



Climate trends in Ethiopia: Summary of ACCRA research in three sites

ACCRA BRIEFS

This ACCRA brief summarises research conducted by the Africa Climate Change Resilience Alliance (ACCRA) in three sites in Ethiopia in 2010-11. This research analysed meteorological data and community perceptions and was conducted by Haramaya University. Federal officials from Ministry of Agriculture, and the Environmental Protection Authority took part in validating the research, alongside colleagues from various Wereda and Regional bureaus in Oromiya, Afar and Amhara Regional States. The brief analyses the impacts of climate hazards, variability and change on livelihoods in all three locations, and concludes with key recommendations for action.

The national picture: climate change in Ethiopia

A range of studies of national climate trends since the 1960s show that mean annual temperatures in Ethiopia have increased by between 0.5 and 1.3°C. In addition, the frequency of cold nights (linked to frost in dry season) has decreased significantly in all seasons². Although national models and missing data obscure regional differences in variability and trends³, there is evidence of a declining trend in the February to April short rains from 1981-2000, and slight increases in the June to August long

rains, as well as in October and November over the same period⁴. Given the dependence on rain-fed agriculture, these trends could have a negative impact on food security⁵. At the same time, flood events are also reported to be becoming more common, with significant disruptions from flooding occurring in 1997 and 2006⁶.

Climate change projections are subject to uncertainties and data gaps, and can be contradictory. In Ethiopian climate models, there are high levels of confidence in projecting continuing temperature increases, though the extent of the rises depends on emissions scenarios and varies between models. A review of 18 different models and emissions forecasts predicted warming of 1.2°C by the 2020s in all four seasons in all regions of Ethiopia⁷ from 1961-2000 mean temperatures. Another study predicts that temperatures could increase by between 1.5°C and 5.1°C by 2090, (from 1970-1999 mean) depending on the levels of emissions reductions and range given in the models.⁸

There is less confidence in rainfall projections and less convergence between models. A slight increase in average, annual rainfall is projected nationally, but with seasonal and regional differences,

This is one in a series of ACCRA briefs developed as an output of ACCRA's research and capacity-building work conducted in 2010-11, in three sites in Ethiopia, and in Uganda and Mozambique, where World Vision International is also a consortium member. See <http://community.eldis.org/accra/> to find out more about ACCRA and to subscribe to our monthly update.



which may mean some regions might experience decreasing rainfall in certain seasons.⁹ The models broadly agree that more rain will fall in 'heavy events' – in increased volumes over shorter periods of time.¹⁰ A further complication in projecting climate impacts is that Ethiopia's exposure to drought and floods is heavily influenced by the El Niño/La Niña phenomena, and the impacts of climate change on these phenomena are not yet clear.¹¹

Findings from ACCRA's research sites

The three research sites are in very different geographical and climatic areas, ranging from the semi-arid and hot lowland in Ander Kello to the cool and relatively rainfall-secure highlands in Wokin. Nonetheless, respondents in all three sites perceived distinct changes to local climate trends in the recent past, and ranked climate hazards¹ as having the most significant impact on their lives. Figure 1 shows the responses that communities gave.

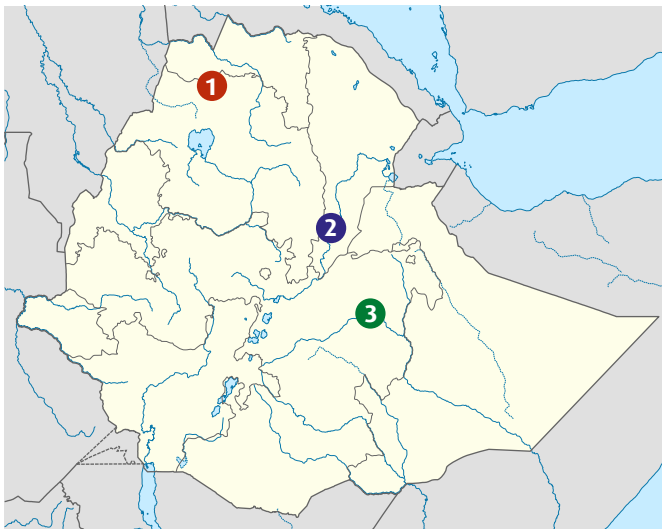


Figure 1: Community perceptions of hazards and trends in the three sites

1 Wokin kebele, Dabat wereda, Amhara Region

- **Major hazards and problems:** Flood, uneven distribution of rainfall, water logging, hail storms, water shortage.
- **Climate trends:** Increasing temperatures, decreasing frost, irregular rainfall between February and May.
- **Other trends:** Population growth, shrinking plot sizes, decreased availability of grazing land, deforestation and soil erosion drying of springs, increased focus on natural resource management activities, improved basic infrastructure (schools, health centres)

2 Ander Kello kebele, Chifra wereda, Afar Region

- **Major hazards and problems:** Drought, erratic rainfall, animal diseases, shortage of water, human diseases.
- **Climate trends:** Increasing temperatures, declining short rains.
- **Other trends:** Population growth, rangeland degradation, significantly decreased herd size per household, increase in basic infrastructure and incentives for settlement.

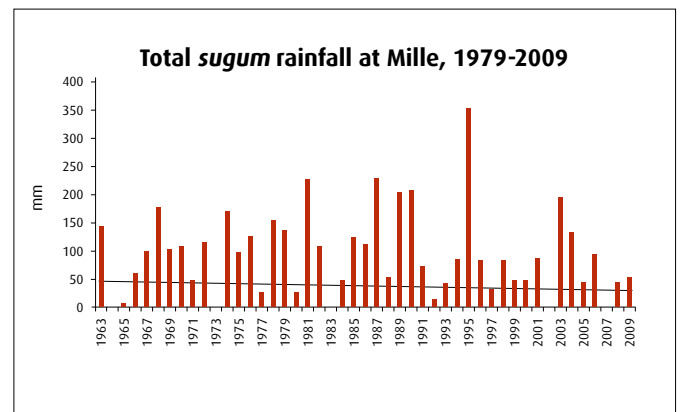
3 Kase-hija kebele, Gemechis wereda, Oromiya Region

- **Major hazards and problems:** Drought, heat, poor road connections, human disease, weeds.
- **Climate trends:** Increasing temperatures, shortening rainfall season.
- **Other trends:** Population growth, deforestation, shrinking plot sizes, decreased availability of grazing land, development of modern irrigation, growing cash crop sales.

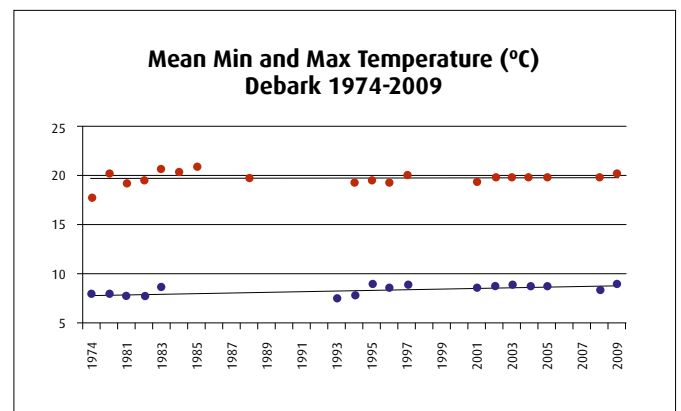
Meteorological data¹² from stations that were near to the sites and possessed historical data was analysed. Due to missing data, no statistically significant changes were identified, but some trends were detected.

For Kase-hija kebele, Gemechis wereda, data from Meiso Meteorological Station, around 77km from the study site, was analysed. Both mean minimum and maximum temperatures were rising. Mean minimum temperatures increased by approximately 0.7°C over the period where data is available. Monthly rainfall distribution indicates a slightly increasing trend for April and September, and a slightly decreasing trend for February, July and August.

For Ander Kello kebele, Chifra wereda, data from Mille Meteorological Station, 98km from the research site, showed mean minimum temperature had increased, while mean maximum temperature remained more or less the same between 1979 and 2009. There was a slight trend of increasing rainfall during the June-to-October rainy season (karma) and decreasing rainfall during the February-May (sugum) rainy season (see Figure 2), correlating with communities' perceptions of declining sugum rains. In addition, a slight increase in the maximum rainfall per rainy day was identified.



For Wokin kebele, Dabat wereda, data from Debarck Meteorological Station, 15km from the study site, showed increases in both mean minimum and mean maximum temperatures from 1974-2009. In particular, the increase in minimum temperatures, observed after 1994, corresponds with communities' description of decreased frost. Over the whole period, a small decreasing trend in average annual rainfall can be postulated, though several years are missing. For the latter period after 1993, no trend can be detected. Whilst there was no change in rainfall in June, July and August, there was a slight decrease in rainfall in May and September.



¹ The fact that 'problems', rather than 'hazards' – for example, poor infrastructure – were reported is related with translation difficulties, with hazards being translated as 'chigger', or its equivalent in Afar and Oromifaa, which means 'problem' in general

Impacts of hazards and trends on rural livelihoods

While the economic and social impacts of climate change at national level are difficult to estimate, the World Bank's study of the Economics of Adaptation to Climate Change indicates that climate change has the potential to reduce Ethiopia's GDP growth by 2-6% by 2015, with losses in the worst-case scenario rising to 10% by 2045.¹³ The ACCRA study did not attempt to quantify the current climate impacts in its three sites, but highlighted the vulnerability of rural livelihoods to current weather conditions and future changes, both weather and non-weather related, as well as detailing how communities are already adapting. In particular, the research tried to highlight how women experience the impacts of these hazards and trends, see some specific examples below.

Site	Perceived impacts of hazards and trends (climate and non-climate), and changes in livelihoods
Ander Kello	<p>Perceived impacts: Herd size declined, animal diseases increased, rangeland degraded, traditional re-stocking mechanisms reduced. Women report psychological stress related to pressure to provide the household with food and water.</p> <p>Reported changes in livelihoods: Growing settlement and agro-pastoralism, shifting herd composition from grazers to browsers, more limited migration,</p>
Kase-hija	<p>Perceived impacts: Parthenium (an invasive weed) and the stalk borer pest have become more common. Fallowing has been abandoned. Women report declining social support mechanisms and increased migration with livestock to find grazing during the dry season, with associated impacts on children's food security and household cohesion.</p> <p>Reported changes in livelihoods: Farmers report switching from long-maturing sorghum to short-maturing maize due to the shortening of the rainy season and increased dependence on irrigation and sweet potato, farmers prefer browsing, farmers' efforts to extend irrigation system strengthened.</p>
Wokin	<p>Impacts: Springs have dried, crop pests and animal diseases have increased, more and increasingly unsuitable land is ploughed, soil erosion has increased.</p> <p>Reported changes in livelihoods: Increased construction of check dams and drainage systems around farm land, implementation of gully-control measures, adoption of supplementary activities, such as growing eucalyptus or horticulture as cash crops.</p>

Recommendations for action

Government and development partners must support climate change adaptation and disaster risk-reduction planning by taking into account the broad range of climate and non-climate related hazards and trends. Communities in all three sites report food insecurity and water scarcity as major problems, to which climate change is a contributing factor. Given the interaction between climate change and other trends, new stand-alone climate change projects cannot provide the solution.

Rather, more resources need to be directed into key development sectors for rural livelihoods (particularly, agriculture and food security, natural resource management, and water). Current and new investments should be shaped by appropriate analysis in order to reduce vulnerability and build communities' capacity to adapt to future changes. This means considering lessons learned from previous work and potential future changes, whether climate-related or as a result of changing development pathways. This analysis is central to efforts to mainstream Climate Change Adaptation and Disaster Risk Management into all development plans.ⁱⁱ

Government and development partners must avoid supporting unsustainable livelihood strategies. Further analysis is needed to ensure that development choices are not ultimately making communities more vulnerable to climate change or other pressures. In Wokin, 29% of households are already landless¹⁴ and pressure on land due to population growth was identified as a challenge in all three sites. However, the research found that in the three sites little had been done to identify and invest in off-farm or agro-processing activities that could relieve the pressure on land. The Household Asset Building (HAB) programme offers an opportunity to build the assets of chronically food insecure communities, but research in Wokin found they resulted in increased livestock numbers, placing additional pressure on already degraded, communal grazing land which ultimately risks reducing the productivity of everyone's livestock. In the future, HAB activities could make a greater contribution to off-farm activities. In the pastoral area of Ander Kello, some investment had been made to promote irrigated cultivation, based on the assumption that water would be available in sufficient quantity and livestock dependent livelihoods would not be negatively affected. However, despite Government's policy, in this case, no assessment had been made of local ground or river-water resources to establish if this strategy would be sustainable in future or at scale and no long-term resource use plan had been agreed with the community. Efforts to change livelihood strategies in unsustainable ways are often described as maladaptation or 'an adaptation that does not succeed in reducing vulnerability but increases it instead'¹⁵ The risk of inadvertently investing in maladaptation as communities are encouraged to change their livelihood strategies in the light of climate change or other pressures must be avoided. Therefore in line with existing sectoral and environmental policies, studies that link community understanding and interest with high-quality, technical analysis must be undertaken to ensure development investments are not maladaptive.

In the old days, there was plenty of grass in this area. We simply released our animals into the grass which was more than 3m tall. When I was young, I tended large numbers of livestock belonging to my relatives and neighbours. Then rich households had close to 1,000 cattle and more than 2,000 sheep. Now the number of cattle and sheep for a rich person are less than 30 and 50, respectively. This is mainly due to the frequent droughts since the 1970s. Also the amount of water has decreased and animal diseases have become more common. The rangeland has changed, which reduces the amount of food for the animals.
AK, 68 years old, Ander Kello kebele.

ⁱⁱ For more information, see *Development Interventions and Adaptive Capacity* policy brief in this series.

The National Meteorological Agency (NMA) should increase efforts to improve data collection and climate models, and Sector Line Ministries must ensure that they use weather and other relevant information more effectively in their planning.

Sector Line Ministries and regional and local government offices are responsible for making decisions based on the best-available information. Climate models provide one part of this information and improved climate-modelling must be linked to efforts to improve decision-making and the use of information and analysis at all planning levels. Efforts to improve information supply (not just about climate models, but also for example, disaster-risk profiling and the water, sanitation and hygiene (WASH) facility inventory) should give greater attention to identifying how this information can be used to inform action. In terms of climate information, poor-quality historical data and lack of investment mean that the improvement of national and local climate models will require additional resources. Efforts are being made to improve data supply, but these need to be increased and donors must also invest in the relevant ministries in order to ensure that the government can both generate and use the long-term information required for more effective decision-making.

The NMA and the Ministry of Agriculture should invest in providing timely and easy-to-understand, short-term and seasonal weather forecasts and advisories to communities and local government staff.

While decision-makers at federal and regional level tend to receive seasonal forecasts and advisories, communities and local government officials rarely have access to this information. It is vital that efforts to provide local forecasting should be linked to activities that ensure that the information is useful for decision-making. Women and men, farmers and pastoralists must be encouraged to understand the implications of forecasts on their livelihoods, production and marketing strategies. Local governments should also use this information to support farmer and pastoralist decision-making – for example, in procuring appropriate inputs in a timely manner and in the development and delivery of relevant extension packages.

Ministry of Agriculture, Agricultural Research Institutes, NGOs and donors need to increase investment in strategies to promote appropriate crop varieties, manage crop diseases, control weeds and combat invasive species. In all three sites, communities repeatedly explained how crop diseases, weeds and invasive species were threatening their livelihoods and that changing land use patterns, crop varieties and weather patterns could all be responsible. In Wokin, communities explained that chocolate spot was causing losses in the fava bean harvest and Boren weed was jeopardising malt-barley crops. In Kase-hija, the rapid spread of Parthenium weed contributed to shortages of grazing land and stalk borer affected new maize varieties. In Ander Kello, invasive shrubs and bushes were contributing to rangeland degradation. Although this is one of a number of issues raised by communities – they also noted the need for short-maturing drought resistant varieties (Kase-hija) or for infrastructure to be better protected from flood (Ander Kello), it is an issue which was felt to have received less attention in national debates on climate change adaptation options. In

addition, while research on the control of weeds and pests has been carried out, communities in the three sites requested additional support in tackling these problems, to avoid the regular production losses that they currently face. More efforts are urgently needed for extension services to link researchers to communities, and to scale up successful approaches to pest and weed control.

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- 12 Meteorological data obtained from National Meteorological Agency (NMA). The meteorological data was processed using the INSTAT climate guide. Where a year had more than three days of missing data, it was excluded from the analysis. For more detail and graphs, see Ludi E, Million Getnet, Wilson K, Kindie Tesfaye, Beneru Shimelis, Levine S and Jones L, 2011. Preparing for the future? Understanding the Influence of Development Interventions on Adaptive Capacity at Local Level In Ethiopia. ACCRA.
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- 14 Figure collected from wealth-ranking exercise in Finote Selam Got of Wokin kebele.
- 15 IPCC, 2001 cited in Barnett and O'Neill, Maladaptation, *Global Environmental Change* 20 (2010) 211–213

Front cover: Pastoralists describe how consecutive droughts have drastically reduced the amount of pasture available in Ander Kello and the surrounding areas. Photo: Haramaya University