



Research Paper

## Effect of Climate Change on Livestock Production in Beletweyn Hiran Region

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### Abstract

This study examines the impact of climate change on livestock production in the Beletweyne district of the Hiran region in Somalia. Climate change is characterized as a substantial change in climate variables, such as temperature, precipitation, and wind patterns. The primary aim is to assess climate change effects on livestock production within a specified area of Beletweyne, Hiran, Somalia. The study set out to (1) ascertain the impact of drought on livestock production, (2) evaluate the consequences of flooding on livestock, and (3) identify coping strategies of Agro-pastoral communities in the Beletweyne district. The study was carried out in a cross-sectional and descriptive design. The 106 respondents were purposely selected. Data collection was performed using a questionnaire method, and the analysis was carried out utilizing the Statistical Package for the Social Sciences (SPSS). The findings include 63% of respondents consider cattle to be the most drought-susceptible species. In terms of the drought's impact, 67% of respondents indicated a loss of milk production as a significant effect on animal productivity. When examining the health effects of flooding on livestock, 59% of respondents highlighted parasite infestation as a key issue. Addressing drought management, 55% of respondents noted that migration is a common strategy among farmers. To combat the effects of flooding, 66% of respondents suggested the construction of man-made channels or levees. The study culminates with recommendations to build local and national capacities for improved climate forecasting and communication, as well as to enhance awareness of climate change and its potential threats, thereby strengthening informed assessment capabilities and response strategies.

**Keywords:** Livestock, Climate, Droughts, Floods

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### I. INTRODUCTION

Climate change has been defined as a significant variation of the mean state of climate-relevant variables such as temperature, precipitation, and wind over some time, mostly to be taken as over 30 years (IPCC., 2007). Global climate change is a major threat facing humanity. According to Intergovernmental Panel on Climate Change (IPCC., 2007) climate change has led to an increase in global average air and ocean temperatures, widespread melting of snow and ice and rising global mean sea level.

One region of the world where the effects of climate change are being felt is particularly Africa. Because of the lack of economic, development, and institutional capacity, African countries are likely to be among the most vulnerable to the impacts of climate change (IPCC., 2007). Climatic data in the region shows that there is subsequent failure of precipitation and recurrent droughts that severely affected livestock production and caused disruption of pastoral livelihoods leading to hunger, malnutrition, insecurity, and migrations (Ketiem, (2009)). The direct impact is felt by Somalia whose economy largely depends on Livestock production reared under pastoral systems. 60% of Somalia are pastoralists who engage in livestock production for employment, livelihood, and employment.

### II. METHODS AND MATERIALS

The methodology for this study was structured to investigate the effects of climate change on livestock production in Beletweyne, Hiran region, Somalia. The research aimed to identify the consequences of drought and flooding on livestock and to understand how the Agro-pastoral communities cope with these challenges. With a targeted population of 145, encompassing a broad spectrum of individuals connected to pastoral life, the

study used a purposive sampling method to select 106 participants. These participants, primarily elders, provided insights via questionnaires. The significance of the study is anchored in its potential to influence policy and interventions for the benefit of nomadic pastoralists and to aid development entities in tailoring their initiatives to the realities on the ground. The design of the study was both descriptive and cross-sectional, capturing a snapshot of the current state of affairs without extending into longitudinal analysis. The choice of Beletweyne as the study area was strategic, given its central role in the Hiran region. The research's utility lies in its potential to shape policy and offer practical recommendations for stakeholders invested in the region's pastoral development.

**III. Results and Discussion, Conclusion and Recommendation.**

**3.1 SECTION A Objective one is to determine the effect of drought on livestock production**

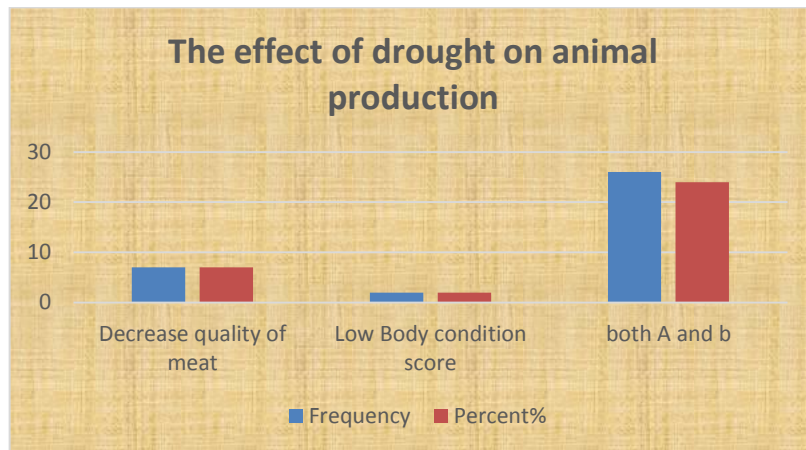
**Table 3.7 How Drought Affects Livestock Feed and Fodder Availability**

How drought affects livestock Feed and Fodder Availability	Frequency	Percent%
lack of forage quantity and quality	88	83.0
increase the price of feed	16	15.1
lack of water availability	2	1.9
Total	106	100.0

The table above indicates that eighty-three percent (83%) of respondents reported that drought affects livestock primarily through the reduced quantity and quality of forage. Fifteen percent (15.1%) of respondents mentioned that drought leads to an increase in feed prices. Furthermore, nearly two percent (1.9%) stated that drought results in a lack of water availability.

**Chart.1 What are the effects of drought on animal production.**

The chart below illustrates that sixty-seven percent (67%) of respondents believe the primary effect of drought on animal production is a decrease in milk production. Additionally, seven percent (7%) of respondents reported a decrease in meat quality because of drought. Two percent (2%) indicated a reduction in body condition score, and twenty-four percent (24%) mentioned both a loss of milk production and meat quality as effects of drought.

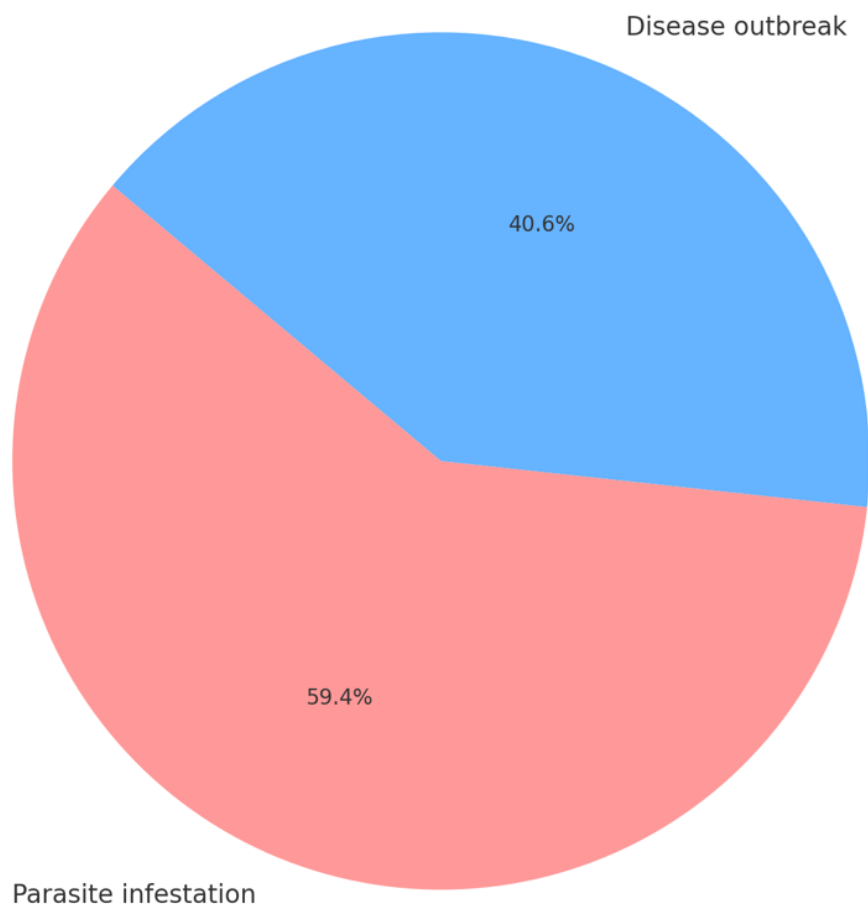


**4.1 SECTION B Objective two is to evaluate the effect of Floods on livestock production.**

**Pie chart 1 What is the health impact of floods on animal production**

The pie chart visualizes the health impacts of floods on animal production: 59.4% of respondents indicated parasite infestation as the main impact, while 40.6% reported disease outbreaks.

### Health Impact of Floods on Animal Production



**Table 4.1.2 What are the impact of floods at the field scale**

The table above indicates that 32.1% of respondents reported that the impact of floods at the field scale includes damage to pastures and grass production. In addition, 36.8% of respondents observed a loss of yield and quality,

The impact of floods at the field scale	Frequency	Percent%
Damage to pastures and grass production	34	32.1
Loss of yield and quality	39	36.8
Damage drainage system and field infrastructure	28	26.4
Loss of beneficial soil invertebrates, Especially Earthworms	5	4.7
Total	106	100.0

while 26.4% cited damage to the drainage system and field infrastructure. Furthermore, 4.7% of respondents noted the loss of beneficial soil invertebrates, particularly earthworms.

#### 4.2 SECTION C objective Three To determine the coping strategies of Agro-pastoral communities in Hiran region.

**Table 4.2.1 How do farmers deal with drought**

How do farmers deal with drought	Frequency	Percent%
Migration	58	54.7
Fodder conservation	31	29.2
Destocking	12	11.4
water trucking	5	4.7
Total	106	100.0

The table above shows that 54.7% of respondents indicated that farmers cope with drought by migrating. Meanwhile, 29.2% reported dealing with drought through fodder conservation, 11.4% by destocking, and 4.7% by water trucking.

**Table 4.2.2 How we can prevent droughts**

How we can prevent droughts	Frequency	Percent%
Avoiding over grazing	36	34.0
Improve water harvesting and storage	59	55.7
Early warning to relocate	4	3.8
Prevention of Deforestation	7	6.5
Total	106	100.0

The table above shows that 34% of respondents indicated that they prevent drought by avoiding overgrazing, while 55.7% said they improve water harvesting and storage as a strategy against drought. Furthermore, 3.8% use early warnings to relocate as a preventative measure and 6.5% implement prevention of deforestation to combat drought.

#### IV. Discussion

In the present study assessing the impact of drought on livestock feed and fodder availability, the majority (83%) of respondents indicated a lack of forage quality and quantity, while 15% noted a high price of feed. Respondents commonly cited a rapid decline in forage quality due to drought because livestock tend to graze the highest quality forage first. This rate of decline in both forage quantity and quality during drought is significantly more pronounced than in an average growing season. Similarly, Thornton (2009) notes that climate change affects livestock production by altering the quantity and quality of available feed, potentially changing species composition of grasslands, affecting forage digestibility, and nutritional quality.

Regarding the impact of drought on livestock production, 67% of respondents mentioned a reduction in milk production, while 7% cited a lack of meat production. This is consistent with Gaughan's (2008) findings that high production animals are more affected by climatic factors, particularly under tropical conditions, due to heat stress, which negatively impacts milk production and composition. Wheelock et al. (2010) and Berman (2005) estimated that environmental heat loads above 35°C activate stress responses in lactating dairy cows, leading to reduced feed intake and energy balance issues, which are primarily responsible for decreased milk production. JW (2003) reported that for every 1°C rise in air temperature above the cow's thermoneutral zone, dry matter intake decreases by 0.85 kg, accounting for about 36% of the drop in milk production (Rhoads et al., 2009). Poor performance in cows, observed through low milk yields, meat yields, calving rates, late age at first calving, and long calving intervals, were attributed to low levels of nutrition and management.

Quantitative and qualitative feeds were limited in the smallholder sector. Natural pastures and crop residues, being the primary feed resources, became scarce during drought due to water shortages. The high cost and unavailability of protein-rich commercial concentrates led to inconsistent and inadequate concentrate supplementation, affecting milk and meat yield.

In terms of the health impact of floods on animal production, 59% of respondents identified parasite infestation as the primary issue, and 41% reported disease outbreaks, with many mentioning fasciola infections affecting mainly sheep and cattle. Animals can suffer from toxic substances in floodwaters, leading to dermatitis, conjunctivitis, or hair loss, and extended standing in water can cause foot/hoof problems, which necessitate vigilance for signs of infection, injury, or lameness.

When examining the impact of floods at the field scale, 37% of respondents reported a loss of crop yield and quality, 32% mentioned damage to pastures and grass production, 26% spoke of damaged drainage systems and field infrastructure, and others pointed out the loss of beneficial soil invertebrates. Floods have severely affected crops, shelters, and critical service infrastructures such as water, health, and nutrition, and educational facilities. According to Akoroda (2004) and Ebisemiju (2008), flooding causes extensive structural and environmental damage, eroding soil and weakening infrastructure, disrupting services, and increasing health hazards due to pollution and waterborne diseases. Olaniran (2007) notes that although river flooding is natural, damage has escalated due to reduced space for rivers and increased population pressure.

Regarding coping strategies for drought among pastoralists, 55% migrate in search of water and feed, 29% rely on fodder conservation, 11% practice destocking, and 5% resort to water trucking. Johnson (1969) identifies the combination of animals herded and the significance of agriculture in a pastoral group's economy as key factors determining migration patterns. Pastoralists have systems of insurance against drought, such as 'lending' animals to relatives or friends, which serves as a basis for restocking after a crisis.

Finally, concerning flood management strategies, 66% of farmers construct man-made channels, while 23% depend on flood forecasting and warnings. Most respondents living in flood-prone areas adopt strategies like channel or levee construction to manage water pressure or runoff, while others focus on flood awareness and early warning systems.

## V. CONCLUSION

The impacts of climate change on agricultural production and livestock are challenging to establish and differentiate from other changes in natural and human environments. Many non-climatic drivers, such as migration, overgrazing of natural pastures, changes in livestock management, and fluctuations in human and livestock populations, are interconnected with the impacts of climate change. Livestock production in Somalia is vulnerable and at high risk of being severely affected by climate change. Therefore, ongoing research, education, and sensitization are essential to adapt to and mitigate the potential effects of climate change at the local, national, and regional levels.

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