation. The participatory community workshop took three days and was attended by the project team, the local Development officer and the village leader together with 29 selected members of the Korme Bujure Kebele. The participants were selected equally from the different zones of the kebele and consisted of 9 women and 20 men that ranged in age from 22- 63.

The workshop was organised jointly by HoA-REC, LEI and RCWDO. This collaboration was intended to maximize local capacity building on climate adaptation by the local NGO (RCWDO), while ensuring good background knowledge of the community. The workshop was prepared by two initial visits to the community to discuss the community's interest and availability. It was made clear that the workshop would not consist of training for the community members and that it would not result in the direct development of programs in the community, but would serve for research purposes. However the community workshop was followed by a WOREDA meeting with the different responsible government sector offices and civil society organisations actively working in the area in which the results were presented and implications discussed. This was highly appreciated by community members as communication with WOREDA offices was difficult.

The team existed of :

- A specialist in social sciences with regard to the use of natural resources (LEI)
- A specialist in environment, agronomy, rural development and Rift Valley branch office coordinator (HoA-REC)
- Specialist in participatory climate adaptation research (HoA-REC)
- A specialist on forestry and environmental program officer of with experience in the kebele (RCWDO)

RCWDO

Rift Valley Children and Women Development Organisation (RCWDO) is an indigenous, national, non governmental, not for profit making and secular development organisation dealing with the promotion of the welfare of the poor and marginalized people particularly children and women who are the most vulnerable groups exposed to all the problems of underdevelopment. RCWDO operates since 1994 in the Ethiopian Central Rift Valley Oromia National Regional State in East Shoa Zone (Adamitullu Jido-Kombolcha and Dugda districts) and Arsi Negele, Kofele, Munesa, Kersa and shala districts of West Arsi Zone. RCWDO programs include the following:

- Livelihood diversification
- Food facility
- Value chain improvement
- Environmental protection and management
- Gender support program

HoA-REC/N

The Horn of Africa Regional Environment Centre and Network (HoA-REC/N) focuses on Environmental concerns and sustainable development options within the Horn of Africa regions of Sudan, Somalia, Kenya, Ethiopia, Eritrea and Djibouti. It is an autonomous institution under the Addis Ababa University that serves on the one hand as the secretariat for the network of environmental and development NGOs in the above mentioned countries,

and on the other hand it facilitates and supports cooperation between member organisations and other environmental actors, including private sector and government, to carry out activities "on the ground". The Centre has several components, of which the most important ones are the partnership programmes, capacity upgrading and demand driven action research. Concerning the latter, the Centre aims to motivate students in environment related studies by offering practice oriented research options in field situations.

LEI

LEI develops socio- economic expertise for government bodies and industry in the field of food, agriculture and the natural environment. By means of independent research, LEI offers its customers a solid basis for socially and strategically justifiable policy choices.

LEI carries out its research in close consultation with clients and other concerned parties within society. LEI bases its expertise on thorough knowledge of the sector and the focused use of economic and other social scientific disciplines in this regard. The field of work encompasses the agricultural sector, fisheries, nature management and the use of the natural environment. All the links in the chain, from consumer to producer, are involved. LEI collaborates with a great many scientific partners, both within the Netherlands and in other countries. LEI is part of UR (Wageningen University & Research centre), forming the Social Sciences Group with the department of Social Sciences and Wageningen UR Centre for Development Innovation.

Selection of Kebele

This case study focussed on the southern part of the East Shoa Adminitrative zone, with particular focus on the Adami Tuli disctrict. RCWDO was selected as research partner because their activities that are of relevance to this study. RCWDO is currently active in the Korme Bujure kebele and proposed this community for the study in Adamitulu Jido Kombolcha Woreda of East Shoa Zone. Here RCWDO is currently developing public works, focusing on improving infrastructure. Working in a kebele where RWCDO is active ensured good working knowledge of the current conditions in the kebele and easy cooperation and discussion with the community on their interest and availability for a workshop.

Korme Bujure has a population size of 3,471, from which 1812 are male and 1,659 are female. In addition the kebele has 450 and 245 male and female headed households respectively. In this kebele the majority of the community is dependent upon rain fed agriculture. The higher zone of the Kebele has soil with better nutrient content, while soils in the low land part of the kebele are sandier.

No	Crop type	Cultivated land (ha)
1	Maize	1106
2	Wheat	99
3	Barley	36
4	Teff	0
5	Sorghum	10
6	Beans	127

Table 1: Crop production in 2010 for Korme Bujure

Furthermore, in 2010 the kebele had cattle population of 6,659. This the population existed of oxen, cow, heifer, young ox and calf numbers equalling 1093, 1383, 1984, 1183 and 1016 respectively. Accordingly the population of Chicken (Poultry), Sheep, Goat and Equines (Donkey, Horse and Mule) is 3483, 146, 7289 and 1216 respectively, but the majority of the Equines population is that of Donkey.

The information obtained from the woreda Disaster preparedness section indicates that in 2009, the kebele Korme Bujure has received a support of in the form of food items (Maize and Wheat) for about three months. The kebele is not part of the woreda safety net program in 2010 and 2011.

Tools

The participatory workshop consisted of three phases:

1. Identification and prioritization of most important past and current climate-related problems.
2. Identification and prioritization of applied and possible adaptation options.
3. Identification of constraints to the implementation of prioritized options.

These topics were discussed using the following tools:

Tools	Focus	Participants
Climatic stress and trend lines	Learning from local knowledge on important changes in rainfall and its effects on farm & household management. The mentioned negative effects are listed as problems.	One mixed group of community elders, woman and men.
Pair wise ranking of priority problems linked to climatic stress.	Each group identifies the 3 priorities when it comes to climate related problems identified in the timeline.	3 groups: women/men/elders
Flow chart	Bringing together priority problems and to explore possible solutions.	3 groups: women/men/elders
Pair wise ranking of priority solutions linked to climatic stress.	Each group identifies the 3 priorities when it comes to climate related solutions identified in the flow chart	3 groups: women/men/elders
Adaptation assessment	Learning about the effectiveness of adaptation options and their potential for triple win.	One mixed group of community elders, woman and men.
Key informant interviews	The interviews should accompany the use of every tool included in this table, since it will be useful to probe certain questions and follow up topics of interest.	Farmers with different age were selected that did not participate in the community workshop.

Table 2: Participatory tool description

4. Research area

Current land management issues

The catchment of Lake Ziway is a prominent agricultural economic hub in Ethiopia, which is rapidly developing thanks to the expansion of irrigated agriculture. Since the majority of Ethiopia's population depends on agricultural development of this sector is crucial for the Ethiopian economy. At the same time agriculture is highly sensitive to climate change. The watershed of Lake Ziway is located in the Central Rift Valley (CRV) of Ethiopia, and consists of a chain of lakes, streams and wetlands surrounded by highlands. The Bulbula River connects Lake Abyata to Lake Ziway, the only fresh water lake in the Ethiopian Central Rift Valley. The CRV is a closed system, which means that there is no inflow or outflow of surface water; and all water resources in the area originate from rainfall. Slight changes in land use and precipitation can therefore have significant effects on the entire watershed (Jansen et al., 2007). Lake Abyata forms part of the Abyata-Shala National Park, which is renowned for its large diversity of bird species.

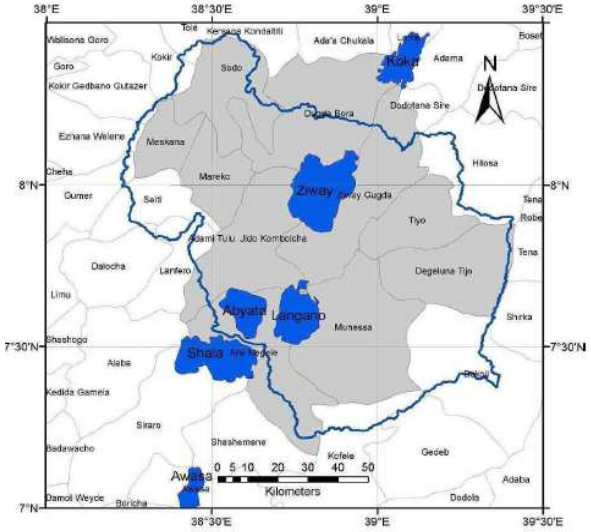


Figure 2: The Central Rift Valley watershed.

The wetlands of the CRV do not only attract many (migratory) bird species, they also makes the area attractive for irrigated agriculture. The conventional rain fed small scale production of wheat and legume crops mixed with livestock rearing is the dominant agricultural system in the watershed. The area under intense cultivation has increased rapidly over the last decades (Jansen et al., 2007). Since 1990 the irrigation area increased from approximately 1000 to over 10,000 ha in 2010. This development is stimulated by the Agricultural Development Led Industrialization (ADLI) Policy of the Ethiopian government to reduce poverty and increase economic growth. As part of ADLI both large scale agro investors and smallholder farmers receive incentives (e.g. tax reductions, subsidies, etc.) to diversify and commercialize production through irrigation. As a result, economic growth around Lake Ziway is considerable and attracting new labor forces from outside the area. Current population of the CRV is estimated at 1.5 million and it grows with approximately 2.5-3% per year. The town of Ziway has grown rapidly in recent years (from 1984-2007 with 545%). The economic opportunities developed by the horticulture companies attract people looking for a job from other areas, as far as Gondar in the northern part of Ethiopia. Van de Valk (forthcoming) states that the growing demand for employees in the floriculture and other urban services has contributed to population growth. Increasing urbanization and population growth have led to higher demand for land, water resources and labor (van de Valk, forthcoming). These claims however compete strongly and have led to overexploitation of land, water and biomass.

Rain fed agriculture in the CRV is characterized by low yields between 1000 and 4000 kg/ha maize and 750-1500 kg/ha teff. In the higher altitudes farmers mainly grow wheat, barley and pulses, while in the lowlands maize and barley dominate in combination with animal husbandry. The income of rain fed agriculture is highly dependent upon prices, while

production is susceptible to rainfall and to a lesser extend temperature. Therefore production and income are more uncertain with increasing rainfall variability as expected by climatic change. Recurrent drought and unreliable distribution of rainfall makes rain-fed farming a highly risk-prone activity, resulting in food-insecure situations for a large number of people. In the current farming systems, animals serve as traction power and a saving buffer in periods of insufficient food. However in periods of drought also livestock rearing suffers from a lack of water resources and reduced fodder production from rangelands. With a rapidly growing population and increasing periods of drought farmers depend on the expansion of their cultivated land to fulfill the household demand for food and income. This has contributed to a rapid transformation of natural (forested) land to cultivated land. Due to population increase land availability is reduced, which is indicated by diminishing size of cropland per household (Garedew, 2009). As alternative livelihood source many families rely on the production of charcoal. The increase of cultivated land, overgrazing of rangelands and logging for construction and charcoal has led to a degradation of land and decreasing availability of wood.

The changes in land use towards intensely cultivated and irrigated agriculture have had effect on the availability of water in the catchment. Depending on the amount of evapotranspiration, deep percolation and land cover rainwater runoff is gathered in the rivers and lakes. Irrigated agriculture increasingly uses this water, resulting in reduced water availability for other purposes such as drinking water for livestock and the growing urban population in Ziway and surrounding. The water level in Lake Ziway has decreased from 2002 to 2005 by approximately 0.5 meter, which corresponds approximately to 150-200Mm^3 (Jansen et al., 2007). Consequently, the outflow into Lake Abyata has decreased significantly. Ultimately, this means that with increasing demand for water Lake Ziway might become a saline terminal lake (Jansen et al, 2007). This would greatly affect both the availability of water for irrigation and consumption by people and cattle. In addition, the reduced outflow into Lake Abyata threatens the biodiversity in the national park of Abyata-Shala (Rodriguez, 2008).

The socio-economic development in the catchment of Lake Ziway heavily depends upon the regular distribution and quantity of rainfall and temperatures that subsequently influence water availability in its lakes and rivers. Population increase and the lack of proper land management regarding soil fertility of cultivated lands, overexploitation of rangelands and woody resources are creating challenges to achieving food security and subsequently the sustainable development of the area. Climate change will affect temperatures and rainfall and is therefore likely to significantly impact the further development of the CRV as an agricultural economic hub.

Climate change in the CRV[2]

Using the result of 21 Global Circulation Models, the IPCC fourth Assessment report showed that temperatures are likely to increase between 2 and 4 degrees in the Horn of Africa (IPCC 2007). Considering changes in rainfall there is considerable uncertainty and models results differ widely. On average an increase of rainfall of about 10% is projected by the end of the century. Especially in the period dec-feb most models show an increase in rainfall.

As part of his MSc Gosa Dadii downscaled the results of two Global Circulation Models (GCMs) for the central rift valley. For each model 2 emission scenarios were used A1b and B1. The overall results of the two models fit within the wider ensemble or results for the Horn of Africa presented in the latest IPCC report and the analyses done by Shongwe et al. (2009).

Summarized both models predict an increase in temperature. The FGOALS model predicts about 2 degrees increase by the end of the century. The Echam5 model shows a larger predicted increase, up to 4 degrees by the end of the century. Considering the precipitation, especially the FGOALS model predicts an increase especially after 2050. The ECHAM model simulation show limited change in annual rainfall (Figure 3).

[2] This paragraph was written by Fulco Ludwig and Gosa Dadii.(2010)

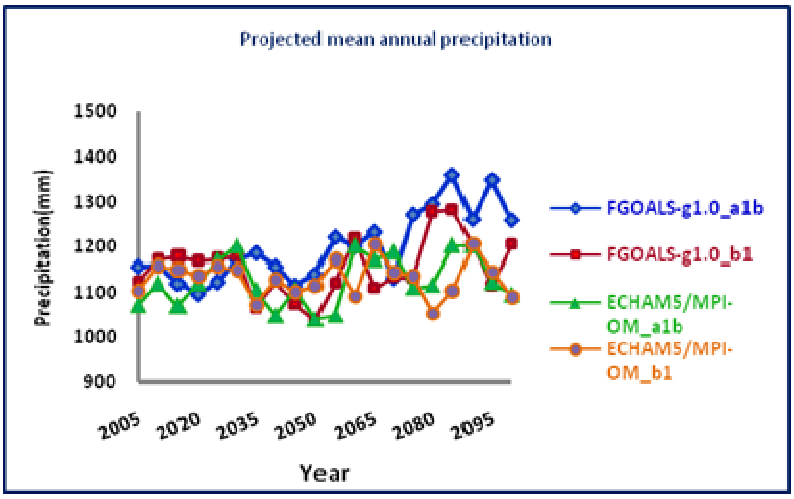


Figure 3 Projected mean annual precipitation field over the central rift valley (CRV) basin

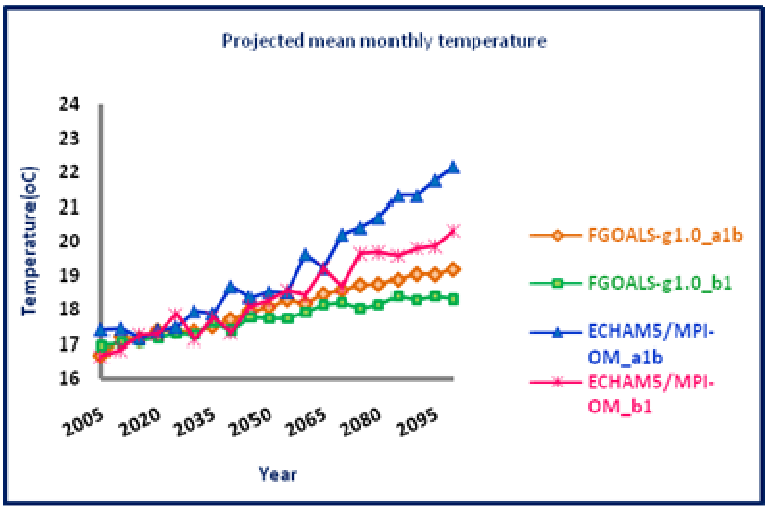


Figure 4 Projected mean monthly temperature over the central rift valley (CRV) basin

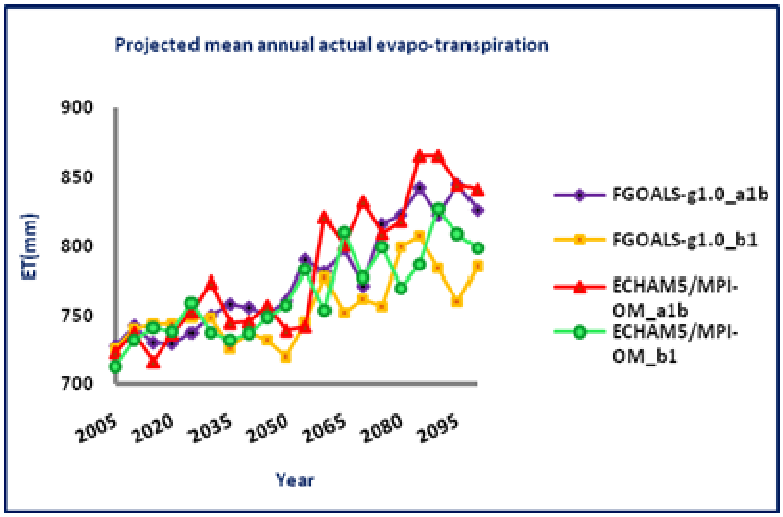


Figure 5. Projected mean monthly actual evapotranspiration (ET) over the central rift valley basin of Ethiopia based on FGOALS-g1.0 and ECHAM5/MPI-OM a1b and b1 scenarios

Due to higher temperatures potential evapotranspiration will increase this will probably result into an increase in the actual evaporation. Changes in actual evaporation do not only depend on temperature but are also driven by changes in radiation. How radiation will change due to climate is highly uncertain. This will mainly depend on how cloud cover will change. For this study a simple evapotranspiration was used, this method indicated that evaporation will increase in the future. Due to this higher evapotranspiration projected run-off decreased using the Echam model. Using the FGoals model a small increase in run-off is project, which is due to the higher rainfall.

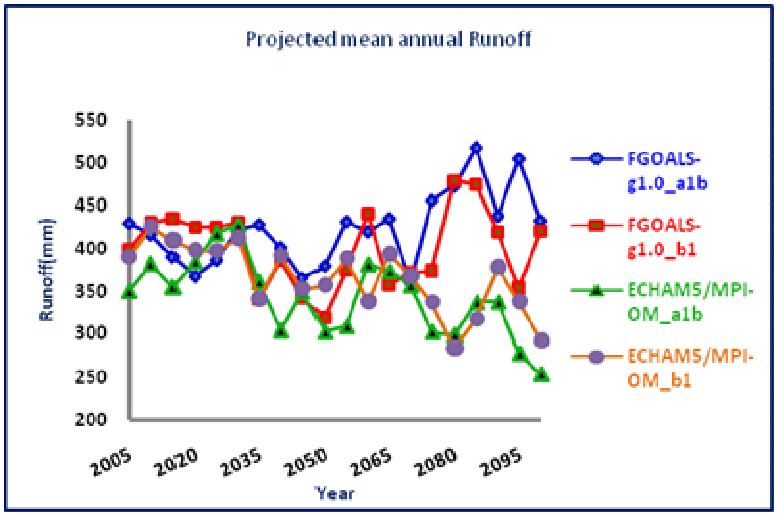


Figure 6. Projected mean annual runoff (inflow) values over the central rift valley basin of Ethiopia based on FGOALS-g1.0 and ECHAM5/MPI-OM a1b and b1 scenarios

Summarized, it is unclear if climate change will increase or decrease water availability in the CRV. Rainfall is more likely to increase than decrease, though the timing may be more uncertain. At the same time also evaporation is likely to increase due to higher temperatures. So climate change will increase the *uncertainty* in water supply but at the stage it is impossible to say if more or less water will become available due to climate change. However the actual water availability will be less, as water use by irrigation is most likely not decreasing. Therefore water stress is to be expected and water quality problems could be aggravated by climate change .

Ethiopian national and regional policies for sustainable development

In the first two paragraphs current land use problems and climate change predictions for the CRV have been explored. Although climate change affects agriculture, the main driver for economic development in the CRV, climate change has not been mainstreamed into national development policies and programs (Regassa et al., 2010; Verburg et al., 2009). In this section we will look at national policy objectives and its regional implications for the catchment of Lake Ziway.

National climate change policy

In 2008 the Ethiopian government has described its urgent and immediate needs for adaptation to climate change in its National Adaptation Programmes of Action (NAPA) that has been delivered as internationally agreed to the UNFCCC secretariat. The expectation was, that based on the NAPA, the country would receive support from the international community. The NAPA is based on existing information and rapid assessments among key experts and stakeholders (Abebe Tadege,2007,Verburg et al., 2009). It identifies 37 adaptation measures with a vulnerability assessment of which 10 projects were prioritized. One of these, the development of small scale irrigation and water harvesting schemes (Table 3), is especially relevant to the water catchment of Lake Ziway.

Nr	Description of NAPA project	Estimated Cost (million USD)
1	Promoting drought/crop insurance programme in Ethiopia	8
2	Strengthening/enhancing drought and flood early warning systems in Ethiopia	10
3	Development of small scale irrigation and water harvesting schemes in arid, semi-arid, and dry sub-humid areas of Ethiopia	30
4	Improving/enhancing rangeland resource management practices in the pastoral areas of Ethiopia	2
5	Community-based sustainable utilization and management of wetlands in selected parts of Ethiopia	2
6	Capacity building program for climate change adaptation in Ethiopia	3
7	Realizing food security through multi-purpose large-scale water development project in Genale–Dawa Basin	700
8	Community Based Carbon Sequestration Project in the Rift Valley System of Ethiopia	1
9	Establishment of national research and development (R&D) center for climate change	2
10	Strengthening malaria containment program(MCP) in selected areas of Ethiopia	6
11	Promotion of on-farm and homestead forestry and agro-forestry practices in arid, semi-arid and dry-sub humid parts of Ethiopia	5
	Total	770

Table 3:Projects described in Ethiopian NAPA with a land use component (Abebe Tadege, 2007)

In its NAPA the Ethiopian Government also addresses the need to integrate climate adaptation options into the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) and to extend these insights to the regional level.

National development and poverty reduction policies

The overarching aim of the national development strategy in Ethiopia is poverty reduction. This objective was laid out in the Sustainable Development and Poverty Reduction Programme (SDPRP), issued in 2002 followed by the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) that addresses the period between 2005/06 to 2009/10. SDPRP objectives include :

1. agricultural development led industrialization and food security
2. justice system and civil service reform
3. decentralization and empowerment,
4. capacity building in public and private sectors.

Furthermore, the SDPRP identifies key sectoral measures with respect to education, health, HIV/AIDS, roads, water supply, sanitation, private sector development, and trade, as well as cross- cutting issues such as gender and the environment (Halcrow, 2007). The main strategies in the SDPRP are:

- Focus on agriculture as it is the main source of livelihood for over 80% of the population.
- Strengthen private sector growth and development, especially in industry.

- Rapidly expand exports through the production of high value agricultural products and increase support to export oriented manufacturing, particularly leather and textiles.
- Deepen and strengthen the decentralisation process to shift decision making and management of development activities closer to local communities.
- Improve governance and implement political reforms to strengthen the current process of democratisation and local empowerment.
- Invest in capacity building to overcome critical constraints to the implementation of development programs.
- Improve water resource development to ensure food security.

PASDEP builds upon the directions pursued under SDPRP such as food security, expanding education, strengthening health services, capacity building and decentralization (Halcrow, 2007). PASDEP is more explicit on economic growth through agricultural commercialization and aims to upscale measures to achieve the Millennium Development Goals. In the PASDEP rural growth centers with high potential for economic development through agriculture are identified, among others the catchment of Lake Ziway. The Ziway region is seen as highly important due to its availability of water for cash crops and its logistical connections to larger urban centers and export markets (Halcrow, 2007).

Regional development policies

As mentioned in the SDPRP decentralization has been a focal point in governmental policy. There are 5 administrative levels within governmental policy. The first is the federal government, under which the country is separated into 9 regions and two city administrations. The Central Rift Valley lies in the regional states of Oromiya and the South Nations Nationalities and Peoples Region (SNNP). These are separated into administrative zones that consist of several districts (called woreda). The woredas are the central point for local government. The priorities set out in the PASDEP have been given shape in the regional Masters Plan of Oromiya and SNNP states. This plan emphasizes the agricultural sector as the main driver for development. By transforming the agricultural sector from traditional subsistence farming to commercial production the region aims to create food security by self- sufficiency, while also increasing exports and providing raw input material for industrial processing. These goals are achieved with help of private investors that will stimulate the production of high value crops, such as vegetables, fruits, flowers and spices, as well as create agro-industrial enterprises that in turn will create employment (Halcrow, 2007). This is to be achieved by significant expansion of cultivated land under irrigation. Land in Ethiopia is under ownership of the state. In order to support farmers to invest in new agricultural systems the government has started to provide land user right certificates to farmers to enhance security of tenure.

4. Results of the community workshop and key- informant interviews

This section will describe the workshop results on the basis of the different participatory exercises that have been described in the previous chapter.

Climate-related and other developments

By the means of a timeline exercise in which participants were asked to describe climate related events, their impacts and the way in which they dealt with these impacts. In order to indicate the timeline three time horizons were used: presence (up to 5 years ago), 30 years ago, 50 years ago. Important societal developments were also taken into account and relations were discussed with climate change.

	50 years ago	30 years ago	Now (and up to 5 years ago)
Climatic circumstances	There were 2 rainy seasons, in which more rain fell than currently.	Low amount of rainfall, long droughts in 1985	No early rain season, delay rain season and erratic rains. 9 months without rain this year.
Other circumstances	Illiteracy, there was no knowledge on agriculture and hygiene	Money develops value for community War, children taken for military Corruption No social support from government	Education Institutional support in agriculture and health No food aid Women organization started that provides a credit saving scheme. Family planning
Impacts	A lot of grasses and forests Diseases (malaria and cholera) No arable cropping practiced Living from animal products and forest products	no drinking water Diseases & deaths Food aid Start of cultivation and expansion of farm land	Late sowing /short grow season Little food and fodder Low productivity Low soil moisture Floods Long water transportation cause of this loose of cattle.
Livelihood descriptions	Pastoralists (“we used to pay over 50 cattle to the family of the groom in a marriage”) Drinking water was taken from pools where the cattle also drunk (urinated)	Expansion of agricultural land causes deforestation You were considered a hero when you would deforest a truck full. Charcoal making Edir =Cultural institution to for collaboration and social support Drink water instead of milk and previously we use butter for cooking and now we use oil.	Law to prevent logging. Start of seedling planting, but not working due to lack of water. Charcoal making Use cow dung as energy source & compost Shorter growth of varieties use of Fertilizer and Improved seeds. Long distance of collecting water 3km Selling of assets & cattle

From the timeline exercise 5 climate-related problems were prioritized by the use of a pair wise ranking exercise:

1. Low crop productivity
2. Low fodder production
3. Low cattle productivity
4. Human disease
5. Flooding

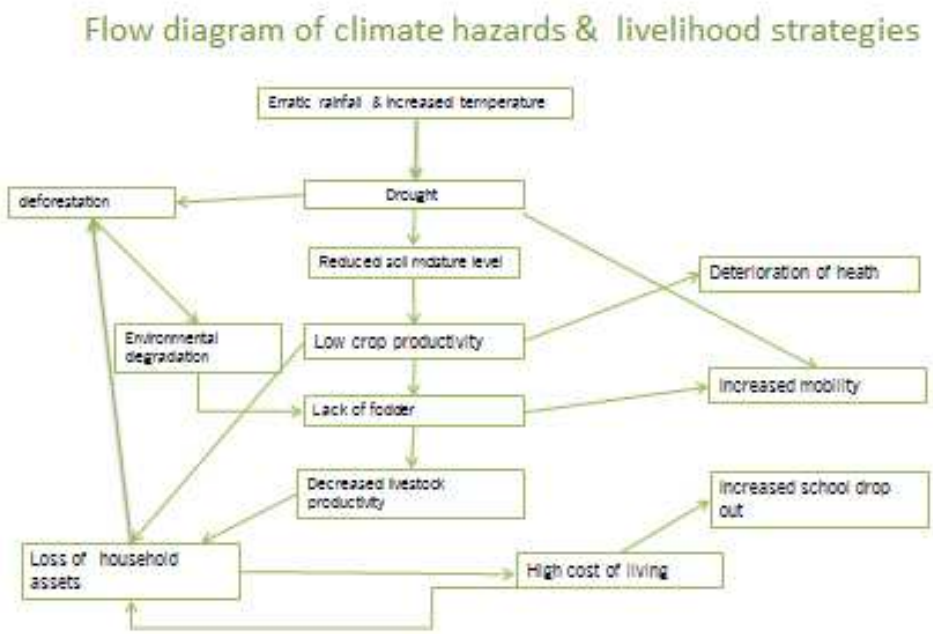
Even though deforestation was highly ranked by the community (especially the man in the group), it has not been included in this list as it is a result of land use change, and less related to changes in climate. The participants indicated the close interrelatedness between these climate impacts and therefore selected food production as the most important. Human diseases were considered as very detrimental, but with sufficient food the people would be more resilient to diseases. Floods were also experienced as very severe impacts, but it was argued that even though sometimes leading to casualties and destruction of houses and crops floods only affect few and therefore the community is able to help the affected families. During the Key- informant interviews farmers indicated also more specifically a change in temperatures. They are experiencing low germination of seeds when planting before the rainy season, because seeds will not germinate .



Adaptation versus maladaptation

Traditional and contemporary adaptation options to climate variability and extremes in Ethiopia include change in cropping and planting practices, reduction of consumption levels, collection of wild foods, use of inter-household transfers and loans, increased petty commodity production, temporary and permanent migration in search of employment, grain storage, sale of assets such as livestock and agricultural tools, mortgaging of land, credit from merchants and money lenders, use of early warning system, food appeal/aid (Worldbank,2010). From these common adaptation mechanisms in Ethiopia, the most

prominent adaptation practices observed at Korme Bujure are cattle selling, mobility, social support (Ider) and charcoal making as mentioned by participants in the timeline exercise, followed by matrix ranking exercises. The flow diagram below shows how climate variability and extremes (Erratic rain fall and increased temperature) create a number of interrelated problems at the study site and also shows how it impacts on the livelihood of the community.



During the workshop the participants proposed the following adaptation options to the existing problems occurring as the result of climate change in the area:

1. Reforestation,
2. Creation of farmer cooperatives,
3. Storing facilities and planting in the rainy season,
4. Training on crop management practices,
5. Improved access to fertilizer and improved seeds,
6. Composting and water harvesting.

During the three day workshop it was possible to undertake different group discussions in order to identify a prioritization of the identified adaptation options . Participants give priority to the need of training on crop management and conservation of natural resources. Farmers also mentioned the need for reforestation activities in their kebele, as the elders explained that the current decrease in rain fall has come after the communities have started cutting trees in their compound. Therefore, in order to rehabilitate the deforested area they agreed up on the importance of the tree plantation activity in the future. Storing produce and planting in rainy season are also among the prioritized options by the kebele dwellers. Most

of the farmers have indicted the importance of planting their crops after the soil received optimum moisture in order to get better production, but they indicated the problem of identifying the timeliness of planting, as early rains are more erratic than in the past. Access to weather forecasting in a certain period of the year, especially at the beginning of the rainy season, would support the planting of crops at more appropriate moments.

The provision of improved seed and fertilizer is preferred way to improve income by most farmers. These inputs are relevant in improving the livelihood of the farmers, since they increase yields and thus may result in a better income for the family. However, due to limited rainfall farmers, do not produce sufficiently even with the use of these inputs. The farmers are worried about the current high price of the inputs and their capacity to return the credit later. Composting and water harvesting can also help to build resilience to climate variability and extremes. However, the availability of composting material is low and labour requirements high in order to produce sufficient benefits. Similarly, water harvesting is perceived limited due to the low rain fall amount in the area and the poor technology currently used. One example on the water harvesting practice on the adjusting kebele was mentioned by participants, which uses concrete and gives much more support to the community during dry periods.

Constraints to the implementation of adaptation options

Based upon the reasons given for prioritized options combined with a final discussion on feasibility of the preferred option the following issues are put forward by the community that enable or restrain them from developing successful climate adaptations that will support climate smart development.

Cash

The most important constraint for farmers to realize adaptation optionsis the lack of cash. Cash is needed not only for the necessary inputs to increase crop productivity, such as improved seeds and fertilizer. It is also one of the pre-criteria in engaging in farmer cooperatives, collective co-financing of infrastructure (such as water ponds) and alternatives

income sources (such as petty trade). Furthermore cash income is used for the payment of schools, health centers, clothes and other household necessitates. Participants have clearly indicated that any strategy that is able to derive cash when needed is preferred.

Cash income is dependent upon the available household assets for trade, which include cattle, labour, harvest (land holding) and availability of social support (Ider). All of which are affected by the increasing variability of the climate. Increasing periods of drought reduce crop yields and fodder. Due to the reduced water availability labor becomes an important constraint, as the collection of water, fodder & necessary inputs are more time- consuming than in the past. Both donkeys and horses receive less fodder, while their use as means of transport increases. This overall leads to a deterioration of the cattle's health and increased mortality.

The need for income drives farmers to migrate with cattle to more fertile regions or look for work in the urban area. They also prefer working as a day laborer for other farmers for which they will receive cash, land, crops or inputs as payment. Cash is also derived by the trade of cattle, but due to the poor health, cattle prices are low and no income is generated from the production of milk or butter. Women find that fattening of goats is more beneficial as they are also able to feed on bushes and acacia's, therefore, women have increased the amount of goats in comparison to that of cows or donkeys. Another source of direct income is the production of charcoal from acacia trees. Both the increase in goats and charcoal production endanger the acacia vegetation. The acacia trees provide shade to livestock and increase the soils capacity to retain moisture, thereby influencing agricultural production and protection from flooding and soil erosion.

Land hold size

The second important constraint for climate smart development is land holding size. In the Korme Bujure kebele land hold size vary between 0.5 to 2 hectares. These small land holdings do not provide (with current soil fertility & moisture levels and selection of inputs and crops) sufficient production and income to satisfy household needs. Farmers are not able to purchase their own oxen and plough, and therefore depend on richer farmers during land preparation. Poor farmers, therefore often sow their seeds either long before the rain start or weeks after the rain has started, thereby severely limiting the production of their crops. . Farmer cooperatives help in acquiring inputs, but require cash or repayment of credit. Finally low production contributes to malnutrition which affects the health of the household members and therefore the amount of labor available.

Capacity building

To become effective, prioritized adaptation options, such as the use of inputs, seedling plantation training and capacity building is considered essential by the participants. According to the participants those in the community that received some formal education are better able to apply inputs correctly and engage in activities, such as composting and seedling management.

Water availability

Climate change directly affects water availability in this area. Fresh water is a scarce good. Currently the community does not have access to a pond or groundwater for drinking water. The lack of fresh water stimulates the mobility of labour and hinders farmers to apply irrigation to seedlings or selected crops. Furthermore farmers indicate that alternative livelihood options such as beekeeping depends upon the availability of wild flowers, which are absent in periods of drought.

What is clear from this overview of constraints to the development of long term adaptation options is that the people with least buffers to invest and take risks to explore alternative livelihood options are also the ones most affected by climate change. The current (mal)adaptations undermine the development of sustainable adaptation strategies. For example, the fattening of goats and production of charcoal directly leads to deforestation, while the increasing mobility affects the health of cattle and available cash due to transport costs. These results clearly demonstrate that current adaptation options employed lead to an erosion of both livelihood assets that limits people's ability to adapt to future conditions. The practices that are currently employed only increase vulnerability to future climatic changes and can therefore be labeled as maladaptations.

5. Conclusion & discussion

The constraints described in the Results chapter indicate how current adaptation options decrease climate resilience, i.e. by eroding both livelihood and natural assets available to the community of Korme Bujure. What do these constraints tell us when identifying locally relevant indicators for the policy assessment of triple win strategies for small scale rain fed farmers?

Indicators for the assessment of triple win strategies

We identify three types of indicators; those related to (i) required inputs, (ii) available inputs and (iii) expected income. With regard to the availability of cash it is clear that the costs of adaptation options are of high importance. Low cost adaptation options are not only

preferred by the community, but also executed more often than those that require high investments. This is not only related to cash investment but also that of labor and other assets (such as oxen). The choices farmers make are also largely based on the ability of a strategy to generate cash. Cattle trading, for example, is highly preferred as option by women as they can be sold when needed to cover health and school costs. Farmers also clearly indicated that lack of control on communal benefits is a strong constraint for applying adaptation options, therefore private ownership of the benefits of any adaptation option are preferred. Participants indicated that training is required for most adaptation options; therefore for the successful application of adaptation options, the level of education is important, as well as access to extension services that provide information relevant and useful to the farmers (both men and women; both well off and less well off). This is complemented by the access to extension services for the successful application of adaptation options. A schooled farmer is better able to gather information for better farm practices. Another important constraint is the health of household members. This will partly be included in the available labour of a household, but should also include an indicator on the level of (mal)nutrition.

A strong constraint identified by participants is land hold size. This is a direct indicator of farmer's livelihood assets, but also clearly relates to the feasibility of certain practices, such as the purchase of oxen and plough. Finally, timing of labour is also an important constraint. So, not only the amount of labour required should be taken into account, but should also be compared to labour required for other livelihood strategies. Based on these results the following indicators for the assessment of triple win strategies can be identified:

I)Indicators for the successful implementation of adaptation options (requirements):

1. Costs for implementing an adaptation option.
2. Labour requirements associated with an adaptation option(in hours and timing).
3. Education level of actors.

II)These indicators should be compared to the available assets:

4. Household assets (land hold size, amount of cattle, yearly income, labour availability, education level) In order to have acquire a realistic overview of the household assets the level of malnutrition and cattle mortality could be included.
5. Access to social support (in the form of extension, tools , oxen, labour, food, etc.)
6. Available natural assets (distance to water, forest, rangeland)

III)Finally adaptation options should be graded on their ability to achieve sustainable benefits:

7. Ownership: Communal or private benefits of strategy.
8. Income generated from application of strategy, both in cash and natural assets.

Further considerations for the assessment of adaptation options

To conclude this report we would like to go back to the current plans developed by the Ethiopian government for climate adaptation in the CRV. The NAPA of Ethiopia consists of a list of prioritised measures that resemble individual project proposals in contrast to an integrated policy plan. When comparing these activities to the findings of the community workshop some important questions arise. In the NAPA there is a focus on the following on-farm activities, such as promoting crop insurance, early warning systems, small scale irrigation, rangeland resource management, carbon sequestration, forestry and agro-forestry practices. The response to climatic changes in the community of Korme Bujure has shown that options that increase climate resilience, such as reforestation are undermined by other (mal) adaptations such as charcoal making and goat trading. Therefore when identifying triple win adaptation strategies their compatibility with other livelihood strategies should be considered. This will most likely ask for a more coherent and coordinated approach to identifying appropriate adaptation options.

Furthermore we have seen that low cost adaptation options are preferred. We therefore suggest that triple win adaptation strategies need to consider different options simultaneously, but also the timing of strategies is of utmost importance. For example, the promotion of market access will not succeed if there is no marketable surplus produced and if there is no access to storage facilities in order to await acceptable price levels. In order to achieve climate compatible development, strategies should be developed that start with low-inputs and build onto local knowledge and practices. The benefits of these initial low cost adaptation options can produce the natural and household assets that can be used to develop new options that will meet the likely increasing climatic stress over time.

The ability of a strategy to deliver a triple win also clearly correlates to the scale at which options are assessed. In the community of Korme Bujure we have seen increased mobility due to climatic changes. Farmers temporarily migrate with cattle to areas with fodder and water, but also in search of other incomes. Working as a day labourer or trader in the urban areas is an important source of income, also for the family members remaining in the community. The importance of having family members with a stable income that does not depend on farming (because of its insecurity) is stressed by the majority of key informants. In this case study we have seen that climate change is one of the drivers of migration to urban areas and other areas with sufficient water/ rangeland. Therefore areas that offer these opportunities will face higher pressures by increasing populations. Even though this effect goes beyond the farm level, it does have implications for the available labour for the future production of food in the kebele of Korme Bujure.

Finally we would like to shortly reflect upon an observation made during the three day community workshop. When prioritizing options participants had difficulty identifying the future impacts if they would continue their current (mal) adaptations. Repeatedly participants expressed the belief that in the future the rains would return if they would pray and plant enough trees. There was no clear indication that the farmers perceived the current moisture stress as a situation that would continue in the future. This withholds the community members from developing new practices that entail a substantial change to their livelihood strategies in line with the change in climate. Therefore, any strategy on adaptation should include not only new technology, knowledge or skills, but also address the attitude of people to change. People recognizing the change and unpredictability of the climate as inevitable would certainly be more inclined to develop long term strategies that will increase resilience and stop the use of their environment in a non-sustainable way.

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7. Annex

Key-informant interview guideline

Goal of key informant interviews is to gather verification and in depth insight in the topics raised during the community workshop. These interviews will ensure validation of information gathered by the community workshop and will allow gathering information that is not shared in public meetings. Furthermore the key informant interviews will relate basic household data to choices of adaptation practises.

Kebele name:
Zone:
Name respondent:
Sex:
Age:
Size of household (in amount of members):

1. What types of farming does the household to which the farmer belongs practice?(crop farming, animal husbandry, day labour agricultural, off farm labour, trade and commerce, other)

    a. What kind of crops does he/ she grow?

    b. How much land does the household own?

    c. What types of cattle does he/ she have? (cow, donkey, chicken, goat, sheep, other) How many?

    d. Does he grow any other crops or trees in his/ her compound? If yes, what?

    e. Did the household have more or less livestock 3 years ago? If yes, how much?

2. Did he/ she any experiences in climate in their lifetime? If yes what and when?

1. Less rainfall leading to drought low crop productivity and not having sufficient water for cattle
2. Excess rainfall leading to floods and crop damage
3. High temperatures leading to crop damage
4. Other

3. A.Which practices do they use to deal with this hazard after it happens? (with relation to mobility, storage, diversification (on and off farm), communal pooling, market exchange)And which practices are used to prevent these imapcts in the future?

B. Is the strategy performed by men/ women? Individuals or in groups ?

C. What kind of inputs do you need to perform these practices (select 3 most important ones)? (cash or credit, equipment, manure, seeds) Who provided these?

D. What benefits did the strategy lead to? (Cash income, less risk, non- cash income)?

f. Which institutions provided help in terms of training, inputs and assistance relevant for the hazards mentioned under (b)?

1. National authorities	6. Non Governmental Organization	11. Religious communities
2. Regional authorities	7. Cooperatives	12. Women's groups
3. Local authorities	8. Schools	13. Micro-finance groups
4. Extension agency	9. Banks	14. Self-help groups
5. International donors	10. Village communities	15. Unions

g. What kind of inputs did you obtain from these institutions? (1. training; 2. labor; 3. inputs (seeds, equipment, wood, machinery, bricks....); 4. cash; 5. food)

strategy	Inputs required	Provided by and received		Performed group or individual	Men or women	Benefits (cash, non-cash, less risk)