

## Research Paper

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# Climate change and livestock production in Ethiopia

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### ABSTRACT

Agriculture which includes crop production, animal husbandry livestock, forestry, fisheries and apiculture remains by far the most important sector of the country from which livestock constitutes the largest component of the Ethiopian agricultural sector. The livestock population of the country that reaches more than 80 million heads is the largest in Africa and the 10<sup>th</sup> in the world. The recent livestock population estimates that the country has about 52.1 million heads of cattle, 24.2 million sheep, 22.6 million goats and 44.9 million poultry. Ethiopia is also the continent's top livestock exporter. However, livestock production in Ethiopia is heavily dependent on climate change and variability, and Ethiopia is among those countries most vulnerable to climate risks in Africa. So, this paper aims to give an overview on the effects of climate change on livestock production in Ethiopia.

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### INTRODUCTION

World population is expected to grow from 5.5 billion now to about 8 billion in the year 2020. As a result of this, the importance of livestock production can be expected to increase over the next decades (World Bank, 2002). Extensive livestock production is practiced in arid and semi-arid areas all over the world (McCarthy, 2001). Livestock is the sole source of livelihood for at least 20 million pastoral families and an important source of income for at least 200 million stalk holder farmer families in Asia, Africa and Latin America (World Bank, 2002). Extensive livestock production still provides a livelihood for a large number of people in marginal areas of sub-Saharan Africa. Yet, few advances of any sort have been made over the last three decades, and these areas remain characterized by low productivity and extreme vulnerability to climatic fluctuations (McCarthy, 2001). The livestock population in Ethiopia that reaches more than 80 million heads is the largest in Africa and the 10<sup>th</sup> in the world. It constitutes a large component of the Ethiopian agricultural sector and is well integrated with the farming systems found in the highlands and provides the sole means of subsistence for the nomadic pastoralists in the lowlands (FDRE, 2001). However, Ethiopia is among those countries most vulnerable to climate risks in Africa (Stark et al., 2011)

which has its root in various factors, including its geographic location and social and economic structure (UNDP, 2011). In the same way, Zenebe et al. (2012) also reported that its low adaptive capacity, geographical location and topography make the country highly vulnerable to the adverse impacts of climate change. In addition, dependency of its population on climate sensitive sectors for livelihood, widespread environmental degradation and fragile ecosystems, limited national scientific, technological, financial and institutional capacity, poor infrastructure - add-up to heighten Ethiopia's vulnerability to the impacts of climate change (UNDP, 2011). Therefore, this paper aims to give an overview on the effects of climate change on livestock production in Ethiopia.

### CLIMATE CHANGE AND LIVESTOCK PRODUCTION IN ETHIOPIA

#### Climatic feature

Ethiopia is located between 3°N - 15°N and 33°E - 48°E. Ethiopia's climate is typically tropical in the south-eastern

and north-eastern lowland regions, but much cooler in the large central highland regions of the country. Mean annual temperatures are around 15-20°C in high altitude regions, whilst 25-30°C in the lowlands (McSweeney et al., 2007). Mean annual rainfall distribution has maxima (>2000 mm) over the Southwestern highlands and minima (<300 mm) over the Southeastern & Northeastern lowlands (FDRE, 2001). Regional projections of climate models indicate a substantial rise in mean temperatures in Ethiopia over the 21<sup>st</sup> century and an increase in rainfall variability, with a rising frequency of both extreme flooding and droughts due to global warming (Robinson et al., 2013).

### **Livestock resources**

Livestock production in Africa accounts for about 30% of the gross value of agricultural production, with 92% of that coming from the production of beef cattle, dairy cattle, goats, sheep and chickens (IFAD, 2009; IUCN, 2010). Livestock production is increasing throughout Africa, driven by growth of human population, living standards (increases in the demand for livestock products as incomes rise) and urbanization (IUCN, 2010; Philip et al., 2007).

Ethiopia is home to Africa's largest livestock population, and it is the continent's top livestock producer and exporter. Although domestic demand for animal products in Ethiopia is increasing driven by the urban middle and upper-classes export potential is the key force encouraging expansion and intensification of livestock production (MacDonald and Simon, 2011). The livestock sector is an integral part of the farming systems in the country. It is the source of many social and economic values such as food, draught power, fuel, cash income, security and investment in both the highlands and the lowlands/pastoral farming systems (FDRE, 2001). The recent livestock population of Ethiopia estimates that the country has about 52.1 million heads of cattle, 24.2 million sheep, 22.6 million goats and 44.9 million poultry (MOA, 2013; Berihu et al., 2014).

### **Effects of climate change on livestock production**

Livestock and climate change have a close relationship (Iqbal, 2013). The spatial distribution and availability of pasture and water are highly dependent on the pattern and availability of rainfall (Aklilu et al., 2013). Changes in the patterns of rainfall and ranges of temperature affect feed availability, grazing ranges, feed quality, weed, pest and disease incidence (Coffey, 2008). Thus, changes in climatic factors such as temperature, precipitation and the frequency and severity of extreme events like droughts directly affected livestock yields (Adams et al., 1998). According to Coffey (2008), livestock production is doubly impacted by climate change. Similarly, Adams et al. (1998) also reported that livestock can be affected in two ways by

climate change: the quality and amount of forage from grasslands may be affected and there may be direct effects on livestock due to higher temperatures. The harsh effect of climate change is expected to have maximum impact on vulnerable pastoral communities engaged in extensive livestock production systems in dry-lands (Saidu and Omedo, 2010).

According to ONRS (2011), climate change and variability in Ethiopia poses particular risks to poor farmers and pastoralists who have an immediate daily dependence on climate sensitive livelihoods and natural resources. In addition to the physiological effects of higher temperatures on individual animals, loss of animals as a result of droughts and floods, or disease epidemics related to climate change may thus increase. Indirect effects may be felt via ecosystem changes that alter the distribution of animal diseases or the supply of feed. As reported by ANRS (2010) all pastoral regions in Ethiopia are highly prone to the adverse impacts of climate change, while the problem is more prevalent in the North Eastern lowlands of the country. The afar region is home to pastoral and agro-pastoral people who largely depend on livestock production for their livelihood but due to climate variability the people exposing to the risks of several climate related disasters. Similarly, a study by Kassaye (2010) accounted that livestock production in already marginal ecosystems in Ethiopia is severely affected by climate change induced disasters. MacDonald and Simon (2011) also reported that farmers living in Ethiopia's semi-arid and arid lowlands that have less diversified assets and are heavily reliant on rain-fed agriculture are, along with their livestock, particularly vulnerable to climate change.

Thus, there is no doubt about the victim of livestock sector by climate change. According to Zelalem et al. (2009), the four major effects of climate change on livestock production in Borana pastoralists include feed shortage, water shortage, reduced productivity, and decreased mature weight and/or longer time to reach mature weight. Again, he revealed that heavy infestation of invasive species due to climate change has reduced the availability of herbaceous species and hence resulted in a critical shortage of feed. On the same way, Stark et al. (2011) reported that in some regions, invasive species linked by pastoralists to both restrictions on bush burning and climate change are severely reducing or eliminating viable grazing areas. Trends indicative of climate change, such as increasingly recurrent drought, floods, erratic rainfall patterns, and high temperatures are adding significantly to these stresses. The effect of climate change on the range lands in Moyale and Dillo areas is also remarkable. In many of the cases, the range land is changed into bare termite mound (Zelalem et al., 2009).

Climate change will have far-reaching consequences for dairy and meat production, especially in vulnerable parts of the world where it is vital for nutrition and livelihoods (UNFCCC, 2007; WSPA, 2012). Similarly, Adams et al.

(1998) stated that climate change tended to have adverse impacts on livestock production (e.g. low milk production) through both declining forage quality and increased ambient temperature. Climate change, especially increases in temperature, has a direct impact by increasing heat stress in animals (Coffey, 2008). Warming is also expected to alter the feed intake, mortality, growth, reproduction, maintenance, and production of animals (Robinson et al., 2013).

In Ethiopia, increased frequencies of extreme events such as drought and flooding which attributed to climate change undermine the rural livelihood systems (Aklilu et al., 2013). In line with this, Zelalem et al. (2009) reported that animal had died during severe droughts. The southern lowlands of Ethiopia are among the country's vulnerable regions to the impacts of climate change. Recurrent droughts, flash floods, diseases, and pests are among the prevalent disaster risks related to climate change in the area. Pastoral communities are the major victims of these disaster risks (Aklilu et al., 2013).

A study conducted in Yabelo, Borana Zone in southern Ethiopia indicated that households have experienced a severe reduction in their assets, with an average reduction of 80% in livestock holdings from their peak holdings over the past ten years mainly by climate change (Stark et al., 2011). Additional study indicated that the decline in the number of livestock species namely cattle, goats, sheep and donkey kept by pastoralists of Moyale and Dillo areas was remarkable in which most of the animals were reported to have died during severe droughts, which occurred in 2005 and 2008 (Zelalem et al., 2009). Again, the decreases in number of livestock in Arba Minch district is directly or indirectly interlinked and related to climate change (Iqbal, 2013). Livestock health problems exacerbated by climate change such as the high prevalence of Trypanosomiasis in the lowlands are among the challenges that affect livestock fertility (Habtamu, 2012). Thus, it is agreed that livestock productivity is highly affected by climate change. Livestock productivity is affected most severely under the Ethiopia dry scenario, in which the ratio between future and baseline productivity falls to a low value of approximately 0.70 in the moisture reliable humid lowland zone, or a 30% decline in productivity. Under each scenario, there is a downward trend in productivity over the 2001 to 2050 period (Robinson et al., 2013).

## CONCLUSION

Ethiopia's economy is highly dependent on agriculture. Livestock constitutes the largest component of the Ethiopian agricultural sector. Ethiopia is the primary producer and export of livestock production in Africa. However, climate change has far reaching consequences on livestock production potential of the country and it is a huge treat for many who directly depend on livestock production. Along with, it is also a treat for the export

capacity of the country as observed by many literatures. Thus, new livestock management practices should be implemented so as to minimize its effects on livestock production of the country.

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