

Analysis of Climate Change Impacts on Food Security in Somalia

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Abstract

This study uses a combination of qualitative and quantitative research methods to explore the impact of climate change on food security in Somalia. Data were collected through questionnaires and interviews with a sample size of 80, consisting of farmers, agricultural teachers, students, and environmental workers in the surrounding area. The findings show significant changes in precipitation and temperature leading to land degradation and other environmental challenges, ultimately leading to water shortages and degradation of crops and livestock. Famine is the cause of food insecurity and subsequent flooding in Somalia. Based on the findings, policy interventions are recommended to address food shortages in the country. These interventions should focus on promoting sustainable research and development of food and vegetable crops, facilitating the adaptation and use of appropriate agricultural technologies and being effective, and helping farmers adapt to changing environments. This study highlights the importance of sustainable crop production as a way to reduce high food insecurity in Somalia. In addition, these measures can help reduce the risk of significant developments and communities' exposure to climate risks. The research supports ongoing efforts to maintain a healthier and more stable environment in the country by revealing the specific impacts of climate change on food security in Somalia and providing actionable recommendations. Implementation of this policy is essential to addressing the challenges posed by climate change and ensuring food security for the Somali people in the future.

Key Words: climate change; food security; environmental issues; somalia

Introduction

The weather changes around the world identify the major contributors of greenhouse gases (particularly carbon dioxide, methane, and nitrous oxide) released into the earth's atmosphere from fossil fuel combustion, intensive agriculture, and deforestation. [1] Scientists and researchers agree that climate change has an impact on 36 types of agriculture. As the world experiences population growth, changing diet patterns, and rising incomes, the demand for food is expected to increase in the future. [2] Millions of people's livelihoods and access to food security are likely to be threatened by the negative effects of such climate changes, which might affect almost every sector of the African economy. [3] Over the following decades, climate change is anticipated to have an impact on food security in Africa in addition to population expansion. Undernourishment is still a major issue in Africa, despite the advancements made over the past 25 years, and there is still much room for development. In fact, the area still lags behind the rest of the globe in eradicating chronic hunger. Fighting hunger and attaining food security in Africa continue to be difficult tasks, especially considering climate change, as is the case with achieving food security on a worldwide basis.[4] Almost

all African economies are estimated to be at risk from the adverse effects of this climate change, which affects millions of people's food security and loss of livelihoods. East and South Africa also made some progress, but the central sub-region fell behind on both targets. The number of undernourished people in Central Africa has increased significantly since 1990 due to population growth, and conflict... [5]

In the context of Somalia, agriculture remains the backbone of the Somali economy as it contributes approximately 75% of the GDP and 93% of the country's total income. [6] In fact, according to the Global Development Center based in Somalia, which is one of the safest countries in the world regarding climate change, environmental factors, especially climate change, are the biggest problems. [7] Climate change appears critical to food security in Somalia. The quality and availability of livestock and rain-fed crops are two pillars of jobs and rural livelihoods that are directly affected by climate. Somalia is a semi-arid climate. Only two regions received 400–600 mm of rain - a small region in the northwest and the Shabelle and Juba valleys.

Droughts are common, with mild to moderate droughts occurring every 3–4 years and major droughts occurring every 8–10 years. [8]

On the one hand, the temperature has greatly affected agriculture in Somalia. It increases evaporation and reduces humidity, resulting in drier conditions and no rain. This ultimately reduces the amount of water available in irrigation, resulting in a sharp drop in crop yield. As a result, Somalia has faced drought in recent years that has hampered the development of agriculture. According to the FAO and the World Bank (2018), the 2017 drought caused losses of US\$71 million in four main crops grown in Somalia, US\$35 million in corn and sorghum, US\$9 million, and US\$28 million in cowpea. [9] Flooding, on the other hand, is another form of climate change that degrades crops, destroys property, displaces families and sometimes takes the lives of vulnerable people.

Flooding usually occurs during the rainy season as rainwater overflows from existing waterways. For example, the last flood in 2019 claimed many lives, displaced 412,000 people, and destroyed crops.[10] In addition, Somalia experienced typhoons that reduced soil fertility and thus affected the productivity of farmland. [11] Changes in precipitation patterns, coupled with changes in temperature, can indicate poor growth and subsequently reduce crop production, leading to food shortages and famine after a bad meal. Therefore, the importance of this study is to understand the short and

long side of the process underlying these changes to determine their impact on crop production and food safety.

2. Materials and methods

This study uses descriptive research methods and specifically uses research methods to explore research objectives. The target group includes small farmers engaged in agriculture. Data were collected through structured questionnaires and in-depth interviews, which are the main tools of data collection. The study population includes 100 workers, including ranchers, agricultural lecturers at the Somalia Agricultural University, students, and environmental workers.

A sample size of 80 participants was selected using purposive sampling. This exemplary design allows participants to be selected based on their skills and relevance to the study, ensuring accuracy and knowledge of data collection. The samples consisted of key informants, including 21 farmers, 9 agricultural trainers, 36 students, and 14 environmental workers. These individuals were specifically selected for their knowledge and involvement with agriculture, making them the best people to provide insight into the research topic. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) program. This analysis tool provides a good and rigorous analysis of the collected data, making it easy to organize data, tabulate and calculate relevant frequencies.

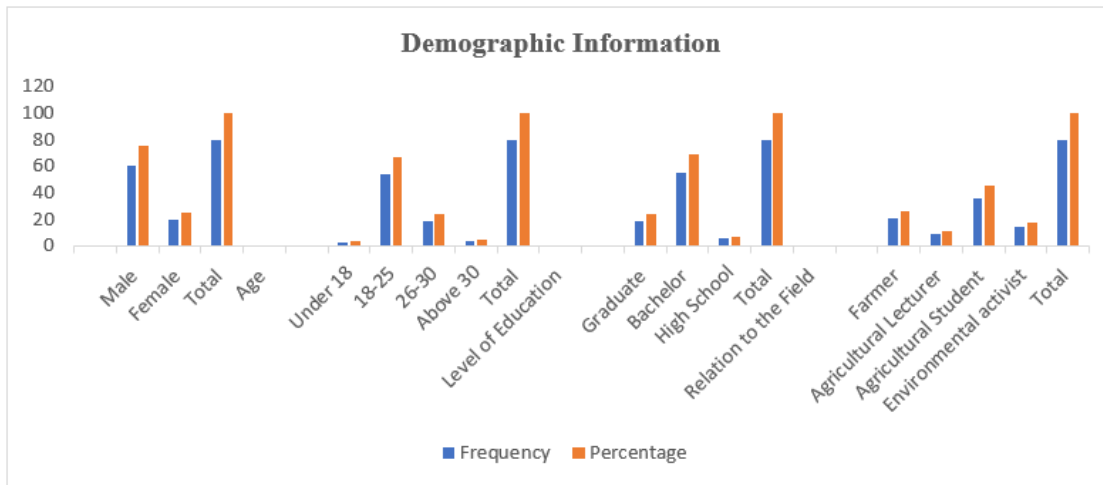


Figure 1: Demographic Information.

3. Results and Discussion

As shown in the above Figure 75% of the majority of respondents were male and 25% were female. This shows that the male Respondents of the study were more than contributed females in the study. In age respondents, 67% agreed at the age of 18–25 Years, while 24% of the respondents are at the age between 26–30 Years, likewise 5% of the respondents are above 30 Years, and 4% of the respondents are under 18 years, thus this points out that majority of the respondents aged between 18–25. According to the above

table, 69% of the majority of respondents were Bachelor holders while 24% of respondents were Graduate students, the minority of respondents 7% were High school level, and none of the participants were non-formal educated as the study emphasizes. The above table explains that 45% majority Contributed were Students 26% of the study respondents were farmers 18% of the study participations were Environmental activists and 11% were lecturers, this means that most occupation of the respondents were students of different levels from different universities in Mogadishu.

Variables	N	Percentage
Perceptions about Changing Rainfall in Somalia		
Irregularity	50	63
Decreased	21	23
Constant	9	11
Perceptions about Temperature Change Somalia		
Increased	52	65

Constant	16	20
Decreased	12	15
Climate change has affected on the performance of rainfed crop production		
Strong agree	22	28
Agree	41	51
Disagree	5	6
Strong disagree	12	15
Climate change results destroyed the potential for livestock production		
Strong agree	22	27
Agree	39	49
Disagree	5	6
Strong disagree	14	18
Farmers in Somalia will need to adapt to inevitable environmental changes and their destructive impacts		
Strong agree	45	56
Agree	19	24
Disagree	8	10
Strong disagree	8	10
Without climate change adaptation policies, the food insecurity situation will continue to worsen		
Strong agree	35	44
Agree	22	27
Disagree	13	16
Strong disagree	10	13
Food security challenges in Somalia are caused by the severe change in weather patterns		
Strong agree	15	19
Agree	36	45
Disagree	18	22
Strong disagree	11	14
Land degradation, exacerbated by climate change and population pressure, is a significant driver of food insecurity in Somalia		
Strong agree	16	20
Agree	40	50
Disagree	18	22
Strong disagree	6	8
Agriculture and livestock production systems get damaged, or annihilated in some cases, it takes a long time to regenerate and recover		
Strongly agree	11	14
Agree	46	57
Disagree	15	19
Strongly disagree	8	10
The most common driver of food insecurity in Somali		
Floods	20	25
Drought	41	51
Lack of climate change adaptation policies.	19	24
* Percentage do not add up to 100%, because of multiple responses		

Table 1: Impacts of Climate Change on Food Security in Somalia

In the study area, the respondents indicated that rainfall patterns have changed. Approximately 63% of the respondents agreed that there is an irregularity in rainfall, while 26% acknowledged a decrease in rainfall. Another 11% reported no change, perceiving a constant level of precipitation. Interestingly, none of the respondents reported an increase in rainfall compared to previous years. Most responses suggesting decreased rainfall pointed to a recent decline. Additionally, the respondents agreed that

water availability is a problem, primarily due to its unpredictability, which has significantly impacted agricultural production.

Regarding temperature, 65% of the respondents agreed that it has increased. In contrast, 20% perceived temperature to be generally constant, and 15% believed it has decreased compared to previous years. Those acknowledging an increase in temperature described a heightened sense of heat compared to the past. They noted that the intensity and pervasiveness of heat have risen both indoors and outdoors. Conversely, those who reported constant

temperature levels did not observe any notable changes, attributing the consistency to the uninterrupted heavy sunshine experienced throughout the region. Some respondents who noted a decrease in temperature attributed it to increased winds, which they believed would lead to fewer hot days. This perception aligns with data from meteorological stations and the World Climate Guide, which indicate relatively stable high temperatures in southern parts of the east coast of Somalia, with variations occurring during specific periods due to trade winds and humidity levels. [12]

The data reveals that 51% of the respondents agreed that climate change has negatively impacted rainfed crop production, while 28% strongly agreed. In contrast, 15% strongly disagreed and 6% disagreed with this statement. These findings indicate that climate change has significantly affected the performance of rainfed crop production, particularly cereal crops that serve as both food and fodder. Similarly, the data demonstrates that climate change has diminished the potential of livestock production. It indicates that 49% of the respondents agreed with the reduction in livestock production, while 27% strongly agreed. Conversely, 16% strongly disagreed, and 6% disagreed with this notion. These findings underscore the detrimental effects of climate change on livestock production. Furthermore, the data support the existence of cointegration among rainfall, temperature, rural population, and livestock production, highlighting the sensitivity of livestock to temperature changes in both the short and long term.

The data from the table reveals that most of the respondents, 56%, strongly agreed that farmers in Somalia need to adapt to inevitable environmental changes and their destructive impacts. Another 24% agreed, while 10% disagreed, and 10% strongly disagreed. This highlights the urgency of implementing climate change adaptation policies in Somalia, given the limited scientific knowledge and research specific to the region. Predictions for the Horn of Africa suggest that the area will face more frequent and extreme droughts and floods, which are already existing hazards in Somalia. These climatic disasters have led to widespread starvation, loss of human life, and livestock deaths. Thus, reducing vulnerability to climate-related risks in critical sectors and communities is crucial. The data also indicates that 44% of the respondents strongly agreed that, without climate change adaptation policies, food insecurity in Somalia will worsen. 27% agreed, 16% disagreed, and 13% strongly disagreed. This emphasizes the importance of implementing effective adaptation strategies to mitigate the worsening food insecurity situation in the country. Moreover, the table highlights the impact of changing weather patterns on food security challenges in Somalia. 45% of the respondents agreed that severe food insecurity is caused by changes in weather patterns, while 19% strongly agreed. Conversely, 22% disagreed, and 14% strongly disagreed. These findings underscore the role of climate change in exacerbating food security challenges.

Additionally, the data from the table indicates that 50% of the respondents agree that land degradation, exacerbated by climate change and population pressure, is a significant driver of food insecurity in Somalia. Furthermore, 20% of the respondents strongly agree, while 22% disagree and 8% strongly disagree regarding the significance of these patterns on food security. These findings underscore the role of land degradation and population pressure as key factors contributing to food insecurity in Somalia. Respondents highlighted that land degradation results from various factors, including extreme weather conditions, particularly drought, and human activities that degrade soil quality and land utility. This degradation negatively impacts food production, livelihoods, and the provision of ecosystem goods and

services, with desertification being a specific form of land degradation where fertile land transforms into desert.

The table also reveals that 57% of the respondents agree and 14% strongly agree that the regeneration and recovery of agriculture and livestock production systems take a significant amount of time. Conversely, 19% of the respondents disagree, and 10% strongly disagree. These findings indicate that the restoration of damaged agriculture and livestock production systems requires a lengthy process. Despite the importance of agriculture and livestock in the battle against climate change, respondents recognize the substantial challenge of recovering these systems after they have been compromised. This emphasizes the complexity and time-consuming nature of restoring agricultural and livestock production following climate-related damage. Furthermore, the respondents from the study area confirmed that drought is the most common driver of food insecurity in Somalia. Approximately 51% of the respondents agreed that drought is the primary driver of food insecurity, while 26% acknowledged floods as the second most common driver. Another 24% of the respondents agreed that the lack of climate change adaptation policies is also a significant driver of food insecurity. These findings highlight the prevalence of drought as the leading cause of food insecurity in Somalia, followed by floods. Respondents reported experiencing food security crises directly resulting from these climatic events.

Overall, the data underscores the complex relationship between climate change, food insecurity, and land degradation in Somalia. Drought emerges as the most significant driver of food insecurity, while the impact of floods and the absence of climate change adaptation policies are also recognized. Additionally, the data emphasize the challenges of land degradation and the time required for the regeneration and recovery of agriculture and livestock production systems following climate-related damage. These findings highlight the urgent need for effective climate change mitigation and adaptation strategies to address food security challenges in Somalia.

Conclusion

The study highlights the significant threat that climate change poses to Somalia, particularly in terms of inter-annual rainfall variation and increasing temperatures. The changing climate patterns have disrupted water resources, impacting agriculture and livestock production. Farmers have experienced declines in crop production due to irregular rainfall and temperature changes. Excessive rainfall has led to flooding, destroying crops, while droughts and long dry seasons have caused severe food insecurity. Livestock production, heavily dependent on natural pastures, suffers from rain failures, resulting in various challenges such as economic losses, malnutrition, and reduced milk output. Staple food crops like maize and sorghum have seen decreased production due to recurrent droughts and hydrological droughts, exacerbating food insecurity. Environmental problems of human origin, including deforestation, hazardous waste dumping, and unsustainable agricultural practices, contribute to land degradation and poor harvests. However, some adaptation measures have been implemented, such as water reservoirs for irrigation during dry seasons and the use of greenhouses, and improved irrigation methods. The study concludes that the decline in crop production in Somalia is closely linked to changes in rainfall patterns and emphasizes the importance of policy support and research and development for sustainable crop production to mitigate food insecurity.

Recommendations

The findings of this research highlight the urgent need for action by various stakeholders to address the challenges posed by climate change in Somalia. The government should prioritize the development and implementation of robust climate change adaptation policies that focus on sustainable agriculture and livestock production. Adequate resources should be allocated to support farmers in adopting climate-smart practices and to enhance their capacity through training programs. Strengthening early warning systems and improving coordination among government agencies is crucial to enhance preparedness and response to climate-related disasters. Non-Governmental Organizations (NGOs) should work closely with local communities and farmers to provide technical support, and capacity-building programs, and advocate for policies that prioritize climate change adaptation and food security. Additionally, farmers themselves should adapt their farming practices by implementing climate-smart techniques and utilizing sustainable land and water management approaches. By implementing these recommendations, stakeholders can collectively contribute to building resilience, reducing food insecurity, and mitigating the adverse impacts of climate change in Somalia.

Additional Declarations:

Conflict of Interest: No competing interests reported.

Statement of Ethics Approval: The research conducted for this study involving human subjects has received the necessary ethical approval. The study protocol and procedures were thoroughly reviewed and approved by the 3rd International Graduate Studies Congress Committee, where the abstract of this study was presented. The ethics committee carefully evaluated the research design, methodology, potential risks, and benefits associated with the study. The committee ensured that the rights and welfare of the participants were protected throughout the research process. Informed consent was obtained from all participants, and their privacy and confidentiality were strictly maintained. The study protocol followed the ethical guidelines and principles outlined by the 3rd International Graduate Studies Congress Committee, as well as relevant national and international regulations governing research involving human participants. We are committed to upholding the highest ethical standards in our research and have taken all necessary measures to ensure the well-being and rights of the participants.

References

1. UNFCCC, (2007). Climate Change: Effects, Vulnerabilities and Adaptation in Developing Countries. Bonn: UNFCCC Secretariat.
2. Ali Warsame, A., Abdukadir Sheik-Ali, I., Mohamed Barre, G., & Ahmed, A. (2021). Examining the Effects of Climate Change and Political Instability on Maize Production in Somalia 2.
3. IPCC, (2007). Climate Change: Effects, Adaptation and Vulnerability. Cambridge: Cambridge University Press.
4. Hall, C., Dawson, T. P., Macdiarmid, J. I., Matthews, R. B., & Smith, P. (2017). The impact of population growth and climate change on food security in Africa: looking ahead to 2050. *International Journal of Agricultural Sustainability*, 15(2), 124–135.
5. Food and Agriculture Organisation of the United Nations [FAO] (2015). The State of Food Insecurity in the World 2015. Meeting the 2015 international hunger targets: taking stock of uneven progress. Rome: Food and Agriculture Organisation of the United Nations.
6. Ali Warsame, A., Abdukadir Sheik-Ali, I., Osman Ali, A., & Asumadu Sarkodie, S. (n.d.). Climate change and crop production nexus in Somalia: empirical evidence from ARDL technique.
7. Tracy C (2017) A climate in crisis- how climate change is making drought and humanitarian disaster worse in East Africa. OXFAM
8. Food-security-and-climate-change-1-1. (n.d.). Prospects of Food and Security in Somalia Under Looming Climate change (November 2021) Heritage Institute.
9. Federal Government of Somalia (2013) Somalia National Adaptation Programme of Action to Climate Change, Ministry of Natural Resources, Mogadishu-Somalia.
10. GIEWS (2020) Country Brief Somalia. Global information and early warning system on food and agriculture Global carbon atlas (2018) Retrieved from Global carbon atlas: <http://www.globalcarbonatlas.org/en/CO2-emissions>
11. Waaben A, Habimana D, Joshi I, Mumuli S (2020) Uncovering the challenges of domestic energy access in the context of weather and climate extremes in Somalia. *Weather Clim Extremes* 27(July 2017):
12. Average weather, temperature, rainfall, when to go, what to pack: Climate- Somalia, World climate guide.



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