

Climate Change, Natural Disaster and Rural Poverty in Ethiopia

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1. Ethiopia Country Overview

Ethiopia is home to close to 100 million people, and it currently stands to be the second most populous country in Africa. Agricultural sector contributes about 43% of the Gross Domestic Product (GDP), 80% of employment, and 90% of export (Demese et al., 2010). Smallholder farmers account for more than 85% of the rural population that relies on agricultural production. Ethiopia has liberalized its economy and developed poverty reduction strategies that underpin market-led strategies for broad based agricultural development, poverty reduction and economic growth. Within the broader strategy, the focus given to support smallholder farming is believed to be the key rural households poverty reduction. Given the total sum of the population that directly and indirectly make their livelihoods from the sector; its development is viewed as a means to improve the living standards of smallholders and generate economic growth. However, the production is still characterized by low output, poor access to land, poor access to inputs, poor irrigation system, little access to know-how (risk management, technology, and skill), low level of market orientation, poor infrastructure and under developed institutions (Aman et al, 2014 quoted from Bezabih and Hadera, 2007; CSA, 2009; MoFED, 2005; Tilaye, 2010).

The aforementioned challenges and the numerous development constraints exacerbate the nation's vulnerability to climate change, resulting in high levels of food insecurity and ongoing conflicts over natural resources. Chronic food insecurity affects 10 percent of the population, even in years with sufficient rains. Roughly two-thirds of the population earns less than \$2 per day and access to basic services is limited. The rural livelihood systems – crop cultivation, pastoralism and agro-pastoralism – are highly sensitive to climate. Food insecurity patterns and the poverty of rural households are linked to seasonal rainfall patterns, with hunger trends declining significantly after the rainy seasons. Climate variability already negatively impacts livelihoods and this is likely to continue. Drought is the single most destructive climate-related natural hazard in Ethiopia. Estimates suggest climate change may reduce Ethiopia's GDP up to 10 percent by 2045, primarily through impacts on agricultural productivity. These changes also hamper economic activity and aggravate existing social and economic problems (London School of economics, 2015; US Embassy, 2016; USAID, 2015).

2. Climate Change and Natural Disaster

Ethiopia is vulnerable to climate change induced disasters such as drought, epidemics, flood, conflict, earthquake, pests, wildfire and landslide, amongst others. These different hazards occur with varying frequency and severity. Some result in nationwide disasters, while the impacts of others are more localized (Adane *et al.*, 2006). There have been many national and localized droughts in the past and communities managed most of them through their own coping mechanisms. Between the Great Famine and the 1970s at least 20 major drought years were noted affecting most parts of the country, particularly in Tigray and Wollo. The magnitude, frequency and the effects of droughts have increased since the mid-1970s (USAID, 2003). The frequency of nationwide droughts causing severe food shortage increased from once every 10 years in the 1970s and 1980s, to every three years now. Between 1970 and 1996, drought and the resultant food shortages have affected millions. The effects of drought are often combined with other hazards. Migratory pest infestation (locusts) has been a serious problem in some parts of the country and the prevalence of some crop diseases increase when climatic conditions are favorable (USAID, 2003).

The increasing trend of drought-induced disaster, associated with other hazards, is reflected in the increasing number of people needing food assistance in Ethiopia. Between 1990 and 2005, on average, each year 6.3 million people required food assistance amounting to over 654,000 tons annually. These number has now increased to closer to 10 million during the past 10 years. These are people who need food assistance during normal years by being included into the government's productive safety net program. During the drought years, apart from those in the safety net program, the number of people affected is especially significant in Tigray where an annual average of more than 1.2 million people is affected in districts labeled as hotspot. The proportion of the population affected is also high in Amhara and Somali regional states. The number of people affected by drought in 2003 alone was more than 13 million (DPPA, 2005).

Epidemics, both human and livestock, are also another climate change induced shocks which lead greater famine like that of the Great Famine of Ethiopia (Adane *et al.*, 2006). Another climate variability induced shock in Ethiopia is also flood. Flooding caused by rivers overflowing their banks has regularly affected people and their properties, especially in the lowland areas of Somali, Afar, Gambella, Oromia and Amhara regional states. Flash floods affect all regions. Some floods, such as those in 1996 and 2006, triggered disasters which claimed the lives of hundreds of people, displaced hundreds of thousands and destroyed physical, natural and economic assets. Ethiopia is mountainous with rugged topography and steep slopes: the highlands are extensively deforested; rains are sometimes heavy and torrential; water converges in river basins and causes swelling of rivers. The watersheds of the major rivers are highly degraded with negligible vegetation cover, reducing infiltration into the ground and increasing runoff (Adane *et al.*, 2006).

For instance, in the year 2006, unprecedented flash and river flood disaster occurred between August and November with a devastating impact, particularly in Dire Dawa, South Omo, Amahara and Somali regions. According to DPPA (2006), in Dire Dawa alone the livelihood and homes of 10,000 people were completely damaged and more than 250 lives were lost and productive asset worth of birr 70 million was damaged. Moreover, during the same year, in South Omo, the flooding due to river bank overflow has claimed the lives of 360 people and damaged the productive assess and livelihood of more than 20,000 people in Dasanach and Ngangatom districts.

Like drought, flood and epidemics, conflict in Ethiopia has also strong relation with climatic shocks that create scarcity of productive resources among rural community. The climate change induced shock arising from conflict goes back to its ancient history. Civil strife has been happening between different communities in Ethiopia on borders of land, grazing areas, freshwater and borders of districts, village and clans. The struggle for resource control has been the major cause of conflict and tension among the peoples of Ethiopia and many people have lost their livelihoods, assets, and lives (Adane *et al.*, 2006). Other hazards like landslides, volcanic eruption and earth quake are categorized as non-climate change induced ones. They usually occur in some parts of Ethiopia causing damage to infrastructure, lives, and livelihoods. However, the literature coverage on such hazards is very minimal. Within the year 2017-2019, about 3 million are now internally displace due to conflict and climate change induced challenges. The property of large percentage of this internally displaced is already damaged. The Eli Nano incidence of the 2015/16 has made about 18 million people to be affected.

3. Impact of Climate Change on Rural Livelihoods

Climate change is understood as a change in the statistical properties of the climate system when considered over long periods of time, regardless of cause. Accordingly, fluctuations in average temperature, average rainfall and others over periods of more than 20 years may represent climate change while climate variability refers to variations in the mean state and other climate statistics (standard deviations, the occurrence of extremes, etc.) on all temporal and spatial scales beyond those of individual weather events. Variability may result from natural internal processes within the climate system (internal variability) or from variations in natural or anthropogenic external forces (external variability) (Houghton and John, 2001).

The major and almost the exclusive livelihood activities of the rural Ethiopia are crop production, livestock rearing, natural resource extraction, and only less than small percentage engaged in off-farm activities. Hence, given the inherent link of these livelihood activities to natural resources, they are largely at the mercy of uncertainties driven by climate change, including extreme events such as flooding and drought. Over the last decade or so, climate change (in terms of long-term changes in mean temperature or precipitation, as well as an increased frequency of extreme climate effects) has gradually been recognized as an additional factor which, with other conventional pressures, will have a significant weight on the form, scale, and spatial and temporal impact on rural livelihood activities. The distribution of impacts will vary as both the ability to respond to impacts and resources with which to do so vary across nations. In other cases, impacts will be unexpected, and appropriate responses may not easily be known or implemented in advance (Pradeep and Shane, 2003).

Impacts of climate variability and change on the agricultural sector are projected to steadily manifest directly from changes in land and water regimes, the likely primary conduits of change. Changes in the frequency and intensity of droughts, flooding, and storm damage are expected. Climate change is expected to result in long-term water shortages, worsening soil conditions, drought and desertification, disease and pest outbreaks on crops and livestock, sea-level rise, and so on. Vulnerable areas are expected to experience losses in agricultural productivity, primarily due to reductions in crop yields (Rosenzweig *et al.*, 2002). Increasing use of marginal land for agriculture (especially among smallholder farms) is anticipated so as to cover food shortage arising from productivity decline. The general consensus from the literature is that in the absence of adequate response strategies to long-term climate change as well as to climate variability, diverse and region-specific impacts will become more apparent (*ibid*).

Consequently, the likely impacts of climate change on the agricultural sector have prompted concern over the magnitude of future global food production (Bindi and Olesen, 2000; IPCC, 1996). Early global estimates predict (without consideration of CO₂ fertilization effects or adaptation) a 20–30% reduction in grain production. Given the range of warming predicted by the scientific community, regional and local variation in impacts on the agricultural production is likely to be high. However, a rapidly emerging consensus is that the worst impacts will be in tropical regions, such as Ethiopia. As a result, experts predict a spatial shift of crops and agricultural practices away from the tropics toward the temperate and polar regions (IPCC, 2001). Early estimates suggest 4–24% losses in production in the developed countries, and 14–16 % losses in developing countries. Dry land areas (where rainy seasons are already short and significant water shortages are currently the norm) are likely to be among the most vulnerable. Declines in aggregate production are anticipated in most of African countries (for example, Ethiopia, Kenya, Somalia). Murdiyarsa (2000) highlights that rice production in Asia may decline by 3.8% of

production levels of 2000 (estimated at 430 metric tons) under likely future climate regimes.

The concern with climate change is heightened given the linkage of the agricultural sector to poverty. In particular, it is anticipated that adverse impacts on the agricultural sector will exacerbate the incidence of rural poverty. Impacts on poverty are likely to be especially severe in developing countries where the agricultural sector is an important source of livelihood for a majority of the rural population. From some research estimates, the overall economic impact of climate change on the agricultural sector could be up to 10 percent of GDP. In Ethiopia, estimates indicate that nearly 85% of the population is dependent on the agricultural sector, and the sector contributes significant percent to gross domestic product (GDP). The agricultural sector (crop, livestock, natural resource extraction, fishery, etc) is very much vulnerable to climate change impacts such as natural resources degradation, flood, destocking of household assets, etc. With lower technological and capital stocks, the agricultural sector in such poorer developing country is unlikely to withstand the additional pressures imposed by climate change without a concerted response strategy (Crosson, 1997).

4. Climate change as a driver of rural poverty

Climate change poses huge challenges from household level to global economy and to social development. Its impacts will disproportionately affect the rural areas in such countries as Ethiopia because their economies are highly dependent on climate-sensitive activities such as rain-fed agriculture. In Ethiopia, agriculture means the whole of life of the Ethiopian and as such only about 3% of the rural households have diversified their livelihood to non-farm activities. The fact that more than 80% of the population depend on this sector means any impact on this sector shall have a grave consequence that can even turn to destitution. That is why in recent it years it has become common to find pastoralists without livestock in Bale, Borena and some part of southern nations and nationalities (Index Mundi, 2014). At national level, any effect on agriculture will also have impact on the Ethiopian economy.

It is predicted that changes in climate will lead to recurrent droughts and heavy rainfall in different parts of Ethiopia, reducing the amount of land that can be used for agriculture and decreasing crop productivity. For example, the 2006 flood in Gambela region damaged about 1650 hectares of maize and reduced crop productivity by 20% as a result of waterlogging of farmland (Gambela Region Disaster Prevention and Preparedness Agency, 2007). This meant a loss of income for the country and also exacerbated food shortages and malnutrition problems in the region.

The impacts of climate change on the environment could also reduce the national income from the export of agricultural products such as coffee, pulses and flowers. Of particular concern is the possible impact on Ethiopia's famous Arabica coffee, which is exported all over the world. Coffee plants are very sensitive to climate change and there are concerns that Arabica coffee production could become impossible in Ethiopia by the end of this century if the change continues at the current rate.

Ethiopia is home to Africa's largest livestock population, and is the world's tenth-largest producer of livestock and livestock products (MacDonald and Simon, 2011), which make up about 10% of the country's foreign currency earnings (Pantuliano and Wekesa, 2008). Frequent and extensive droughts in the country have a considerable effect on Ethiopia's livestock because decreased rainfall shrinks available water resources and reduces the productivity of grassland and rangeland. In recent year it became evident that households who use to own hundreds of livestock

have now less than one third of their 30 years herd size. Such loss are primarily through death and secondly through selling out to extremely low price to thrive through life threatening moments. Slaughter destocking was the strategy pursued by many of the livestock dependant community, which over time reduced the wealth level of the community and increased their poverty level.

The main causes of livestock deaths in Ethiopia are shortages of water and food during drought (IFAD, 2009; MacDonald and Simon, 2011). Increased temperatures can affect the behaviour and metabolism (internal body processes) of livestock, such as a reduced intake of food and a decline in productivity (IFAD, 2009; Thornton et al., 2009). Changes in rainfall and warmer temperatures may also increase the geographical distribution and survival of vectors like flies and mosquitoes that transmit infectious diseases to livestock (IFAD, 2009; Thornton et al., 2009). These impacts on livestock are already being felt in Ethiopia; in the past two decades in Borana zone, southern Ethiopia, there have been losses of livestock associated with drought. The number of animals per household declined on average 'to three oxen from ten; to seven cows from 35; and to six goats, down from 33' (MacDonald and Simon, 2011).

Like drought, flood has a significant impact on livestock. Animals can be drowned or washed away by flood. For instance, more than 15,600 livestock were lost due to flooding in 2006 in SNNPR (EWD DPPA, 2007). Flood also covers large areas of grazing land with water, making it impossible for the animals to find food. In general in addition to affecting agriculture and livestock, climate change induced disasters usually cause huge damage to property, livelihoods and infrastructure. This occurred in the 2006, 2008 and 2015/16 floods and drought incidences across many districts of the country.

5. Summary of the Review

Climate change affects regions across the globe, however, people living in poor countries such as rural Ethiopia are more affected. Climate change can bring about disastrous weather events, of which cause serious household economic losses occur in less developed countries, to the extent of turning rich crop and livestock dependants to poor. Because of their already vulnerable state, poor communities in rural Ethiopia are particularly at risk of feeling the effects of climate change. In summary there are four ways climate change is exacerbate rural poverty in Ethiopia:

a) Natural disasters sink poor communities further into poverty

Studies suggest that natural disasters are on the rise, as evidenced by the fact that extreme weather events increased three-fold over the years between 1980 and 1989. Drought, Floods, epidemics, landslides and other natural disasters can destroy communities with already fragile infrastructure and poorly developed livelihoods. They often lack diversified livelihoods, highly dependant on climate sensitive activities, lack safe house or very rural villages, clean water supplies, and have little access to health and other services. As a result, communities can suffer widespread disease, shortages in food, water and basic necessities. Hence the change and variability of climate increases frequencies of disaster, which in turn affect the livelihood of poor communities.

b) Greater health risks (Livestock and human)

Climate change in a similar way to human activities like driving cars and producing coal introduce carbon dioxide and other toxic gases, can change the normal composition of the air we breathe and increase warming putting an impact on the respiratory system of humans and

animals. This reduction in air quality and the increased worming reduces the amount of oxygenation in the respiratory system, affecting the brain and the heart, which can lead to cardiovascular and respiratory diseases. The vast majority of people at risk are in urban areas in low and middle income countries. Children in less developed countries experience the greatest health risks. Another health-related impact of climate change is access to clean water. Shrinking sources of fresh water, droughts, changes to the water cycle, and few resources for purifying water, all cause less access to clean water and sanitation. This impacts health, especially for children, by increasing instances of waterborne diseases, malnutrition, and impaired developmental growth.

c) Food security

Changing temperatures and rain patterns, particularly droughts, have detrimental effects on farmers and can cause food insecurity. Unfavorable weather can lower crop yields and decimate livestock. This means that income goes down for farmers and their families, sending people further into poverty. It can also cause massive food shortages, increasing food prices, and even lead to famine.

d) Forced migration

In the aftermath of natural disasters, droughts, famine, and other climate change issues, the poor are often faced with the tough choice of either migrating to places with better living conditions, or staying in their home and risking further uncertainty and loss. In Ethiopia for example following the drought situation of the 2008, and 2015/16 several households have abandoned their homes and livelihoods and migrated to bigger cities. The long term effect is that many people finally leave the country to migrate to Europe and middle east. Some of the recent incidences of people dying in big containers while transported in Tanzania and submerged in the Mediterranean seas are life examples.

Reference

- Adane Tasfaye, Ayalew Tamiru, Bekele Godana, 2006. Leaving disaster behind. Emergency capacity building. A consortium of NGOs in Ethiopia's publication, Nairobi, Kenya.
- Aman Tufa, Adam Bekele and Lemma Zemedu (2014). 'Determinants of smallholder commercialization of horticultural crops in Gemechis District, West Hararge Zone, Ethiopia'. African Journal of Agricultural Research. Vol. 9(3), pp. 310-319, DOI: 10.5897/AJAR2013.6935. ISSN 1991-637X ©2014 Academic Journals <http://www.academicjournals.org/AJAR>
- Bezabih E, Hadera G (2007). 'Constraints and opportunities of horticulture production and marketing in eastern Ethiopia'. Dry Lands Coordination Group Report. Grensen 9b. Norway. pp. 46-90.
- Bindi, M. and J. E. Olesen, 2000. Agriculture: in M. L. Parryed. Assessment of potential effects and adaptations for climate change in Europe: The Europe ACACIA project. Norwich, United Kingdom: Jackson Environment Institute, University of East Anglia.
- Crosson, Pierre, 1997. Impacts of climate change on agriculture. Climate issues brief 4. Resources for the future, Washington, D.C.
- CSA (Central Statistical Agency) (2009). 'Statistical report on area and production of crops'. Addis Ababa, Ethiopia.

- Demese C, Berhanu A, Mellor J (2010). 'Federal Democratic Republic of Ethiopian, Ministry of Agriculture and Rural Development draft report on Ethiopia's Agriculture Sector Policy and Investment Framework'. Ten Year Road Map (2010-2020). May, 2010, Addis Ababa, Ethiopia.
- DPPA, 2005. Number of people affected by drought in Ethiopia during the 1990 – 2005. Addis Ababa, Ethiopia.
- Houghton, T. and John, Theodore, 2001. Climate change. The scientific basis. Contribution of working group I to the third assessment report of the intergovernmental panel on climate change. Cambridge, UK. Cambridge University Press. ISBN 0-521-80767-0. <http://www.ipcc.ch/ipccreports/tar/wg1/518.htm>.
- IPCC, 1996. Impacts, adaptations, and mitigation of climate change: Scientific-technical analyses. Contribution of working group II to the IPCC second assessment report. Cambridge, U.K.: Cambridge University Press.
- IPCC (Intergovernmental Panel on Climate Change), 2001. Climate change: The scientific basis. [O]. Available: <http://www.ipcc.ch/Accessed> by Temesgen Deressa on June 7, 2008. Browsed on September 10, 2011
- London School of Economics. 2015. Ethiopia Country Profile, The Global Climate Change Legislation Study.
- MoFED (Ministry of Finance and Economic Development) (2005). 'Ethiopia: Building on progress: A plan for accelerated and sustained development to end poverty (PASDEP 2005/06-2009/10)'. Addis Ababa, Ethiopia
- Murdiyarsa, Daniel, 2000. Adaptation to climatic variability and change: Asian perspectives on agriculture and food security. *Environmental Monitoring and Assessment* B1(1): 123-131.
- Pradeep Kurukulasuriya and Shane Rosenthal, 2003. Climate change and agriculture. A review of impacts and adaptations. Published jointly with the agriculture and Rural Development Department. World Bank. New York.
- Rosenzweig, C., F. N. Tubiello, R. Goldberg, E. Mills, and J. Bloomfield, 2002. Increased crop damage in the U.S. from excess precipitation under Climate Change." *Global Environmental Change: Human Dimensions and Policy* 12(3): 197-202.
- United States Embassy. 2016. The Humanitarian Response of the USG to the Current Ethiopian Drought.
- USAID. 2015. Climate Information Factsheet: Ethiopia.
- USAID, 2003. Planning for the next drought in Ethiopia: A case study. Addis Ababa, Ethiopia.
- Tilaye B (2010). 'How to involve smallholder farmers in commercial agriculture/horticulture'. Ethiopian horticulture producers and exporters association, Addis Ababa, Ethiopia.