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The impact of drought in Ethiopia: literature review

The Impact of Drought and its Socio-economic Consequences: A Literature Review, in the Case of Ethiopia

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ABSTRACT

This document reviews the impact of drought and its socio-economic consequences in Ethiopia. Livestock deaths and morbidity, human morbidity, food insecurity, reduction of livestock prices, and increase in food prices were among the socioeconomic impacts of drought experienced. Drought is a major cause of poverty in Ethiopia. It results in low stocking rate and livestock deaths, which leads to reduction of assets. Moreover, drought depletes water sources and reduces quantity and quality of forage for livestock. The impacts of drought are felt in large geographical scope than impacts that result from other natural hazards such as floods. Some researchers argue that wide spatial coverage and non-structural nature of impacts make it difficult for planners and decision makers to quantify impacts and provide disaster relief in the event of drought than for other natural hazards. Economic impacts of drought to pastoralists are demonstrated by deteriorating livestock body conditions and massive livestock deaths, which lead to decline in livestock prices. It is therefore a fact that drought results in destruction and collapse of livelihoods, dependence on food aid and long-term destitution.

1 Introduction

1.1 Background

Over the last two decades the world community have been constantly reminded and shocked by the *grim* reality, capable of inflicting extreme misery and death on the vulnerable sectors of society. This has probably been among the most distressing events in the last two decades. Beside the incidence of drought in various parts of the world, the problems have been particularly prevalent in developing nations, particularly the Horn of Africa, the region of the globe that accounts for most of the current drought. Ethiopia has been and remains one of those areas that account for a sizeable proportion of the drought vulnerable groups.

There is a plenty of evidence to show that drought is not a new phenomenon resulting from modern day events but rather that it is rooted deep in the history of the country. Drought in the historical period however may have very little in common with contemporary drought except for its consequences of misery and suffering on the victims. This is so because, judging from present day circumstances, it would not be unfounded to form the presumption that the leaderships at the time of the historic drought would have had very little by way of options, for purposes of averting or preventing natural phenomenon like drought from developing into full blown famines. The literature gives ample indication regarding the frequency of historical famines. According to one review of drought in Ethiopia, which cites the “*Metshafe Senkesar*” a medieval book, drought has occurred as early as the ninth century when because of the wickedness of the people. God prevented the heavens from sending forth rain, with the result, it is reported, that 'all our men were dying of the plague (Kakwani, 1989 & Sen, 1987). On the basis of the same source, the review mentions other drought that took place in the twelfth century, again presumably due to the wrath of God. Pankhurst, who relies mainly upon royal chronicles written in the local language and which enable the rather precise dating of events, has established that during the period of 1540 to 1750 no less than eleven major droughts has occurred. The famine for which the most detailed information is available occurred in the last century, with the famine of 1888-1892 described as perhaps the most terrible natural disaster still remembered in the country (Endale, 1993 & Negash, 2006).

Yet another writer, in a study on the chronology of Ethiopian drought, concludes that on the basis of the drought documented over the last 200 years, seven drought per century can be expected in Ethiopia, while extremely destructive drought, such as those of 1973-75, 1957, 1913, 1888-92, 1560-2 and 1543-4 average two occurrences per century based upon these incomplete statistic (Pankhurst & Johnson, 1988). He therefore cautions that drought is a normal component of Ethiopian life making famines inevitable unless the proper preventive measures are adopted. Regarding the connections of the historical famines, records dating as far back as the thirteenth and fourteenth centuries showing the incidence of several epidemics and famines, indicate that such outbreaks, as noted earlier, were widely regarded as punishment sent by God (Pankhurst, 1972).

Although the causes of famines in the medieval and later periods were expressed in such fatalistic terms, historians interested in the region have nevertheless managed to marshal sufficient evidence particularly on some of the major famines that took place in later periods, associating the causation with incidences of drought, cattle epidemics, harvest failures, and the outbreak of locusts and caterpillars. It is therefore quite apparent, that the physical phenomenon cited above must have triggered the circumstances that led to the entitlement failures of the victims of the historical famines. Given our presumption that the forms of governments at those particular periods in history could not have had the structure required to intervene successfully in averting the famines, the indicated physical phenomenon appear to be the most important factor in the process leading to the famines. According to one well-documented account, a famine that occurred in 1828-29 and which was accompanied by an outbreak of an epidemic, the cause of the famine was attributed to the simultaneous failure of both the grain and the cotton crops, followed by the death of large numbers of cattle (Svedberg, 1991). The famine of 1888-92 is reportedly caused by a combination of natural disasters, a major epidemic of cattle plague or rinderpest, a harvest failure and an outbreak of locust and caterpillar (Svedberg, 1991).

The evidence on the historical famines support physical phenomenon may provide adequate explanation of climatic factors that the failures of rainfall. The Present-day famines are no less grim in intensity or frequency than the large historical famines. One notable research finding seems

to indicate that famines are even more endemic with a far more frequent incidence at regional levels than appears at the national level. Another account puts the major famine periods in Ethiopia during the present century into four with a large number of localized droughts in different years occurring in the various regions of the country. Ethiopia has experienced large-scale drought for half a century due to the failure of the meher rains (rain for the main crop) in 1971 triggered the onset of the 1972-74 drought. The drought of 1972/73, 1984/85, 1987, and 1998-2000 are all recent memories of mass starvations that affected the lives of hundreds of thousands of people and livestock population (Lirenso, 2001). Numerous articles have been written on the drought that occurred during 1982/85 - a drought which managed to waste the lives of probably more people than even the previous drought of 1972/74. The generally accepted truth of the 1982/85 drought is the result of successive periods of low rainfall and poor harvests. Rainfall is reportedly in short supply as early as 1980 in most of the Northern provinces as well as some of the southern provinces of the country (Smith, 1987, Sen, 1987 & Keller, 1992). Ethiopia is particularly very susceptible to drought, which is the most significant climate related disaster influencing the country over time (Seleshi & Zanke, 2004a). Rainfall anomalies and the delayed onset of the rainy season, along with rising temperatures, lead to impoverishment of grassland, lack of livestock feed and water as well as heat stress to livestock. This has, in turn, increased the mortality rate of herds, susceptibility of livestock to disease and emaciation as a result of the long distances they travel in search of pasture and water (Woldetsadik & Hailu, 2010).

1.2 Objectives

The general objective of this literature is to briefly review impacts of drought in Ethiopia and coping strategy of society.

1.2.1 Specific objectives

- To review the socioeconomic impact of drought.
- To review the impact of drought on agricultural sector.
- To review the impact of drought on water sector.

2 Literature review

2.1 Concept and definition of drought

Drought is a deficiency in precipitation over an extended period, usually a season or more, resulting in a water shortage causing adverse impacts on vegetation, animals, and/or people. It is a normal, recurrent feature of climate that occurs in virtually all climate zones, from very wet to very dry. Drought is a temporary aberration from normal climatic conditions, thus it can vary significantly from one region to another. Drought is different than aridity, which is a permanent feature of climate in regions where low precipitation is the norm, as in a desert.

In practice, drought is defined in a number of ways that reflect various perspectives and interests. According to the United Nations International Strategy for Disaster Reduction (UNISDR), drought is defined as a deficiency of precipitation over an extended period of time, usually a season or more, which results in a water shortage for some activity, group, or environmental sectors (Murphy, 2020). Drought is a recurrent climate phenomenon which occurs in most parts of the world, with varying frequency, severity and duration (Ponce et al., 2000). According to the European Union Water Framework Directive (EUWFD), drought is a natural phenomenon. Wilhite (2000), described drought as a normal, recurring phenomenon of climate that practically occur in all regions of the world. It is different from aridity, since, while aridity is a permanent phenomenon restricted to low rainfall areas, drought is a temporary aberration that occur in both low and high rainfall areas (Wilhite & Svoboda, 2000 & Hayes et al., 2000). Drought is one of the highest natural disasters globally having major impacts on environmental, economic and social conditions (Eriyagama et al., 2009).

2.2 Types of drought

Many disciplinary perspectives of drought exist. Each discipline incorporates different physical, biological, or socio-economic factors in its definition of drought. Drought differs from other natural hazards in various ways. Drought is a slow on set natural hazard that is often referred to as a creeping phenomenon, and it is a cyclic process that acknowledges drought as a cyclic event

(Zheng et al., 2017). The many definitions lead to drought being grouped by type as follows: meteorological, hydrological, agricultural, and socioeconomic. These classifications are done according to a number of criteria involving several variables, used either alone or in combination: rainfall, temperature, humidity, and evaporation from free water body, transpiration from plants, soil moisture, wind, river and stream flow, and plant condition (WMO, 2006).

2.2.1 Meteorological Drought

The classification based only on precipitation is Meteorological Drought and refers to short period drought or dry spells, when precipitation received is far below the expected normal. Meteorological drought expressed solely on the degree of dryness (often in comparison to some “normal” or average amount) and the duration of the dry period. Other definitions may include actual precipitation departures to average amounts on monthly, seasonal, year, or annual time-scales. For example, some definitions differentiate meteorological drought on the number of days with precipitation less than some specified threshold (WMO, 2006).

2.2.2 Agricultural drought

Agricultural drought is probably the most important aspects of drought. However, that problem is far more specialized and complicated than some investigators seem to realize. This related to physiological drought, which is determined from conditions of natural vegetation, crops, livestock, pastures and other agricultural systems. This defined by measure of the availability of soil water to plants or animals. In this case, radiation (heat), drying wind and evaporation become important factors. It usually measured by the effects of water deficit in terms of economic losses to agriculturists. The economic loss terms can include factors like drop in crop production, livestock deaths, industrial losses, plants not planted or replanted changes in land use (WMO, 2006).

2.2.3 Hydrological drought

Hydrological drought is the deficit of runoff into rivers and other surface water resources and in groundwater resources. It involves the description of availability of water, in the form of precipitation runoff, evaporation, infiltration, river systems, and other surface/ groundwater

inflow/outflow systems, which may be included in the hydrological water balance equation (available water for the system such as precipitation, infiltration, storage, evaporation runoff, etc.)

2.2.4 Socio-economic drought

Socio-economic drought differs markedly from the other types of drought because it reflects the relationship between the supply and demand for some commodity or economic good, such as water, livestock forage or hydroelectric power that is dependent on precipitation. Supply varies annually as a function of precipitation or water availability. Demand also fluctuates and is often associated with a positive trend because of increasing population, development or other factors (WMO, 2006).

2.3 The cause of drought

The variations in rainfall in a country from year to year are under the control of complex and incompletely understood interactions among meteorological, oceanographic and other geophysical phenomena that are often far distance from the country in question. In addition, the question arises of whether local human actions can increase the frequency or severity of drought.

Annual rainfall characteristics of Ethiopia are classified into three rainy seasons as documented by many authors (Admassu & Seid, 2006 & Korecha & Barnston, 2007). These distinct seasons are the dry (October–January), the small rainy (February– May), and the main rainy (June–September) seasons. The seasons locally defined as Bega (October–January), Belg (February–May), and Kiremt (June–September). The most important weather systems that cause rain variability over Ethiopia include Sub-Tropical Jet (STJ), Inter Tropical Convergence Zone (ITCZ), Red Sea Convergence Zone (RSCZ), Tropical Easterly Jet (TEJ) and Somalia Jet (Kassahun, 1987 & Liebmann et al., 2014). The spatial variation of the rainfall, thus, influenced by the changes in the intensity, position, and direction of movement of these rain-producing systems over the country. Moreover, the spatial distribution of rainfall in Ethiopia is significantly influenced by topography (Viste et al., 2013). As reported by National Meteorological Agency of Ethiopia, climate related hazards in the country include drought, floods, heavy rains, strong winds, frost, heat waves (high temperatures) (Conway & Schipper, 2011). Precipitation exhibits great spatial

and temporal variation both in annual average and inter-annually that could be taken as the major cause for the occurrence of drought in the country (Parker, 2010 & Viste et al., 2013). Viste et al., (2013) conclude that there are no years without drought in many parts of Ethiopia.

3 Impact of drought

Based on past experiences, drought affected nearly all sectors in Ethiopia, agriculture (loss of crops and livestock), water resources (increase in evaporation and decline in availability of fresh water which results in water stress), inadequate water for industry and reduced electricity production from hydropower. Although it has not been assessed and documented properly, the impact on ecosystems is significant (loss of wet lands and lakes, loss of forest and soil cover, increased soil erosion and land degradation. The social and economic impacts (increased human and livestock diseases, migration, and conflict over water, and the decline in the National Gross Domestic Product (GDP)) are hugely important. Perhaps nowhere else is the change in weather (drought) and climate regimes more noticeable in food and water sector (Kundzewicz et al., 2007 & Gutiérrez et al., 2014), which in turn affects all other sectors significantly, and this is as a result of drought (Van Dijk et al., 2013 & Tesfamariam et al., 2019).

Agricultural production in a country is predominantly rain fed and variation of rainfall in space and time affects the agricultural production system, this results in national food insecurity (Bewket, 2009 & Asfaw et al., 2017). The recent drought years of 1965, 1972–73, 1983–84, 1987–88 and 1997 resulted in low agricultural production and affected millions of rural poor farmers, pastoralists, domestic and wild animals, with serious degradation of the environment (Seleshi & Zanke, 2004 & Viste et al., 2013b). According to Famine Early Warning System Network (FEWSNET) report, the humanitarian situation has changed dramatically due to the 2015/2016 drought since the beginning of 2017 in Somali and Afar regional states. That is resulted in large livestock losses and caused severe food insecurity affecting many communities in the pastoral area of Ethiopia (FEWSNET, 2016 & Net & Africa, 2017).

3.1 Impact on crops and livestock

The Ministry of Livestock and Fisheries and the International Livestock Research Institute findings showed that the national herd, consisting of about 55.2 million cattle, 29 million sheep and the same number of goats, 4.5 million camels and close to 50 million poultry, produces currently about 1,128 metric tons (MT) of meat, 174 million eggs and 5.2 billion liters of milk per year. In addition, it provides about 68 million tons of organic fertilizer and almost 617 million days in animal traction (LSA & Livestock, 2017). The loss of crops and livestock often results in severe household food shortages and psychological stress and insecurity among the affected people. The seasonal rainfall failure resulted in widespread crops failure in agricultural area, pasture and forage and massive death of livestock in pastoralist areas, and resulted in widespread malnutrition. The recent drought of 2015 caused malnutrition for a population of about 10 million people (10%) (estimate based on the number of people requiring food aid). The humanitarian situation has changed dramatically since the beginning of 2017. Livestock body condition losses had a significant impact on pastoralist, resulting in reduced purchasing power and consequently food access (ACAPS, 2017 & Oxfam, 2019). The average market price of cattle has reduced from 8228 to 4096 Ethiopian Birr (ETB) due to the 2015/2016 drought (Menghistu et al., 2018). The Afar National Regional State (ANRS) report indicated that for the last several years, the livestock prices has down as much as 60% to 70% (ANRS, 2002). The 1984, 2002 droughts were the most devastating and historic in creating huge food shortage for a large proportion of the population that relied heavily and predominantly on subsistent-rain-fed agriculture. The drought in 1984 resulted in famine as the drought prolonged a year and severe water and food shortage occurred, and widespread hunger and diseases killed millions of people covering large part of the country. The local people called such period as “Kefu Qen” or evil day (Stefan et al., 2010). There were many kefu Qens since antiquity as a result of the recurrent droughts.

3.2 Impact on water resources and its environment

Over the last two decades, Ethiopia has been building massive infrastructure to harvest water for generating electricity and developing irrigation to produce food and fiber crops for domestic consumption and support local industries. Presently several dams are built and as a

result the country has increased its water security. Industrialization which requires electric power is also growing to diversify the country's economy. The recent droughts are impacting the country more seriously, far beyond creating drying of water sources. The water resources in both manmade and natural water bodies are shrinking severely affecting the availability of water for irrigation and electricity production and in return affects the economy. The drop in lake levels, low flows in rivers/streams and drop in ground water levels are often recognized as hydrological drought is becoming a common phenomenon. It is also characterized by changes in wet lands, decreased biomass or vegetative cover and over all damage to the land (land degradation) in all ecologies due to excessive dryness (Mera, 2018).

3.3 Socio economic impact

Pankhurst (1988) wrote an extensive account and assessment (case studies) on drought and its social, economic and environmental impacts in certain hot spot regions in Ethiopia. In the first reference, four major droughts with a wide range of impacts of historic significance were recorded. First the devastation of oxen by render pest in the 1888–1892, second the Tigray famine of 1958 which killed over 100,000 people, third the Wag-Lasta famine of 1966, and fourth the Wollo Famine of 1973/74. These droughts affected large number of people over the years. The number varied significantly between 2 million in 1972 and 14 million in 2002/3 with a significant and sharp increase in 1976–1977, 1982–1984 and 1991–2002 (Mersha & Boken, 2005, Mera, 2018).

The UN Office for the Coordination of Humanitarian Affairs (UNOCHA) has documented the number of people affected by food shortages (based on emergency food aid reports) in each drought year over the last several decades. The number of the people affected by the drought varies from region to region and it is unfailingly growing. The 2015 drought left over 10 million people (10%) in 2016, and it was reported as the strongest drought in the past fifty years (Oxfam, 2019). The number of people that needed food aid varied by region, Tigray, Afar and Somali Regions were hardly hit and the population affected was 24%, 25% and 21%, respectively. More food aid was required in Oromia followed by Amhara and Tigray Regions. In terms of large geographic coverage, more areas were affected in Afar and Somali Regions. Children, largely in pastoralist areas, were more affected by the drought as it decimated nearly 50% of the livestock in the regions.

A brief summary of famine and drought from a historical perspective is given. In an attempt to estimate the magnitude of deaths due to the 1984-85 famine in Ethiopia, a survey was conducted among the resettled famine victims. The results showed that the expected life at birth among the male and female famine victims was 6.2 and 5.7 years, respectively. Regional variations between the two famine affected regions showed that mortality in Tigray was slightly higher than that of Wello. Also pre famine socio-economic differentials between households did not seem to have an effect on mortality. The results suggested that as much as 700,000 excess deaths might have occurred during the 1984-85 famine period in Ethiopia (Kidane, 1990). The 1972-73 and 1984-85 famines varied significantly among different populations within famine areas at the regional, community and household levels. Political and social factors were crucial in this pattern. Evidence from both pastoral and farming areas indicated that the development of community-based resources may be less disruptive socially and economically and result in less morbidity and mortality than dependence on relief shelters (Kloos & Lindtjorn, 1994).

4 Conclusion

Droughts are natural calamities that no one can prevent, but we can prepare for the effects of the disaster to make it more manageable. There are numerous human and natural system costs that we should be aware of as a result of this force of nature. Main conclusions of the review include: drought and its impact continue to threaten the livelihoods of millions of people in Ethiopia. The economic consequences of drought, crop failure, livestock death and famine. The impact is series mainly in the norther, northeastern and eastern part of the country, particularly the pastoral community are among seriously affected areas in Ethiopia.

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