

Food Crisis and Global Warming in Africa

Wadah Elsheikh^{1*}, İlknur Uçak², M. Cüneyt Bağdatlı³

¹University of Khartoum, Faculty of Animal Production, Khartoum, Sudan.

²Nigde Ömer Halisdemir University, Faculty of Agricultural Sciences and Technologies, Niğde, Türkiye

³Nigde Ömer Halisdemir University, Faculty of Architecture, Department of City and Regional Planning, Niğde, Türkiye

Abstract

Climate change has already had an influence on global food production; it is expected that the availability of calories has decreased in about half of the food-insecure countries. With the predicted high population growth, this issue will be the primary contributor to widespread food insecurity and undernourishment across Africa, especially in light of the changing global climate. These trends are likely to exacerbate the region's vulnerability to climate change via the economy and food security in Africa. This review aims to verify the relationship between the food crisis and global warming in Africa. Given the reliance of Africa on conventional agriculture, crop yields are predicted to drop under future climatic circumstances, and a new study suggests that yields have already been impacted. Food insecurity is characterized by inadequate food production, availability, and consumption, as well as inadequate food quality or nutritional content, which has been significantly impacted by changes in the world's environment. As a result of the importance of the agricultural sector as a driver for economic development, all governments must assure food security. Climate change-resistant plant types, as well as smart resource management, may help mitigate the effects of climate change and food poverty.

Keywords: *Global Warming, Food Crisis, Food Security, Africa*

Introduction

Climate may be defined as the range of temperature, precipitation, humidity, and winds that are characteristic of a place, area, or the entire planet at any one time. Food supplies, particularly in agriculture, will be disrupted by climate change, which will have an impact on society in developing nations. Agriculture is one of the sectors most at risk from climate change (FAO, 2022). The timing of extreme events, which are anticipated to occur more frequently due to climate change, will have an effect on food security. The repercussions of global warming are being felt everywhere in the world (Elsheikh et al., 2022a). Temperature and precipitation changes, the two most important climate variables and severe events (İstanbuluoğlu et al., 2013; Bağdatlı and Ballı, 2019). Furthermore, it was demonstrated that an ongoing trend of rising temperatures has a negative long-term effect on agricultural productivity (Bağdatlı et al., 2014). A key component of higher crop yield is soil temperature that is matched to a specific growing plant (Bağdatlı and Ballı, 2020). Because of the increase in carbon dioxide emissions, the rate of global warming has accelerated (Bağdatlı and Bellitürk, 2016a). Crop yields and plant growth are decreased by climate change, which also causes drought and land degradation (Elsheikh et al., 2022a).

Food security in Africa has been significantly influenced by climate change. It is obvious that rapid global climate change is having an effect and that there are hazards associated with these changes. Humanity is already being affected by climate change, which is changing the availability of land and water, human health, and most importantly, food security (Tumushabe, 2018). According to the FAO (2006), food security is the ability to receive enough food for each member of the family to live a healthy life in socially acceptable ways, whereas food insecurity is the inability to obtain enough food that is both safe and nutritionally adequate. The world is increasingly concerned about food insecurity, especially in poor countries. This is particularly true for Asia and Africa, where 552 and 226.4 million of the world's undernourished individuals dwell, respectively (Zhou et al., 2019). Ofori et al. (2021) predict that the Horn of Africa's food insecurity will intensify as a result of climate change. Food insecurity in nations that rely on food imports may emerge from climate change's effect on the pricing of important commodities. The amount of food available will be less due to climate change, which will result in higher food costs. Additionally, a serious and growing danger to the region's food security is posed by climate change (Hasegawa et al., 2018, Elsheikh et al., 2022b).

According to the FAO (2019), 1.3 billion people (17%) and 820 million people (or 11% of the world's current population) are both undernourished in terms of energy consumption. They are concentrated in Sub-Saharan Africa (SSA) and Asia. People who are vulnerable and food insecure are predicted to become much more prevalent as a result of the COVID-19 pandemic and climate change, particularly in SSA. Global supply networks are disrupted by the recession, and it will be harder to finance the massive food imports that certain countries, particularly those in SSA (FSIN, 2020). Improved food security will be dependent on the sustainable use and management of



resources, including land and water and water and nutrients, while maintaining planetary boundaries (Bağdatlı and Arslan, 2019).

For sustainable food systems and the use and management of land and water, finding the ideal balance between food and nutritional security, preserving the environment, and tackling climate change remain important issues (Willett et al., 2019).

In a number of studies, agricultural yields in different African nations might fall by up to 50% by 2020, and net crop income could plummet by as much as 90% by 2100 (Mason-D'Croz et al., 2019). The productivity of agriculture is predicted to be further disrupted by rising temperatures (Bağdatlı and Can, 2020; Bağdatlı et al., 2015). The livelihoods of rural residents, long-term food security, and price stability are at risk due to anticipated increases in obstacles, losses in crop yields and quality, and changes in severe occurrences. Within months of one another, floods and droughts can occur in the same region. These occurrences have the potential to cause widespread socioeconomic unrest and hunger. 220 million people in Africa experience drought every year, with one-third of the population living in areas prone to it (Ramin et al., 2009). Various explanations for the present "food crisis" have been put out, including financial speculation, rising demand for grains, export restrictions on certain commodities, insufficient grain reserves, higher oil prices, subpar harvests, and the use of cropland for the development of biofuels (Gregory and Ingram, 2009). Moreover, Millions of people in Africa are also seriously threatened by climate change. This review aims to verify the relationship between the food crisis and global warming in Africa

Food crisis and global warming in Africa

In 2010, 578 million people in the Asia-Pacific area, 239 million in sub-Saharan Africa, 53 million in Latin America and the Caribbean, 37 million in North Africa, and 19 million in industrialized nations were among the world's hungry. These numbers were predicted to climb owing to a second global food crisis in 2011, which was triggered by a significant spike in the price of commodities and food.

The World Bank estimates that between June and December 2010, the rise in food prices caused an additional 44 million people living on less than US\$1.25 per day to slip into severe poverty. As a result, at the beginning of 2011, 1.2 billion individuals were in such circumstances (Sasson, 2012).

Food insecurity is a result of a number of economic, social, and political issues that frequently interact and overlap. The most significant reasons for the financial crisis in Africa are thought to be conflicts, climate change, and economic shocks. In addition to pandemics, poor political choices, and global policies. Since the time of decolonization, Africa has also been troubled by persistent conflict (Dodo, 2020).

Food insecurity has been linked to climate change as a significant factor. Extreme weather patterns brought on by climate change can cause floods from too much rain and droughts from not enough. In Africa, these trends have had a detrimental effect on food harvests and agriculture. In Africa, seasonality has a greater influence on agriculture, animal output, and food poverty due to the consequences of climate change. Because of this, many farmers commonly face decreased agricultural yields, which cause an increase in the price of food (Dodo, 2020; Trudell et al., 2021; Bağdatlı et al., 2023). Due to its effects on the production of food crops, food insecurity is the most frequent consequence of climate change. The demand for food crops is rising in tandem with population growth, but the impact of climate change is working against it, limiting endless small-scale crop production, thus exacerbating the issue of food insecurity. Crop yield and quality are hampered by climate change (Tumushabe et al., 2018). Crop yields are reduced and crop failure is brought on by the degradation of arable land and desertification. A significant amount of agricultural land will be lost due to climate change, which will result in poorer yields and, ultimately, food insecurity (Albut et al., 2018; Smith et al., 2020).

Africa is reliant on imported food and is susceptible to currency devaluations and changes in the value of commodities on the global market. Families are forced by inflation to make smaller food purchases and are only able to afford inexpensive, low-quality food. Due to a decline in commerce, the depreciation of the currency also causes a reduction in job and income opportunities, which ultimately causes a rise in poverty and the inability to buy food. In addition, 60–70% of the continent's workforce is employed in smallholder agriculture, which is a crucial source of labor (United Nations, 2020). There is little doubt that undernourishment remains a significant issue in Africa despite the advancements made over the past 25 years, and there is still much room for improvement. In fact, the area still falls behind of the rest of the world in terms of eradicating chronic hunger. Fighting hunger and attaining food security in Africa continue to be difficult tasks, especially in light of climate change, just as it is with achieving food security on a worldwide basis (Hall et al., 2017).

In fact, according to the World Bank MDG database, Africa not only has the biggest percentage of its people living below the international poverty line, it also saw an increase in this proportion from 47.4% in 1990 to 49% by 2000. Africa must attain an annual GDP growth rate of 7% in order to meet the first MDG (AFDB 2003). However, only 10 of the continent's 37 nations saw their average GDP grow by 5% or more between 1997 and 2003. According to predictions, 42.3% of the population would still be living in poverty by 2015 instead of the objective of 23.7%



because Africa as a whole is expanding at a rate of roughly 3%. Around 65% of Africans depend primarily on agriculture for their living, which also contributes between 30% and 40% of the continent's GDP and nearly 60% of its export revenue. Increased agricultural and rural development will be necessary for Africa to reduce its extreme poverty and hunger (Behnassi et al., 2011).

Over the next few decades, climate change and population expansion are both anticipated to have an impact on food security in Africa. Strong evidence suggests that developing nations will be the ones most affected by climate change. Due to their high rates of poverty, inadequate infrastructure, and little capacity for adaptation, these areas are particularly susceptible to unfavorable climatic conditions. Due to its already high temperatures, heavy reliance on rain-fed agriculture, and fragile economic structure, sub-Saharan Africa is expected to be the worst-affected of all the emerging regions (Ray et al., 2019). Along with the accelerating global climate change, it is especially necessary to assess regional temperatures and analyze the product pattern (Bağdatlı and Arıkan, 2020). Food quality and quantity are expected to vary as a result of climate change and a rapidly expanding population, increasing the strain on the food supply network. Given the close association between climate change and agricultural regions, appropriate climatic conditions can significantly affect the output of whole food crops in these situations (Afreen et al., 2022). The impact of climate change on agriculture in Africa will consequently be the main focus of this section.

Some studies indicate that the areas with the greatest levels of food insecurity were also those where farming practices were anticipated to be significantly altered by climate change. The majority of these regions are in Africa and South Asia, but they could also have an impact on China and Latin America. The lives of hundreds of millions of people who are already poor or very poor will be in danger because these regions' agricultural seasons would be shorter, warmer, and drier in less than 40 years. Through adjusting the crop seasons or grazing lands, farmers have already tried to adapt to climatic changes. But more extreme adaptations would be required given how quickly and widely the climate is changing. Rice and maize yields are impacted by typical maximum temperatures over 30°C, while bean cultivation becomes exceedingly challenging. By 2050, tens of millions of small farmers in sub-Saharan Africa could face this challenge (Sasson, 2012). In the ensuing decades, food security in Africa is anticipated to be impacted by both population expansion and climate change. There is compelling evidence to suggest that the effects of climate change will be most severe in emerging nations. Because of their high rates of poverty, limited capacity for adaptation, and inadequate infrastructure, these areas are particularly susceptible to unfavorable climatic conditions. Sub-Saharan Africa is expected to be the worst affected of all the developing regions because of its already high temperatures, high reliance on rain-fed agriculture, and fragile economy. For instance, just 5% of the farmed land in this area is on irrigated farms (Hall et al., 2017).

The average temperature will rise across Sub-Saharan Africa, though to varying degrees. In particular, an increase in annual mean surface air temperature between 3°C and 4°C over the period 2080–2099 is predicted under a medium to high emissions scenario (IPCC, 2007). Estimates have been made; however, projections for precipitation are less reliable because of the high frequency of spatial and temporal changes. The Mediterranean coast, which includes parts of the northern Sahara and the west coast (to 15°N), is quite likely to have a 20% decline in mean annual rainfall over the years 2080 to 2099. But in tropical and eastern regions, rainfall is probably going to rise by about 7% (Christensen et al., 2007). Food security will be directly impacted by climate change since crop yields, water availability, pest and disease outbreaks, and livestock health will all be affected by changes in temperature and rainfall patterns. According to a study by Knox et al. (2012), this effect will result in a mean yield drop of 17% in wheat, 15% in sorghum, 10% in millet, and 5% in maize across Africa by 2050 due to climate change. There was a significant amount of diversity in the reported impact, but the majority of the evidence assessed for Africa predicted a yield drop of up to 40% across all crop categories and sub-regions. The majority of data in the scientific literature refers to maize. Despite making up 27% of Africa's total cultivated area, rice, sugarcane, and yams account for only 6 of the 162 observations for the continent. According to some studies, the predicted mean yield decrease for West Africa (12.5%) roughly matches the median yield loss of 11% reported by prior research (Roudier et al., 2011).

Despite the seeming abundance of evidence in the scientific literature, there are still significant gaps in our understanding of how climate change will affect certain crops and locations, with Central Africa having by far the fewest estimates of its effects on crop productivity (Knox et al., 2012). Increased food crop productivity, household earnings, and food security may all be indirectly impacted by the rise in precipitation (Bağdatlı and Arslan, 2020). Temperature-related indicators show that agricultural production is negatively impacted by temperature change (Elsheikh and Nasreldin, 2022). This study also demonstrated a direct connection between climate change and food insecurity in the Horn of Africa. According to Smith et al. (2020), a fast changing climate puts a greater strain on the production of food crops. The availability of food for individuals has an impact on production variety.

According to Bedasa et al. (2023), in The Horn Africa countries, their Results show that political stability, food production index, precipitation, cereal yields, and yields were important and had a negative impact on food insecurity. Since all other inputs remain constant, a 1 percent increase in the food production index and political stability leads to a 0.031 percent drop in food insecurity. The findings of Beyene et al. (2022) are supported by



this outcome. Results additionally revealed that a 1% increase in grain yield was associated with a 0.108% decrease in food insecurity. For every 1% increase in precipitation, the rate of food insecurity fell by 0.023 percent.

The potential of Africa's next generation is undermined by the underlying crisis of child malnutrition and under education. Communities residing in secluded parts of the continent are especially affected by food insecurity. The absence of infrastructure and prohibitively high transit costs limit access to markets and utilities. The cost of transportation is higher in Africa when compared to other regions of the world. Due to high transportation expenses, farmers are unable to get their produce to markets at a price that is competitive. High post-harvest agricultural losses are also a result of inadequate storage facilities in rural areas. Farmers find it too expensive to obtain agricultural supplies like seeds and fertilizer (Balogun, 2011).

For the majority of impoverished and vulnerable groups in various countries in Africa, fish is a key source of sustenance. As one of the most traded food items in the area, the industry also employs a large number of men and women. By providing a significant source of cash revenue to pay off foreign debt, supporting the operations of national governments, and importing food for domestic consumption, the fish trade supports economic growth in many developing countries in general and most SSA countries in particular. This helps to ensure national food security and diversify diets. But the region's fisheries are seriously threatened by climate change (Mohammed and Uruguchi, 2013). Physical and biological changes can have an impact on fisheries, including increases in sea level, water salinity, and ocean acidification (Bağdatlı and Bellitürk, 2016b). Biological changes include shifts in primary production and the distribution of fish stocks. As a result of these changes, aquatic flora and fauna's food chains may be disrupted, habitats may be destroyed, food supplies may be depleted, the composition of prey and predators may alter, coastal fish landings may be destroyed, and processing and marketing facilities may be at risk. When these negative effects are coupled, they will negatively affect the resource, which is already under stress, which will lower fish output (Elsheikh et al., 2022a). The livelihoods of many vulnerable fishing communities and the food security of several countries in the region may be threatened by the depletion of fish stocks and the decline in fish production.

Future food production is anticipated to be impacted by climate change. For instance, the most widely consumed cereal crops like sorghum, millet, and maize are all included. The exclusion of starchy roots like yam, cassava, and sweet potato, which are commonly consumed, is a constraint. There is a dearth of information on how other foods will be impacted because the majority of current literature concentrates on how climate change will affect important staple crops (Hall et al., 2017). This study provides a thorough evaluation of the potential effects on crop production for policymakers and practitioners. According to research, not all of Africa's significant agricultural systems have been thoroughly evaluated at the continental level. This study, which is also strongly related to food security in Africa, is intended to bring attention to this crucial issue. And also presenting a thorough analysis of the effects of the climate on crop output in Africa, a continent already afflicted by crises and food insecurity.

Conclusion

Climate change and global warming have a significant impact on food systems, including food supply chains, food habitats, and food systems as a whole. Along the food value chain, these changes have an impact on food production, storage, processing, marketing, availability, promotion, affordability, and quality. On the other hand, global warming has begun to affect food production and yields all around the world. Food security is in danger, especially in arid and semi-arid regions, where it will continue to diminish. Most arid and semiarid countries do not now have good status. These nations are unable to supply the necessary amount of food for their people. Africa had already been identified as one of the continent's most vulnerable to climate change. Because of the population's vulnerability as well as the anticipated warming and rainfall shortfalls, it is anticipated that climate change will have a particularly harmful impact. With decreasing agricultural output, degraded land, high market prices, detrimental effects on livelihoods, and increased malnutrition, the impact on food security will be significant. Before the issue of climate change becomes so serious, a substantial portion of the population in Africa has food insecurity, necessitating more measures to avert this catastrophe. In order to lessen food insecurity and climate change in Africa, it is vital that adaptation techniques be adopted. Furthermore, more research and studies on the effects of climate change on food security in Africa in general and agriculture in particular should be conducted.

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