The Impact of Climate Change on Food Security: A Case Study of Famine in Sahel, West Africa

Aninda Nova Nurfitriani, Natasha Mardiani Alfons Heyden, Aris Fernando Gultom, Safitri Dwi Ananda, Syifa Nur Salsabila
Universitas Pembangunan Nasional "Veteran" Jawa Timur
Email: syifansbilazh@gmail.com

ABSTRACT

Climate change poses a significant threat to global food security, weakening economies and increasing food scarcity. This study examines the specific impacts of climate change on hunger in the Sahel region of West Africa. This research aims to identify how climate change affects agricultural productivity, the availability of air resources, and community migration patterns, as well as initiating adaptation strategies that can increase food security. The Sahel region is facing increasing drought, erratic rainfall, and rising temperatures, which are having a detrimental impact on agriculture, air resources, and food security. These challenges lead to malnutrition, social instability, and changes in migration patterns. There are efforts that must be made to overcome the hunger crisis in the Sahel region. This aims to reduce the higher the rate of hunger and death, if there is no support, people live without sufficient food and nutrition. This study highlights the urgent need for targeted adaptation strategies, such as climate-resilient crops and improved air management, to increase food security. Understanding these impacts is critical to developing effective mitigation strategies. This research uses a qualitative approach with descriptive data analysis. Thus, this research will provide important insights for policy makers and stakeholders in formulating effective solutions to address food challenges in Sahel.

Keywords: *Climate change, Food security, Social inclusion, Sahel.*

INTRODUCTION

Climate Change is one of the major environmental factors exacerbating human conflict, following other factors such as drought, desertification, land degradation, decreased water supply, deforestation, depletion of fisheries resources, and depletion of the ozone layer (Homer-Dixon, 1991). Climate change has become a significant threat to global food security, with increasingly pronounced impacts on economies, social instability and food availability, especially in vulnerable regions such as the Sahel, West Africa. This region, which has long struggled with environmental and social challenges, is now increasingly vulnerable due to rising temperatures, prolonged droughts and erratic rainfall.

The Sahel region's reliance on rain-fed agriculture makes it particularly vulnerable to the negative impacts of climate change. Declining crop yields and water scarcity have not only worsened food security, but also led to widespread malnutrition and increased

mortality. In addition, the pressure on livelihoods due to these climatic conditions has triggered mass migration as people seek more stable areas. This migration, both to neighboring regions and urban centers, puts additional strain on already limited resources and further exacerbates socio-economic conditions.

Addressing the impacts of climate change on food security in the Sahel is critical to reducing long-term risks to human well-being and regional stability. Solutions such as the development of climate-resilient crops, better water management and international cooperation are needed to mitigate the adverse impacts of climate change in the region. Based on the background explanation above, the focus of this research is first, the impact of Climate Change on Food Security globally in the Sahel region. Second, the challenges and impacts of Climate Change faced in the Sahel. Third, solutions to improve Food Security that can be applied in the face of climate change.

Theoretical Foundation

The concept of climate change

Climate change refers to long-term changes in global weather patterns, including increases in Earth's average temperature and changes in precipitation, triggered by human activities such as greenhouse gas emissions and deforestation. Impacts include increased global temperatures, sea level rise, extreme weather and disruptions to food security, especially in vulnerable regions such as Africa. Climate change affects agricultural production, food prices and access to food. Adaptations such as the use of heat-resistant crop varieties and water resource management are essential to deal with its impacts. Global solutions are needed for both mitigation and adaptation, given the scale of this challenge.

The Concept of Food Security

The concept of Food Security refers to several dimensions that have evolved since the Food and Agriculture Conference in 1943. Based on Food Law No.7 of 1996, Food Security is defined as the capacity of individuals, households and countries to gain access to sufficient, safe and nutritious food, both physically and economically, to meet the needs of a healthy life. FAO (1997) emphasized that every household should have stable access to food. Maxwell and Frankenberger define Food Security as guaranteed access to sufficient food at all times. Marzeda Młynarska (2017) identifies four dimensions of Food Security, namely, food availability, economic and social access, stability of access, and maximization of food consumption. Threats to Food Security include natural factors such as soil quality, water availability, and weather changes, economic factors such as food price fluctuations and financial crises, social factors including population growth and urbanization, and the impact of globalization on food production and distribution. Food Security is achieved when all individuals have adequate and safe access to nutritious food to support a healthy and active life.

METHODS

This study uses a qualitative approach with descriptive data analysis to understand the phenomenon in depth related to climate change on food security in the Sahel. Data collected through document analysis and previous research journals, which provide a theoretical basis and strengthen the findings. The use of secondary data allows researchers to compare results with previous studies, identify errors, and provide new contributions. With this approach, it is model that uses data analysis techniques with: data reduction, data presentation, and drawing conclusions and verification. Testing the accuracy of the data is done by data triangulation. This study uses Keynesian theory which emphasizes the important role of government in managing economic activities through fiscal and monetary policies expected that this study will provide a comprehensive and significant understanding in the relevant field. In addition, it can determine the impact and find effective solutions in overcoming food challenges in the Sahel.

RESULT AND DISCUSSION

Climate Change on Food Security in Sahel

Climate change is one of the major concerns today that affects the entire world. Climate change can reduce ongoing progress in global food security through production disruptions that cause local unavailability and increase prices, disrupt transportation routes, and reduce food security. Climate change affects food security by causing changes in the rainy or dry season that are increasing or even erratic. This can affect planting patterns and times in agricultural production and also impact the agricultural sector.

One of the regions most affected by climate change is the Sahel, a region in West Africa. The Sahel is one of the most structurally vulnerable and food insecure regions. In particular, the climate crisis is exacerbating long-standing environmental and ecological crises. Climate change projections indicate that the Sahel will be more severely impacted than other regions in the world by rising temperatures and extreme weather. The Sahel faces a range of interrelated challenges, including high levels of food insecurity and malnutrition, unequal access to basic services, poorly integrated markets, increasing insecurity, an environment threatened by land degradation, recurrent droughts, and erratic rainfall. Due to declining natural resources, declining agricultural productivity, and ecological degradation, many communities in the Sahel are trapped in a cycle of poverty and land degradation.

The risk factors in the Sahel is the dependence on climate-sensitive agricultural and livestock livelihoods. Overuse of water and land will reduce the availability of resources over time, as climate variability constrains agricultural and livestock production. In addition, food prices are increasing while food security is decreasing. This phenomenon

can increase the possibility of collective conflict. The existing challenges can lead to threats that increase deprivation and insecurity for the people of the Sahel.

Sahel needs help from local, national, regional and international responses, which will be very helpful and influential in addressing climate change that affects food security in the Sahel. Despite the challenges, the Sahel holds enormous opportunities. The region has great potential for ecosystem recovery and demographic dividends, and it is very helpful if there is a contribution from the community in helping to manage resources, create social safety nets, maintain and produce, and provide economic opportunities, build the potential to transform food systems, support regional integration, open new markets, show the real meaning and real impact and opportunities needed to develop the Sahel region (World Food Programme, 2024).

Challenges and Impacts Faced by Climate Change in Sahel

In an already semi-arid environment, the Sahel's agricultural lands and pastures have been subject to deforestation and overgrazing, reducing the soil's capacity to retain water and making it vulnerable to soil erosion. The Sahel region is also at the heart of the harsh reality of climate change, with temperatures rising 1.5 times faster than the global average. For the Sahel's people who depend on agriculture and livestock for their livelihoods, this means more severe and frequent droughts and floods. The devastating impacts of climate change in the Sahel are leading to a decline in agriculture and livestock as their main source of income. This calls for mobilizing the international community to commit to effective action on climate change.

1. Ecological and Environmental Challenges

Climate change directly affects natural ecosystems in the Sahel, particularly through rising temperatures, changing rainfall patterns, and land degradation.
-Desertification: One of the most visible impacts of climate change in the Sahel region is desertification. Desertification occurs when fertile soil loses its productivity due to the loss of vegetation cover and the decline in soil quality due to prolonged drought and rising temperatures. Decreased rainfall and soil erosion also accelerate land degradation.
-Water Shortage: Unpredictable rainfall makes water resources increasingly difficult to access. More frequent and severe droughts are exacerbating the problem of water availability for agriculture and basic human needs. The region's rivers and lakes are shrinking, with Lake Chad being a prominent example of a lake that has been shrinking over the past few decades. Biodiversity Decline: Climate change is also impacting biodiversity in the Sahel. The loss of vegetation is causing a decline in the populations of animal species that depend on healthy ecosystems. Many plant and animal species are threatened with extinction or are being displaced to more suitable areas.

2. Economic Challenges

The Sahel economy is heavily dependent on natural resources, especially agriculture and livestock. Therefore, climate change poses serious challenges to the economic sector. Uncertainty in Agriculture: The majority of the Sahel population relies on dryland agriculture, which is heavily affected by changing rainfall patterns. More frequent droughts, soil degradation and erosion make agricultural yields increasingly unpredictable, impacting food security and the incomes of smallholder farmers.
-Declining Livestock Productivity: Many people in the Sahel also rely on livestock. Rising temperatures and water shortages are causing a reduction in pasture, which in turn reduces the availability of fodder. This not only affects animal health, but also impacts local economies that depend on the livestock trade.
-Poverty: Declining productivity in the agriculture and livestock sectors is forcing communities to face economic hardship. This is exacerbating poverty in the Sahel region, which is already one of the poorest in the world. Low per capita incomes and high dependence on agriculture make it difficult for communities to adapt to the impacts of climate change.

3. Social Challenges

Climate change in the Sahel is also having a significant impact on people's social lives.

-Food Security: One of the biggest challenges facing communities in the Sahel is increasing food insecurity. Erratic rainfall, drought, and declining agricultural productivity are leaving many families in the Sahel unable to meet their food needs. Rates of hunger and malnutrition are increasing as climate conditions worsen.
-Migration and Population Displacement: Severe drought and environmental instability are driving many people to leave their villages and cities in search of more livable areas. Both internal and cross-border migration are becoming increasingly common, with many people moving to urban areas or neighboring countries. This migration often exacerbates social tensions in the destination areas.
-Resource Conflicts: Climate change has led to increased conflicts over increasingly scarce resources, such as water and land. Farmers, ranchers, and local communities are often embroiled in disputes over increasingly limited land and water resources. These tensions exacerbate security situations in areas already prone to conflict.

4. Political and Security Challenges

The political and security situation in the Sahel has long been affected by instability, and climate change has exacerbated this.

- Radicalization and Terrorism: Rising poverty, economic instability, and uncertainty caused by climate change have strengthened extremist groups in the Sahel region. Radical groups exploit this situation by recruiting frustrated and hopeless local populations, further worsening the security situation in the region.

- Weak Governance and Lack of Policy Response: Many countries in the Sahel have weak governments and are often unable to provide adequate responses to the challenges of climate change. Fragile political systems, coupled with corruption and internal conflict, hamper the implementation of climate change mitigation and adaptation policies at the national and local levels.

- International Influence and Need for Assistance: As the challenges of climate change grow, the Sahel countries are increasingly dependent on international assistance. Assistance from international agencies and donor countries is often needed to help the region cope with the impacts of climate change. However, this assistance is often insufficient to address the increasingly deep and complex problems.

5. Climate Change Adaptation and Mitigation in Sahel

Although the challenges facing the Sahel region are enormous, there are several adaptation and mitigation efforts underway to reduce the impacts of climate change.
- Green Belt Initiative: One of the most well-known climate change adaptation projects is the "Great Green Wall" in Africa. This initiative aims to plant trees and restore land across the Sahel to prevent desertification and increase environmental resilience. The program involves countries in the Sahel region with the aim of restoring ecosystems and supporting local livelihoods.

-Sustainable Agricultural Technologies: Another effort underway is the adoption of agricultural technologies that are more resilient to climate change. Techniques such as agroforestry, better water management, and planting drought-resistant crops are being introduced to help farmers adapt to changing climate conditions.

-Economic Diversification: One of the important steps taken to reduce the economic impacts of climate change is to encourage economic diversification. Many organizations and governments are working together to help local communities find sources of income other than agriculture, such as handicrafts, tourism, or other small businesses.

-Education and Awareness: Raising public awareness about climate change and the importance of environmental conservation is also part of the adaptation strategy in the Sahel. By educating people about more environmentally friendly farming techniques and sustainable resource management, communities can better cope with the challenges they face.

Solutions to Enhance Food Security in the Sahel

With the alarming issue of food security in the Sahel, efforts are needed to enhance food security in the region. The following are some solutions that can be implemented to improve food security in the Sahel:

1. Climate-Smart Agriculture

Climate-Smart Agriculture or CSA is an approach that guides actions to transform agricultural and food systems toward environmentally friendly practices that are resilient to climate change by utilizing sustainable technologies. CSA has three main objectives: to sustainably increase agricultural productivity and incomes; to adapt and build resilience to climate change; and to reduce and/or eliminate greenhouse gas emissions (Food and Agriculture Organization of the United Nations).

2. Water and Irrigation Management

In efforts to enhance food security in the Sahel, the development of efficient irrigation systems and water management is essential. This can be achieved by integrating affordable technology with local knowledge to help farmers irrigate their agricultural land. The benefits of effective water and irrigation management include reducing irrigation costs, decreasing dependence on climate conditions, increasing farmers' incomes, and improving food security (World Bank Group, 2024).

3. Livelihood Diversification

Diversifying sources of income is one of the strategies to enhance food security in the Sahel. This diversification involves increasing the variety of livelihoods or occupations, rather than focusing on just one or a few aspects. In addition to agricultural activities, other aspects such as livestock (sheep, goats, camels) and other climate-resilient sectors can be pursued even amid climate change. This approach can help reduce dependence on specific climatic conditions (BioMed Central, 2016).

Various international organizations, such as the World Food Programme, the World Bank, and others, have been involved in efforts to enhance food security in the Sahel. Some of the initiatives undertaken by these organizations include providing financial aid, rehabilitating land, developing community infrastructure, promoting education, improving nutrition and health, and creating employment opportunities in Sahelian countries.

CONCLUSION

Climate change threatens world food security, impacting the economy, social stability and food availability, especially in vulnerable regions such as the Sahel of West Africa. The Sahel's reliance on rain-fed agriculture makes it vulnerable to climate change, resulting in reduced harvests, water scarcity, malnutrition, death, and mass migration. Human-induced climate change is resulting in long-term changes in global weather patterns, affecting the earth's temperature, rainfall, the top of the ocean, extreme weather and food security. Adaptations such as heat-resistant plants and water management are very important. Food security ensures that all people have access to nutritious food for healthy living, facing threats from natural, economic, social and

global factors. Qualitative research analyzes the impact of climate change on food security in the Sahel using document analysis and previous studies. Research results show that climate change is affecting agriculture, causing food insecurity, malnutrition, unequal access to services, and environmental threats. The challenges include ecological, economic, social, and political issues, with solutions such as Climate Smart Agriculture, water management, and livelihood diversification to increase food security in the Sahel.

REFERENCES

Amnesty International. Human Rights in Burkina Faso. Retrieved from https://translate.google.com/website?sl=en&tl=id&hl=id&client=srp&u=https://www.amnesty.org/en/location/africa/west-and-central-africa/burkina-faso/report-burkina-faso/

BioMed Central. (2016, December 17). *Toward climate-smart agriculture in West Africa: a review of climate change impacts, adaptation strategies and policy developments for the livestock, fishery and crop production sectors.* Retrieved from Agriculture & Food Security: https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-016-0075-3

Devereux, S., & Edwards, J. (2004). Climate change and food security. IDS BULLETIN, 35(3), 22-30.

Food and Agriculture Organization of the United Nations. *Climate-Smart Agriculture.* Retrieved from https://www.fao.org/climate-smart-agriculture/en/

Gregory, P. J., Ingram, J. S., & Brklacich, M. (2005). Climate change and food security. Philosophical Transactions of the Royal Society B: Biological Sciences, 360(1463), 2139-2148.

Hoegh-Guldberg, O., D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K.L. Ebi, F. Engelbrecht, J. Guiot, Y. Hijioka, S. Mehrotra, A. Payne, S.I. Seneviratne, A. Thomas, R. Warren, and G. Zhou, 2018: Impacts of 1.5Oc Global Warming on Natural and Human Systems. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Portner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Pean, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X.Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.

Kula N, Haines A, Fryatt R. Mengurangi kerentanan terhadap perubahan iklim di Afrika sub-Sahara: perlunya bukti yang lebih baik . PLoS Med 2013; 10 (1):e1001374. Marzęda-Młynarska, K. (2017). Food security governance in the Southeast Asia region: from national to regional governance. Historia i Polityka, 27(20), 31-48.

Maxwell, S. & Smith, M. (1992). Household food security; a conceptual review. In S. Maxwell & T.R. Frankenberger, eds. Household Food Security: Concepts, Indicators, Measurements: A Technical Review. New York and Rome: UNICEF and IFAD.

Maxwell, S. 1996. Food security: a post-modern perspective. Food Policy. 21 (2): 155-170.

Parks BC, Roberts JT. Globalisasi, kerentanan terhadap perubahan iklim, dan ketidakadilan yang dirasakan . Soc Nat Resour 2006; 19 (4):337–355.

Singer, J. D. (1961). The level-of-analysis problem in international relations. World Politics, 14(1), 77-92.

Suharyanto, Heri. 2011. Ketahanan Pangan. jsh Jurnal Sosial Humaniora, Vol 4 No.2

Supriyanto, T. (2014). Analisis tingkat ketahanan pangan rumah tangga tani desa mandiri pangan di kecamatan karanggede kabupaten boyolali.

Tarif, K . & Ovidie, A. (2021). Climate change and violent conflict in Mali. Retrieved from https://translate.google.com/website?sl=en&tl=id&hl=id&client=srp&u=https://www.accord.org.za/analysis/climate-change-and-violent-conflict-in-mali/

World Bank Group. (2024, January 4). *Enhancing Food and Nutrition Security in the Sahel and Horn of Africa.* Retrieved from https://www.worldbank.org/en/results/2024/01/04/enhancing-food-and-nutrition-security-in-the-sahel-and-horn-of-afe-africa

World Bank Group. (2024, March 20). *Bringing forth water to combat food insecurity and climate change in the Sahel.* Retrieved from https://www.worldbank.org/en/news/feature/2024/03/20/afw-bringing-forth-water-to-combat-food-insecurity-and-climate-change-in-the-sahel

World Food Programme. (2024, February). "The Sahel Integrated Resilience Programme & Scale-up 2023-2028 Executive summary - February 2024". Retrieved from www.wfp.org/publications/integrated-resilience-sahel

Yobom, O. (2020). Perubahan Iklim, agriculture and food security in Sahel (Doctoral dissertation, Université Bourgogne Franche-Comté).