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Review Article

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The Impact of Drought on Food Security in Somalia: A Comprehensive Review

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Abstract

Drought is one of the primary contributors to food insecurity in developed and developing countries. Somalia, the most drought-prone country in East Africa, has faced chronic food insecurity and high levels of malnutrition since the 1970s. This comprehensive review examines how recurring droughts exacerbate food insecurity in the country by impacting its agricultural productivity sector. This analysis underscores the direct consequences of drought on food availability and access. The study employs secondary data from different data sets including FAO, World Bank, and SWALIM. In Somalia, droughts have severe implications for food security, particularly their impact on agricultural productivity and livestock health. The prolonged drought in Somalia in 2022 brought the country dangerously close to widespread famine. The latest data demonstrate that the food crisis in Somalia has escalated, with 3.7 million people, representing 22% of the population, facing high levels of acute food insecurity. In September 2022 alone, 68,393 people were displaced due to drought, representing a 31% decrease compared to August 2022. The regions that have seen the newest arrivals of displaced people are Bay (26%), Lower Juba (22%), Gedo (14%), Banadir (11%), and Bakool (11%). Nearly 2 million children are at risk of acute malnutrition. Additionally, 3.5 million livestock deaths have devastated livelihoods and reduced access to vital food sources. Displacement due to drought has further compounded the crisis, with tens of thousands forced to flee their homes. This paper highlights the urgent need for sustainable solutions, emphasizing improved water management, climate-resilient agricultural practices, and robust early warning systems to mitigate these impacts and build resilience against future droughts.

Keywords: Climate Change, Agricultural Drought, Food Security, Horn of Africa, Somalia

1. Introduction

Based on the definition of FAO, food security exists “when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life” [1]. Food security is a crucial worldwide challenge affecting modern populations and communities and is a top priority on the worldwide agenda for 2030 [2-4]. Global food security issues have gained attention recently due to the regular occurrence of wars, public security incidents, emerging infectious diseases, unsustainable agricultural practices, and climate change [5-10]. Some of the major concerns about food security are the increasing global population, which is estimated to be approximately 10 billion by 2050, rising urbanization, pollution, land degradation, food loss and waste (FLW), and resource scarcity [11-17]. However, a 70% reduction in crop yield is the result of the negative impact of human-caused climate change on the growth and health of crops [18-21]. This presents a serious threat to global food security, leading millions of people—250 million of them are children— to suffer from malnutrition due to a shortage of food [22]. In developing countries, the number of people suffering from malnutrition, food shortages, and hunger is increasing daily [23-25].

The death of an estimated 9 million people—3.1 million children—every year is caused by hunger and malnutrition. That represents more than the combined effects of AIDS, tuberculosis, and malaria and more than half of the deaths were children under the age of five, and one out of every four children has stunted growth [26-30]. Achieving food security globally is a complex challenge, but several key strategies can contribute to progress, such as promoting practices that are resilient to climate change and implementing techniques including cover cropping and no-till farming to improve soil fertility and prevent erosion, as well as reducing food loss and waste (FLW). These factors can enhance the four pillars of sustainable food security which are food availability, accessibility, utilization, and stability [31-35]. One of the most significant factors that disrupts food production, access, and distribution is drought [36,37].

Large-scale climatic variability causes drought, which is one of the hardest natural hazards, relates to short-term water availability, and it can’t be controlled with local water management, while water scarcity and climatic aridity are based

on long-term conditions, which can be influenced by water managers [38-40]. Drought can be defined as a state of water deficiency relative to normal conditions [41]. Droughts result when there are insufficient water resources—those in rivers, soils, aquifers, and reservoirs—to meet human or environmental demands [42,43]. As Figure 1 presents, four main categories negatively impact food security in developed and developing countries [44-47]. According to the United Nations Development Programme report for 2022, Switzerland, Germany, Australia, Denmark, Sweden, and Finland are some developed countries that are concerned about the increasing impacts of drought [48-52]. While developing countries are struggling already with daily food cost challenges [53,54], drought is the biggest disruptor of food security, causing crop failures and limited food availability [45].

In sub-Saharan Africa, food insecurity is believed to be mostly caused by drought, impacting over 220 million people [55,56]. At least 36 million people in Ethiopia, Kenya, and Somalia are experiencing severe food insecurity as a result of the worst drought in 40 years [57]. In Somalia, repeated droughts have impacted livelihoods and the availability of food by causing widespread crop failures and livestock deaths. Somalia was on the brink of famine due to the 2016–2017 drought. This shock occurs in a vulnerable conflict environment marked by extreme poverty, persistent water scarcity, food insecurity, displacement, and intense interpersonal conflicts [58]. In this paper, we present a comprehensive analysis of the impact of drought on food security in Somalia, by evaluating the factors that contribute to food insecurity during droughts. We also assess the past and ongoing efforts to address food insecurity during droughts. Finally, we recommend immediate relief and long-term solutions that can eradicate food insecurity problems.

1.1. Global Droughts and their Challenges to Food Security

Every year, there is a drought that comes suddenly, without regard to political, boundaries, or economic differences. Its effects are wide-ranging and include transportation, forestry, energy, water resources, recreation, transit, food supply and demand, and other resources in addition to agriculture [59]. Droughts are divided into four main categories which are meteorological drought, agricultural drought, hydrological drought, and socio-economic drought [46,60,61].

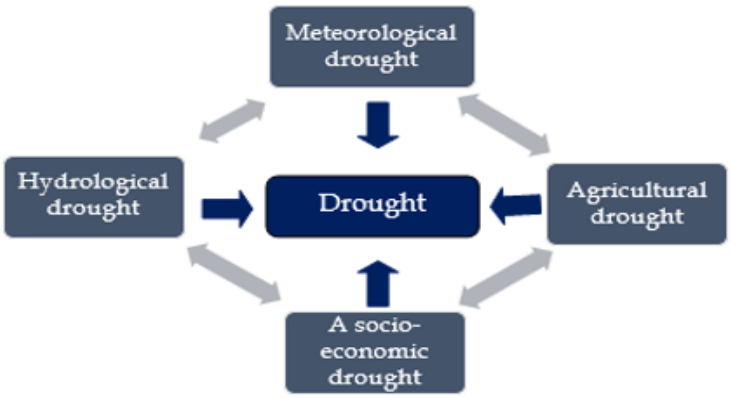

Figure 1: Four Main Categories of Droughts

1. Meteorological drought refers to rather common when compared to others when there is a shortage of precipitation over a prolonged period. Extending this drought causes a deficiency in soil moisture, which leads to agricultural droughts [62-65].
2. Agricultural drought is a condition in which there is not enough rainfall or soil moisture throughout the growing season to support crop growth to maturity [66-68].
3. Hydrological drought refers to when there are reductions in water levels over time, including rivers, aquifers, and reservoirs, which results in a water supply limitation [69-71].
4. A socio-economic drought occurs when the lack of water resources impacts output because water resources are inadequate to meet water demands for certain economic goods in different sectors, such as industries, transportation, tourism, and energy production, leading to shortages of goods and services [66,72-74]. Recently, some studies highlighted groundwater drought as the fifth category while most researchers do not consider it a separate category because it's a result of the water shortage [60,75-77]. All these categories not only negatively affect the environment, water resources, agricultural production, ecosystems, socioeconomic sustainability, population displacement, social conflict, and human health but also cause several different derivative disasters including land desertification, drying rivers, increased sandstorms, land subsidence, and oasis reduction [64-78]. They can also lead to deteriorated water quality, diminished power generation, reduced range productivity, increased wildfires, and social conflicts among communities or nations [79-82].

Currently, the standardized runoff index (SRI) the Palmer drought severity index (PDSI) and the standardized precipitation index (SPI) are the most frequently used for drought indicators [83-85]. These traditional drought indices are mostly calculated using the long-term accumulation of drought-related data, such as temperature, evapotranspiration (ET), and precipitation (PPT), while the meteorological stations are suppliers of data about the drought. According to relative impact, the worst natural hazard

is considered to be drought [86]. This is due to its multi-faceted nature that impacts most societies, and its well-established cause-and-effect relationship with food security [36,87-89]. Droughts reduce crop yield and increase livestock mortality, leading to less food available and a reduction in dairy and meat products, which directly impacts food security globally [90,91].

Drought causes huge losses in many developed and developing countries in various sectors, particularly in agriculture [92-94]. The 42 agricultural countries with the highest ranking have suffered losses from drought since 2001, with a $930 billion estimation [95]. From 1980-2008, Drought killed 0.5 billion people (0.3 billion in Ethiopia) and affected 1.5 billion people (0.3 billion in India) worldwide [96]. For instance, the average annual impact of the drought on crop and pasture results in the United States of America, a nation with highly developed agricultural technology, is estimated to be $6 billion [97,98]. As Table 1 illustrates, in 2020–2023, in the USA, drought, heatwave, and wildfire caused $93.4 billion in damage costs and killed more than 800 people across the South, Central, and Midwest.

Year	Disasters	States affected	Damages	Cost (bill $)	Death (#)
2023	Drought /Heatwave	Southern/Midwestern	Agriculture	14.6	247
2023	Wildfire	TX, LA, OK, KS, IL, MO, NE, HA	Agriculture	5.6	100
2022	Drought /Heatwave	Western/Central	Agriculture/ Industries	23.1	136
2022	Wildfire	Western	Structures	3.3	17
2021	Drought/Heatwave	Western	Agriculture	10.0	229
2021	Wildfire	Western	Structures	11.9	8
2020	Drought/Heatwave	Western/Central	Agriculture	5.3	45
2020	Wildfire	Western- California, Oregon, and Washington	Structures	19.6	46

Table 1: U.S. Billion-Dollar Drought and Fire Disaster from 2020 to 2023 [99]

Drought is plaguing agriculture worldwide in numerous countries, causing concerns with food security, particularly in developing nations. Millions of people in Africa suffered from drought between 1981 and 2010, which resulted in 500 thousand deaths [100]. In 2010, the Food and Agriculture Organization (FAO) estimated that 925 million people in Africa were facing famine; 239 million people in sub-Saharan Africa were facing starvation, in 2012, and there are no encouraging signs that this situation would improve in the future [101].

Rising food demands and environmental pressures are major challenges confronting societies globally, prompting new research into how drought affects food production [102]. Sub-Saharan Africa has seen numerous instances of food insecurity, some of which have reached disastrous levels. Rising food prices and food riots are key indicators of the ongoing food crisis and insecurity in the region [103]. Numerous intense and extended droughts have been documented in recent history, including the 1999-2002 drought in Northwest Africa, droughts in Western Africa (Sahel) during the 1970s and 1980s, the 2010-2011 drought in Eastern Africa (Horn of Africa), and the 2001-2003 drought in Southern and Southeastern Africa, among others [104]. Agriculture and drought are closely interconnected in East Africa (EA), with approximately 40% of the region's Gross Domestic Product (GDP) derived from agriculture [105]. Water shortages pose a significant global threat, yet their effects are particularly severe in Africa, and even more so in Sub-Saharan Africa [106]. Across Somalia, Kenya, and Ethiopia, an estimated 36.1 million people are severely affected by an ongoing drought. This prolonged drought, characterized by four consecutive failed rainy seasons, has led to extreme levels of food insecurity, starvation, and disease for the affected communities in these three countries [107].

1.2. Drought Impacts on Somali Food Security

Droughts have become increasingly frequent and severe, and the areas they affect are expected to expand. Drought is the primary cause of severe food shortages [108]. Somalia, the most drought-prone country in East Africa, has faced chronic food insecurity and high levels of malnutrition since the 1970s [109]. Droughts in Somalia have severe implications for food security, particularly their impact on agricultural productivity and livestock health. According to Pape and Wollburg, the severe drought of 2016/17 in Somalia exacerbated poverty and hunger significantly in rural areas, affecting agricultural households the most. The prolonged drought in Somalia in 2022 brought the country dangerously close to widespread famine [110]. the latest data, demonstrate that the food crisis in Somalia has escalated, with 3.7 million people, representing 22% of the population, facing high levels of acute food insecurity [111]. In September 2022 alone, 68,393 people were displaced due to drought, representing a 31% decrease compared to August 2022. The regions that have seen the newest arrivals of displaced people are Bay (26%), Lower Juba (22%), Gedo (14%), Banadir (11%), and Bakool (11%) [112]. The food crisis in Somalia is far from over and is growing more severe. Nearly 2 million children are at risk of acute malnutrition. Additionally, at least 3.5 million livestock have died, devastating the livelihoods of many Somalis and reducing children's access to vital food sources like milk and meat. Given these dire circumstances, there are serious concerns about the

potential for famine in Somalia [113].

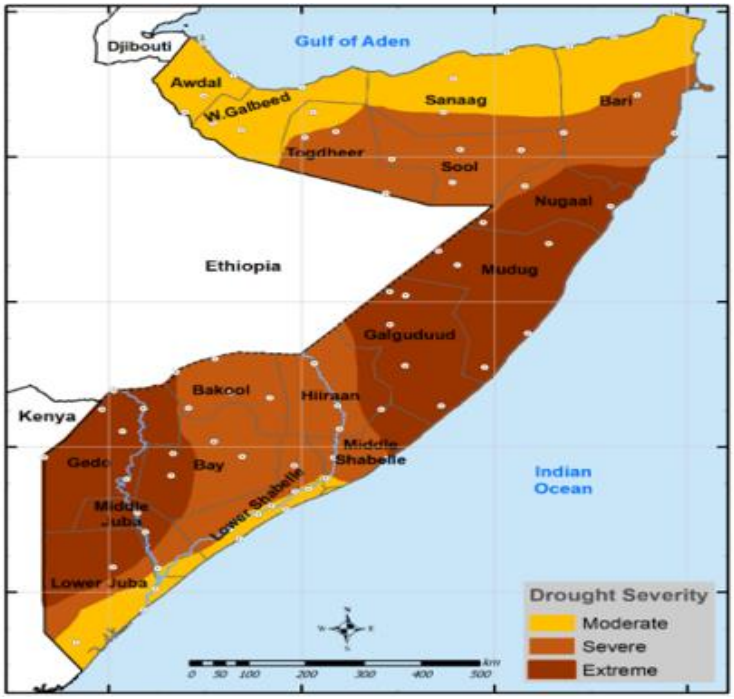

Figure 2: Drought Conditions Map [114]

These droughts led to lower consumption and increased poverty rates, highlighting the critical need for investing in resilience among vulnerable rural communities [115]. Other studies highlight various aspects of how drought affects food security in Somalia. For instance, the ongoing historic droughts, which followed several consecutive failed rainy seasons up to 2022, have led to mass displacement, widespread death of livestock, and a devastating food crisis. This situation is further aggravated by persistent conflict and global economic shocks, severely undermining the water and food security in the region [116]. Additionally, the nutritional surveys conducted in southern Somalia in 2011 assessed the impact of drought combined with insecurity, showing increased malnutrition rates due to crop failures, livestock mortality, and rising cereal prices. This comprehensive analysis underscores the direct consequences of drought on food availability and access [117]. The worsening drought situation in Somalia has led to a severe humanitarian crisis in the country. The lack of rainfall has resulted in widespread water and food shortages, negatively impacting the lives of many Somalis. This crisis is deepening with each passing day, and urgent action is needed to address the growing humanitarian needs of the affected population [118]. The Somali Region has experienced a series of droughts since 1999/2000, with some areas facing three or more years of below-average rainfall.

Food security is essential to prevent famine, which has historically been one of the biggest challenges facing small agricultural countries. Most nations rely heavily on agricultural products and related industries as their primary source of income. The recurrence of severe droughts in the Somali Region has therefore had a profoundly destabilizing effect on the local economy and food supply, threatening the livelihoods and well-being of vulnerable populations who depend on these resources [119]. The combined effects of the drought on agriculture, including rising food and water prices, as well as the disruption to people's livelihoods, have significantly increased levels of food insecurity across Somalia. The cascading impacts of the drought on the agricultural sector and broader economy have contributed to a worsening humanitarian crisis, leaving many Somali households and communities struggling to access sufficient, nutritious food [120].

	BANADIR REGION	BAY REGION	SOMALIA	Reference
Total population (2022)	2.87 million	1.28 million	16.95 million	[122]
Total number of drought-affected people (Jul 2022)	1 million	703,000	7.8 million (47% of the total)	[123]
The proportion of drought-affected people (Jul 2022)	40%	67%	47%	[123]
Total number of people facing acute food insecurity – Crisis (IPC Phase 3) or worse (Jan–Mar 2023 projections)	Approximately 926,330	Approximately 1.07 million	Approximately 6.36 million	[124]
The proportion of the population facing acute food insecurity – IPC 3 or worse (Jan–Mar 2023 projections)	32%	83%	37%	[124]
People experiencing global acute malnutrition (Aug 2022 to Jul 2023 projections)	383,460	214,990	1,785,710	[122]
The proportion of acutely malnourished population under five (Aug 2022 to Jul 2023 projections)	69%	98%	54%	[122]
Absolute poverty rate, 2021	71%	71%	69%	[125]
People internally displaced by drought who departed from the region as of 12/2022	305,000	170,000	1.35 million	[126,127]
People internally displaced by drought who arrived in the region as of 12/2022	3,000	321,000		
The main source of livelihood	Sale of crops, agricultural labor, self-employment	Agricultural labor, pastoralism	Agro-pastoralism	[128,129]

Table 2: Number of People Affected by Drought of Benadir and Bay Regions [121]

2. Conclusion

Food insecurity, exacerbated by recurrent droughts, is highly evident in the country, and its impacts have been well documented. Beyond its immediate impact on health and well-being, food insecurity is linked to broader psychosocial consequences, diminished academic performance, and impaired social skill development [130]. Recurring droughts are the primary driver of this crisis, as they severely disrupt agricultural production, resulting in food shortages and a lack of availability, ultimately threatening the region's overall food security. The cyclical nature of the droughts and their direct contribution to famine conditions is a major driver of the persistent food insecurity challenges. Addressing these challenges through improved water management, the adoption of drought-resistant agricultural practices, and other resilience-building measures is crucial for enhancing long-term food security. Such interventions can also positively influence social, educational, and developmental outcomes for the population. This paper has demonstrated the critical impacts of drought on Somalia's food security, providing a comprehensive understanding of the issue and its far-reaching implications. Further studies are encouraged to explore these effects in greater detail and to identify effective solutions to mitigate the ongoing crisis.

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