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The Impact of Climate Change on SDG 2 in Sub-Saharan Africa

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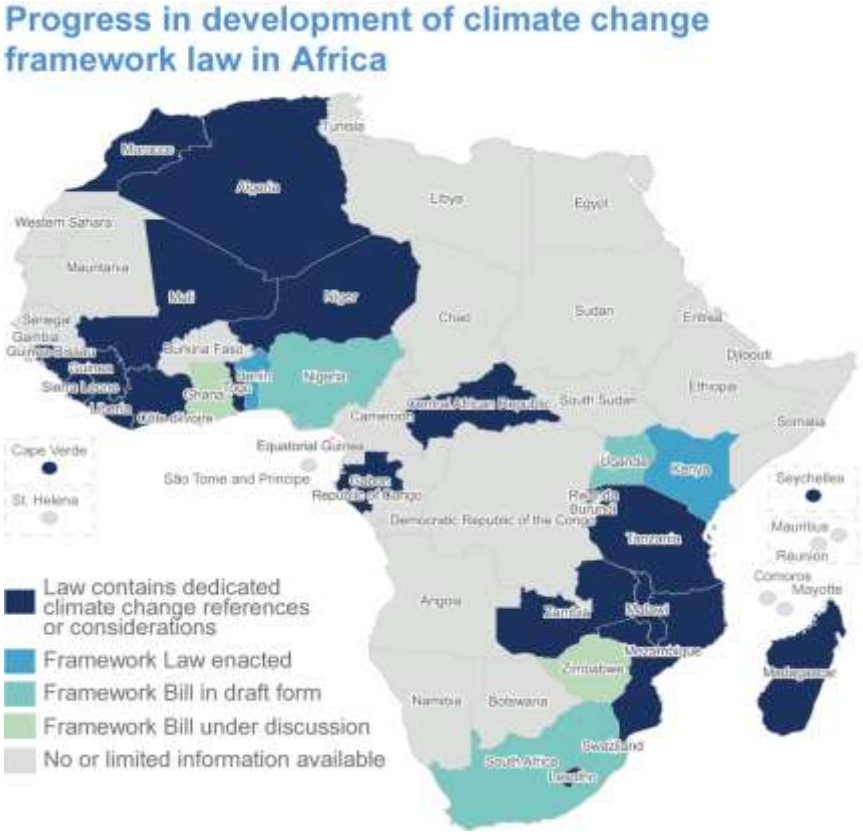
Abstract
Climate change poses a significant threat to the achievement of Sustainable Development Goal 2 (Zero Hunger), particularly in Sub-Saharan Africa, a region heavily reliant on climate-sensitive agriculture. Rising temperatures, erratic rainfall, prolonged droughts, and frequent floods have disrupted food production, reduced crop yields, and heightened food insecurity. This study explores the multifaceted impacts of climate change on food availability, access, and nutrition across the region. It assesses how vulnerable communities, especially smallholder farmers, cope with environmental stressors and evaluates the effectiveness of national and regional policy responses aimed at building climate-resilient food systems. By integrating empirical data, theoretical frameworks, and policy analysis, the research identifies critical challenges and adaptation pathways necessary for sustainable agricultural development. The findings underscore the urgent need for targeted interventions, inclusive governance, and climate-smart agricultural practices to accelerate progress toward SDG 2 in Sub-Saharan Africa and safeguard food security for future generations.
Keywords: *Climate Change, Food Security, Sub-Saharan Africa, Sustainable Agriculture, Smallholder Farmers, SDG 2 (Zero Hunger)*

1. INTRODUCTION

Climate change, especially in Sub-Saharan Africa, poses the greatest threat to achieving Sustainable Development Goal 2 (SDG 2), which aims to eliminate hunger, ensure food security, and end malnutrition, as well as improve sustainable agriculture. Popularly associated with a significant reliance on rain-fed farming culture and a strong manifestation of poverty, such a location is exceptionally vulnerable to climate shocks. Extreme temperatures, changes in rainfall patterns, frequent droughts, and climate impacts are some of the causes that have negatively impacted agricultural outputs, affecting food supply and access to food for rural and urban populations.The impacts of climate variability due to its effects on agriculture do not only include food insecurity; this is also coupled with malnutrition, loss of livelihoods, migration, and social unrest since agriculture is a major source of livelihood of most people in Sub-Saharan Africa. The smallholder farmers who constitute the major strength of food producers in the areas, may usually have no such resources and infrastructure, or institutional backup to make the necessary adjustments to these environmental transformations. Although there are various global and regional policies frameworks, e.g. the Paris Agreement, African Union Comprehensive Africa Agriculture Development Programme (CAADP) and in individual countries adaptation plans, there is no concrete movement on food security due to gaps of implementation. In addition, women inequality, ineffective governance, financial insufficiency as well as technology and skimpy agricultural worth chains are added reasons to the obstacles experienced in the attainment of SDG 2. The present study sleuths the intertwining connection between climate change and SDG 2 in Sub-Saharan Africa, and how environmental stressors impact the food systems, the measures that communities have adopted to cope with this phenomenon, and the available policy responses. With the knowledge background based on the multidisciplinary and combining approaches to climate science, development theory, and food systems analysis, the study is expected to develop recommendations regarding the ways to overcome the barriers to progress and build sustainable and equitable food systems. This study demonstrates the reaction to urgency and magnitude of the issue, the necessity to develop coordinated, inclusive, climate-smart response that would be tied both to the local context and development aspirations of the world. Delivery

of SDG 2 in Sub-Saharan Africa can only be achieved through a shift in transformation to determine the manner in which food systems in the region are governed, maintained, and supported in the era of changing climate.



1.1 Background of the Study

Given the rising climate change, sub-Saharan Africa encounters an increasing concern of attaining Sustainable Development Goal 2 (Zero Hunger). The food systems and economy of the region are mainly agrarian, and thus most citizens rely on rain-fed agriculture as their livelihood and source of food. Nonetheless, changing weather conditions, unpredictable rainfall patterns, long dry spells and common floods have severely decreased the productivity in agriculture, altered the pathway of food distribution and exposed the people to the risks of hunger and malnutrition. These climatic changes have impacted more on smallholder farmers that do not even have access to climate resistant technologies, infrastructures and finance. Although the world has responded to the promise to enhance food security, with the claims and counters thereof in various outfits, including the different regions around the globe, the trend has not been equal, with the asymmetric inequality frustrating the process of attaining food security especially driven by socioeconomic disparities, poor governance, and lack of adaptivemetry. With food insecurity increasing throughout the region, it becomes more imperative to know the relation between climate change and SDG 2. In this research, I examine, the effects of climatic dynamics on food systems in Sub-Saharan Africa and determine possible approaches to establishing resilience and long-term sustainable agricultural planning and development.

2. LITERATURE REVIEW

Dickerson, S., et al (2022). An evaluation of literature on threats of climate change to human development in the Sub-Saharan Africa region shows a highly intertwining crisis in the areas of health, education, livelihoods, and food security. The inability of the region to depend on any other sector runs contrary to sensitivity to climatic change owing to its reliance on agriculture and weak institutional capacity, poverty levels and an insufficiency of infrastructure make the region vulnerable. Research reports repeatedly indicate that any increasing temperatures, unpredictable rains, and episodes of frequent violent

weather phenomena, including droughts and floods, not only jeopardize the crop production but also interfere with education, health, and job opportunities. Children and women are overrepresented, and climate shocks increase malnutrition, school dropout rates, and health hazards through water-borne diseases and through vectors-borne diseases.

Li, Q., & Samimi, C. (2022). International migration of Sub-Saharan Africa which seems to be mainly in tandem with the climatic stressors of droughts, land degradation and food insecurity being a basis of the increased migration poses a great challenge to the sustainable development of this region. With a worsening environment, there will be high levels of migration, most especially among the young people due to improved livelihood, access to education and security. Although migration may allow remittances to alleviate the situation in the medium term, the net effect of it, typically in the long term, is a depletion of human capital, particularly in the agriculture and rural economies, which are already vulnerable due to climate change.

Adesete, A. A., et al (2022). Effect of climate change on food security in the entrant Sub-Saharan African countries chosen (including Ethiopia, Kenya, Malawi, Nigeria and Burkina Faso), climate change is a substantial concern to food security because agriculture in these countries is mostly rain-fed with a very low tolerance level to climatic variability. Increase in temperature, late or irregular rainfall, extended droughts and floods have contributed to decline in crop production, death of livestock and planting and harvesting patterns. Drought often leaks maize production in Ethiopia and Kenya, the sorghum and millet production in Malawi and Burkina Faso has become insecure because of the scarcity and erosion of water and soil. In Nigeria, the flood destroys farmlands and stores despite better distributions of rain in certain areas. These weather pressures have led to increased food insecurity, malnutrition and food aid dependence. With the inability of smallholder farmers to adopt, resilience is further inhibited by the shortage of infrastructure, access to finances, and proper policy enactment. To deal with climate-related food insecurity, it is necessary to implement specific measures, climate-smart approaches and assistive governance.

Ofori, S. A, et al (2021). The interrelation between land degradation, lack of water and food insecurity in Sub-Saharan Africa has been fostered by the climate change in the region and the development of the area is seriously at stake. With the increasing temperature and the more unpredictable rains, the fertile land is being washed away by soil erosion, desertification and poor farming techniques that are affecting the land very rapidly. The water resources which were already unevenly distributed are subjected to severe pressure of protracted droughts, reduced rivers and competition among agricultural, domestic and industrial demands. This change to the environment has a direct opposite impact on food production especially in small-holder farming systems which depend on rain-fed farming.

Omisore, A. G. (2018). The success of Sustainable Development Goals (SDGs) in Sub-Saharan Africa is deeply associated with capabilities of confronting the urgent environmental problems of the region. Climate change, land degradation, deforestation, water scarcity, and biodiversity losses are hurting the work in various SDGs, especially poverty-related (SDG 1), zero-hunger (SDG 2), health (SDG 3), and clean-water SDG (SDG 6). Degradation of the environment does not only jeopardise food and water security, it is a contributor to displacement, outbreaks of diseases and economic weakness. In as much as there exist policy frameworks that are geared towards the promotion of sustainability, implementation is lacking due to low institutional capacity and limited funds, as well as socio-political instability. Unless environmental protection becomes a priority, and climate resilience is incorporated in national development strategies, the goal of implementing the SDGs may not be reached. Adaptive governance structure, investment in transformative green technologies, elective-based maintenance of the environment and community-based management of the environment are desperately needed to make development inclusive and eco-friendly in the case of Sub-Saharan Africa.

3. Climate Change Pathways Affecting SDG 2

Climate change contributes greatly to the underachievement of Sustainable Development Goal 2 (Zero Hunger) with several inter-related routes channeled to destroy food systems in Sub-Saharan Africa. The most notable and imminent impacts include extreme weather outcomes that entail extreme droughts, excessive floods, and even more unpredictable patterns of rainfall. These climatic shocks result in crop

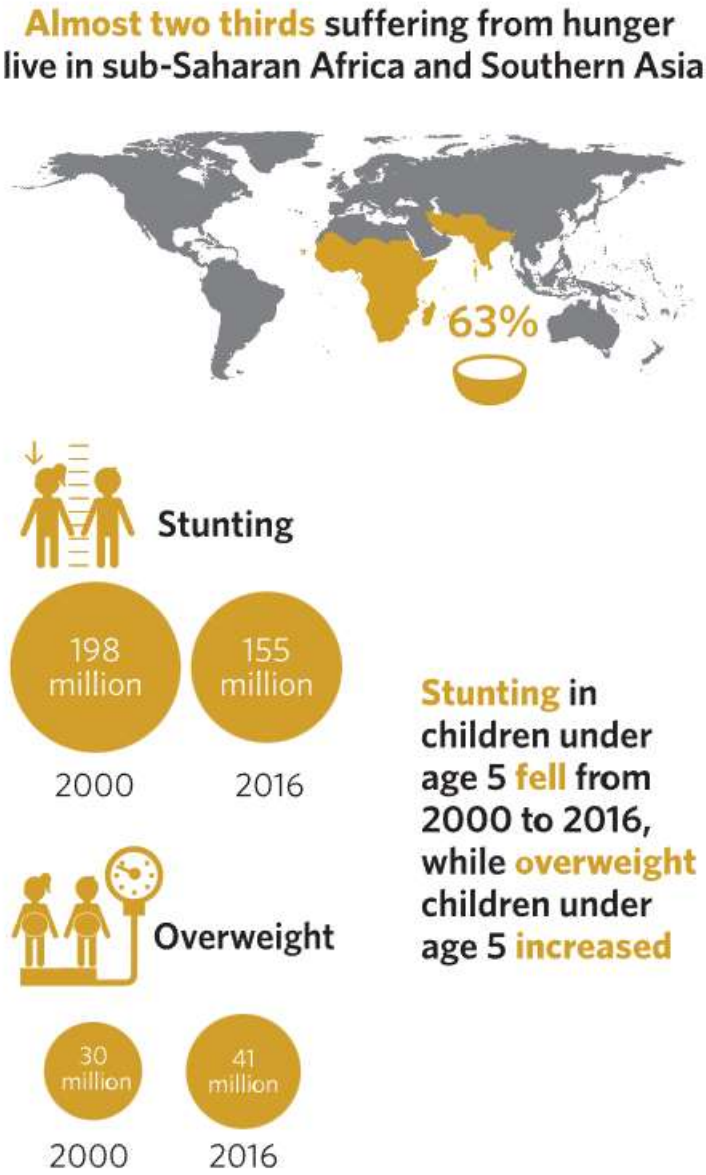
failure, limited water to irrigate crops, deaths of livestock and general uncertainty in agricultural yields. Droughts cause a decrease in the amount of soil moisture and crops growing period, and floods wash away seedlings and destroy farmlands, topsoil, as well as infrastructure including roads, storage facilities, and irrigation networks, which all increase food insecurity. Floods and droughts aggravate the decimal there would be copious rainfall where capital would be more on the agricultural sector which would have maximized the harvest in those areas where once there is no rainfall there would be risk on the part of those farmers who would be putting a guess that more water would be lying around. On a parallel note, depletion of fertile lands, adverse soil organic matter, and agricultural potential have occurred because of increasing temperatures, deforestation, over-grazing, and poor land conditions that have resulted in soil degradation and desertification. Vast tracts of agricultural land in places such as Sahel are becoming dry and inhospitable, not only reducing amounts of food available, but also the ability of the rural population to earn livelihoods based on crop and livestock production.

Adding to these pressures is the rising cases of crop pests and diseases associated with warmer climate and changes in the ecological environment. The increased levels of heat enable the spread of pests like the fall armyworms and locusts, as well as plant and livestock diseases, to new areas and even to last longer in the season destroying major crops such as maize, millet, and sorghum. Such infestations may destroy whole harvests in a matter of weeks leaving a community before the threat of starvation. Moreover, several of such effects are delivered simultaneously or sequentially generating combined shocks that a local coping system cannot handle. An example is that the consecutive losses due to drought and the subsequent pest attacks or floods at the harvest time may be beyond the adaptive capacity of a community. These routes show that climate change destabilizes all dimensions of food security which include availability, access, utilization, and stability, and this way, countries in Sub-Saharan Africa are unable to achieve SDG 2 goals. Until there are timely and co-ordinated efforts that emphasize climate adaptation, sustainable land use, early warning systems, and resilient agricultural practises, the region continues to be at a high risk of deepening food crises. These identified pathways have led to the need to understand and address them to create policy and program design that will not only mitigate the negative impact of the changing climate but also find solutions to ensure resiliency in these food systems in the long term in the continent.

3.1 Global Policy Frameworks Addressing Climate Change and Hunger

Climate change and hunger are two phenomena that have developed an inter-related concern in the last 20 years, which have led to a more global reaction and the acknowledgement of a need to have an environmentally friendly food system in place. The United Nations Framework Convention on Climate Change (UNFCCC) is the main platform that informs the climate policy and talks. The crucial Paris agreement in 2015 under UNFCCC amongst the members pledged to keep the global averagely warm to below 2C with an aspire target of below 1.5C. The association between climate resilience and food security is highlighted in one of the major provisions of the agreement because the development is enhanced via novel climate-resilient approaches in geographical areas such as Sub-Saharan Africa where the highest levels of vulnerabilities are exercised.

Africa has initiated region-specific policies in addition to global climate initiatives, especially the Comprehensive Africa Agriculture Development Programme (CAADP) which the African Union launched in 2003. CAADP accentuates climate-smart agricultural practice, investment in research studies in agriculture as well as transnational policy framework. In this plan, the purpose is to increase the production in tackling the environmental problems facing the African countries in the fight against hunger and climate change.



3.2 Institutional Support, Financing, and Implementation Challenges

In a more attempt to bring together climate solutions and hunger solutions, the international organisations have associated their efforts to the Sustainable Development Goals (SDGs), more specifically SDG 2, Zero hunger, and SDG 13, Climate action, as the most relevant to the climate and hunger predicament after the first goals. The UN agencies, such as the Food and Agriculture Organisation (FAO), World Food Programme (WFP), and International Fund for Agricultural Development (IFAD), have introduced such measures as Climate-Smart Agriculture (CSA) to help smallholder farmers resist man-made and natural challenges. Also, there will be more funding vehicles such as the Green Climate Fund (GCF) and Adaptation fund which are important resources to the agricultural mitigation and adaptation.

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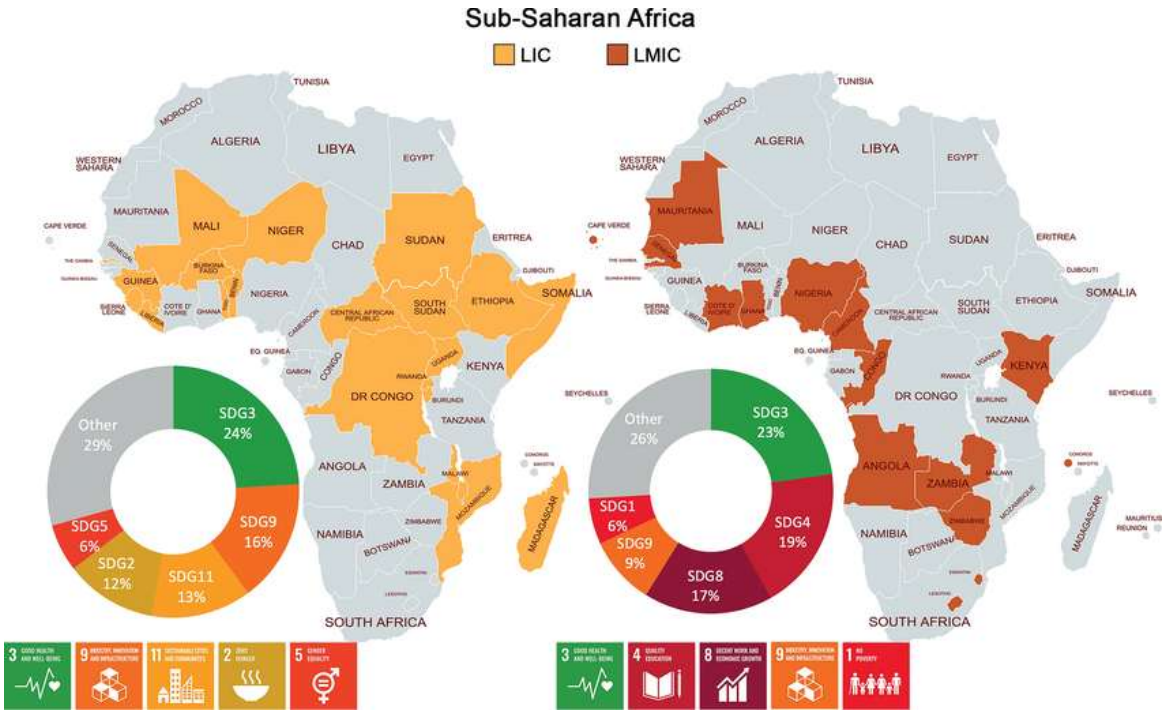

These efforts are reinforced bilaterally and multilaterally by actors (e.g., the World Bank, the Global Alliance for Climate-Smart Agriculture (GACSA)) that foster infrastructure development, innovation, and knowledge transfer. Nevertheless, these grand plans continue to be challenged by lack of funds and proper institutional capacity as well as coordination of activities and plans at national levels. Nevertheless, the world is uniting on the notion of bringing climate and hunger together despite these obstacles. Their long-term adoption at national level is crucial in transforming towards sustainable food systems and ensuring long-term resilience, especially, in Sub-Saharan Africa.

4. METHODOLOGY

The current study embraced mixed methods approach to the examination of the impact of climate change on the Sustainable Development Goal 2 (Zero Hunger) in Sub-Saharan Africa. Secondary sources employed in collection of quantitative data include: reports of Food and Agriculture Organization (FAO), World bank, Intergovernmental panel on climate change (IPCC) and national statistical agencies where the climate trends, agricultural yields and indicators of food security have been collected between 2005 and 2024. Some of their variables of interest included the variation in temperature, rainfall deviation, the percentage of the crop yields and the rate of undernourishment and the prevalence of the stunted children. Also, qualitative information was acquired by carrying out a systematic search of peer-reviewed journals, policy statements, and international guidelines to include the Paris Agreement and CAADP. Other contextual depth was brought in through case studies of different countries (e.g. Ethiopia, Nigeria, Kenya, Malawi and Burkina Faso) included in the study. To determine the trends and connections between climate variables and the SDG 2 indicators, analytical tools like comparative analysis, and interpretation of trends was utilized. A combination of these forms of data allowed developing a complex vision of climate-food system dynamics and an informing suggestion towards adaptive policy and practice. The methodology of this process provides both evidence-based and reality grounded research on the agricultural and climatic complexities of Sub-Saharan Africa.

5. RESULT AND DISCUSSION

Table 1: Climate Variables and Agricultural Output Trends by Country (2005–2025)

Country	Avg. Temp Increase (°C)	Rainfall Deviation (%)	Main Crop Affected	Yield Change (%)	Food Insecurity Rate (%)

Ethiopia	+1.2	-15	Maize	-18	35.4
Nigeria	+1.5	+10	Cassava	-10	28.7
Kenya	+0.9	-8	Maize	-12	32.1
Malawi	+1.3	-20	Sorghum	-22	41.5
Burkina Faso	+1.7	-25	Millet	-25	45.0

Table 1 shows the correlation between the changing climatic variables and agricultural output of any of the five countries in Sub-Saharan Africa between 2005 and 2025. It also focuses on the effects of the increasing temperature and change in rainfalls on key staple foods, making them unproductive and increasing food insecurity. In Ethiopia, temperature rose by 1.2C and rainfall decreased by 15%, hence a 18 percent decrease in maize production and food insecurity level of 35.4 percent. There was a 1.5 degree increase in Nigeria coupled with a rise in rainfall by 10 per cent and cassava yields decreased by 10 per cent, and the food insecure population was 28.7 per cent. Mild warming (+0.9 C) and less rainfall caused Kenya to decline in production of maize by 12 percent. Both Malawi and Burkina Faso, which are very climate-vulnerable, recorded severe rainfall shortages and higher temperature fluctuations, which resulted in huge losses in sorghum and millet yields and the daddy food insecurity levels of 41.5% and 45.0%, respectively. The fact is highlighted by the data showing that climate stressors directly negatively impact the achievement of SDG 2 in the region.

Table 2: Frequency of Climate Events and Agricultural Losses (2010–2024)

Year	Drought Incidents	Flood Events	Area Affected (ha)	Estimated Crop Loss (USD)	Livelihoods Affected
2010	5	2	800,000	$120 million	2.1 million
2015	7	4	1.2 million	$180 million	3.4 million
2020	9	6	1.6 million	$250 million	4.7 million
2024	11	7	2.1 million	$310 million	5.6 million

Table 2 depicts an increasing tendency in the rate and social impacts of the climatic phenomenon-related events, namely droughts, and floods, in the years 2010 to 2024 and their growing agricultural and livelihood effects in the Sub-Saharan Africa. Within this 14-year analysis period, the number of droughts increased by over 100 percent, starting at 5 occurrences in 2010 to 11 occurrences situation in 2024, and floods rose by 400 percent, starting at 2 floods incidences in 2010 to new levels of 7 incidences in 2024. The present impact of extreme weather events is an area under drought that has grown tremendously by an amount that was 800,000 hectares in 2010 and now is 2.1 million hectares by 2024. In line with this, projected crop losses also increased by 260 percent, where initially it was at $120 million and now it is at 310 million, yet another indicator of not only an increase in the frequency of climatic shocks, but also in their intensity. The livelihoods at risk increased to 5.6 million as against 2.1 million, the agricultural dependants in the rural areas are exposed. This information underlines the necessity of evolutionary measures, warning programs, and weather-proof infrastructure to prevent the increasing threats and protect the food safety of the area.

Table 3: SDG 2 Progress Indicators vs. Climate Resilience Measures

Indicator	2010 Value	2020 Value	2024 Value	Related Adaptation Policy	Status
% Undernourished Population	28.5%	25.1%	29.3%	National Resilience Plan	Active
% Stunted Children (<5)	35.2%	30.6%	32.4%	School Feeding Program	Partial

Crop Insurance Coverage (%)	4.1%	6.8%	9.5%	Index-Based Insurance	Active
Access to Irrigation (%)	8.7%	10.3%	11.2%	Smart Irrigation Project	Limited

Table 3 compares major SDG 2 indicators of progress and the status of conducting climate resilience measures in 2010-2024. Although there is at first some improvement in food security and nutrition by 2020, a decline is visible by 2024, especially because of worsening climate conditions. The proportion of population undernourished in 2010 was 28.5% which declined to 25.1% in 2020 and increased to 29.3 in 2024, even after the National Resilience Plan was launched. In the same manner, child stunting rates improved to 30.6% in 2020, but, nevertheless, recovered to 32.4% in 2024, which demonstrates that School Feeding Program does not achieve full success, despite being helpful. On the contrary, other measures to enhance climate resilience, which include crop insurance and access to irrigation systems, are making a slow but tangible improvement. The crop insurance coverage rose to 9.5 percent compared to 4.1 percent with the irrigation access rising to 11.2 percent compared to 8.7 percent. Their scope however is limited and incomplete due to poor reach. The table provides an insight into how more and bigger adaptation policies need to be implemented to maintain steady improvement of food security in the face of climate adversity.

6. CONCLUSION

Climate change effects on the Sustainable Development Goal 2 (Zero Hunger) in the Sub- Saharan Africa are severe, multidimensional, and growing alarming. The paper has established that increasing temperature, rain, pools of severe drought, floods and similar environmental dynamics related to climate change are notably jeopardizing food production, distribution, availability and access in the region. Such climatic upheavals hit smallholder farmers disproportionately due to the absence of adaptive capacity, infrastructure as well as institutional support to manage the rising challenges. Even though there are many international and regional frameworks such as the UNFCCC, the Paris Agreement, and CAADP, which seek to incorporate climate resilience into agriculture and food security policies, the implementation has been chaotic,and, in many instances, it has been limited by limited implementation, lack of finances, and delays in governances. Previously improving food insecurity and child malnutrition is on the increase again, indicating that current efforts on adaptation are not sufficient to react to an increased number of climate stresses. The facts reinforce the call to a paradigm transformation of climate-smart agriculture, greater policy consistency, and participatory governance with empowering the local communities, in particular the smallholder farmers and vulnerable populations. Sustained progress requires enhancing early warning systems, investing in resilient infrastructure, enlarging crop insurance and intensifying the proven interventions, such as school feeding and irrigation schemes. Long and shorter-term strategies that can match agricultural development with sustainability will be necessary to meet SDG 2 in Sub-Saharan Africa beyond providing timely climate action. Only multilateral efforts and effective policies on the national level can help the region to preserve food systems, sustain livelihoods, and achieve significant progress in overcoming hunger under the conditions of climate change.

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