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CLIMATE CHANGE ON FOOD SECURITY IN IGBILE COMMUNITY, OGUN STATE, NIGERIA: EFFECTS AND ADAPTATION STRATEGIES

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ABSTRACT

The study examines how climate impacts food security in developing countries, particularly the Igbile community in Ogun, Nigeria. This paper evaluates the negative impacts of climate change on food productivity and security in the Igbile community and aims to understand adaptation strategies to alleviate these impacts. Climate change has the potential to disrupt advancements towards a hunger-free world. A clear and strong worldwide trend can be identified regarding how climate change affects food security, which could impact food availability. Major impacts have been recognized, such as decreased agricultural output, alterations in land viability for crops, shifts in rain patterns, and warmer temperatures that could create longer growing periods, heightened irrigation needs, and shifts in planting and harvesting schedules, etc. A significant shift is required to establish a climate-resilient food system that can better endure climate challenges. This involves creating crops that can withstand drought and high temperatures or implementing new tillage methods to minimize carbon emissions from soil, but we must also make sure that all trade, investment, and development strategies prioritize climate-resilient food production.
Keywords: Climate change, Food security, Effects, Adaptation strategies, Igbile community

I. INTRODUCTION

Climate change has the potential to disrupt advancements towards achieving a hunger-free world. A clear and strong worldwide pattern is emerging regarding how climate change affects crop productivity, which could impact food availability. Short-term fluctuations in supply due to climate change could jeopardize the stability of entire food systems. Nevertheless, the potential consequences are not as well understood on a regional level, but climate fluctuations and shifts will probably worsen food insecurity in regions that are already susceptible to hunger and malnourishment [1]. Similarly, it is expected that food availability and consumption might be influenced indirectly by the impact on household finances, and food consumption could also be hindered by a lack of access to clean water and health issues. The proof justifies the necessity for significant funding in measures for adapting and reducing the effects of climate change on food security, aiming for a "climate-smart food system" that is better able to withstand these influences [2]. Food security, like climate change, is a complex matter with many different aspects. Various factors, including climate, weather, oil prices, trade policies, social policies, global politics, and population growth, all impact it [2].

According to the United Nations' Food and Agriculture Organization, food security is when all individuals can consistently obtain sufficient, safe, and nourishing good food and satisfy their desires for a healthy and productive life. Ericksen et al. [3] Stated that food security relies on four critical elements: adequate and reliable food supply; accessibility and affordability of food; proper utilization of food with nutritional awareness; and ensuring stability in food supply, access, and utilization. Food security has been a central point of discussion in talks concerning sustainable development. Despite efforts to reduce insufficient nutrition through the Millennium Development Goal (MDG), food insecurity persists, especially in developing nations [3].

Still, it was calculated that more than 2 billion Still, it was calculated that more than 2 billion individuals lack adequate food security, which includes 8% of the populations in developed regions like North America and Europe when factoring in those affected by moderate food insecurity. Bad food is a result of the malfunctioning global food system, which is facing multiple challenges like climate change. Certainly, FAO et al. [4] assert that climate change will have adverse impacts on food security in all aspects through its effects on agriculture. Although food security may be impacted by various factors, such as extreme weather events leading to decreased urban residents' income and food access, agriculture remains a significant pathway through which climate change influences food security. Climate change impacts the natural resources utilized in agricultural production, such as water and land [5]. Climate change (CC) is not only a threat to agriculture and food security but also a major challenge that humanity is currently facing [6]. It plays a key role in the current discussion on sustainable development.

Truly, SDG 13 focuses on addressing climate change and its effects by taking immediate action.

This paper evaluates the negative impacts of climate change on food productivity and security in the Igbile community, Ogun State, Nigeria, and aims to understand the adaptation strategies to alleviate these impacts.

II. THE STUDY AREA

Igbile community is located between latitude N06^{0}43'-N 06^{0}48'and longitude E03^{0}51'-E03^{0}57' (Fig 1). The study area is very well accessible. Igbile is located in the southwestern region of Nigeria, within Ogun State. The town lies in a region characterized by a mix of savanna and forest ecosystems, which significantly influence its agricultural potential. The climate in Igbile is tropical, with distinct wet and dry seasons. The rainy season, which lasts from May to September, is crucial for crop cultivation and poses challenges for water availability.

The terrain in Igbile is relatively flat with some undulating areas, providing a suitable landscape for various agricultural activities. Igbile's soil types are loamy and sandy, generally fertile for various crops. However, fertility varies, requiring effective management practices. Agriculture is the primary economic activity, with residents cultivating cassava, maize, yam, vegetables, and cocoa due to the region's favorable climate for cocoa trees.

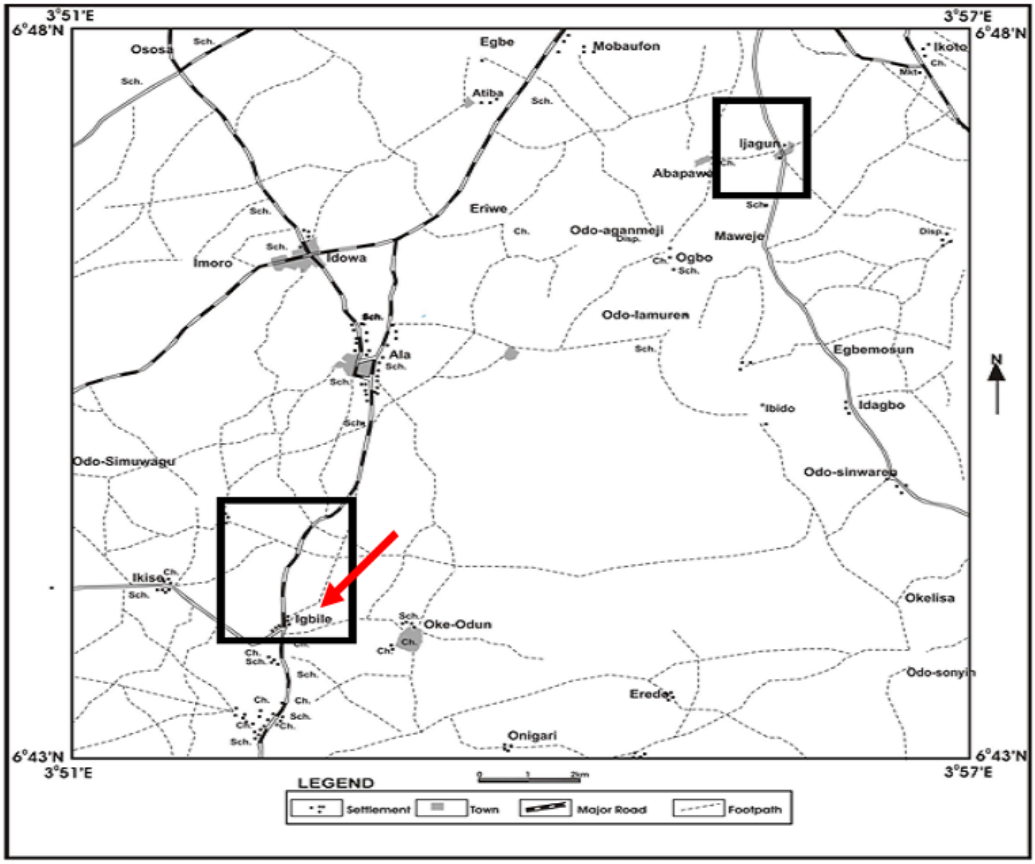

Figure 1. Map of the study area

III. CLIMATE CHANGE AND IT'S EFFECT ON FOOD SECURITY

Food insecurity is seen as the biggest danger of climate change to vulnerable human populations and society in general [2]. Certain areas may see improved food security due to climate change, while underdeveloped countries will likely suffer. Global warming worsens negative impacts on agriculture with increasing temperatures. Climate change poses dangers to worldwide food production, including risks to grains, vegetables, fruits, livestock, and fisheries [2].

3.1 Impact on Crops

Understanding the negative side effects of climate change on our food supply can be challenging. Rises in temperature and carbon dioxide (CO2) levels may be advantageous for certain crops in specific regions. To reap these advantages, nutrient levels, soil moisture, water availability, and other requirements must also be satisfied [1]. In certain regions, the

increase in temperature could be advantageous for the usual crops grown in those areas. Nonetheless, if the temperature goes above the ideal level for a crop, its production may decrease. Elevated levels of CO2 can lead to higher crop yields. Under a doubling of CO2 concentrations, certain crops, such as wheat and soybeans, may experience a 30% or higher increase in yields. Increased temperature and rainfall can hinder the growth of crops. Severe incidents, notably floods and droughts, have the potential to damage crops and lower harvests (Figs. 2 and 3).

Figure 2. Flood affected newly transplanted rice farms.

Figure 3. Drought impact on a Corn farm

3.2 Impact on Livestock

Climate variations could impact animals in both a direct and indirect manner. Increased heat due to climate change may pose a direct threat to livestock. Several states have reported losing over 5,000 animals during a single heat wave [7]. Animals are impacted by heat stress in both direct and indirect ways. Over a period, heat stress can heighten susceptibility to illness, decrease reproductive capacity, and lower milk output. Pasture and feed supplies could be at risk due to drought conditions. Flooding decreases the quantity of high-quality food accessible for grazing animals. Certain regions may undergo prolonged, more severe droughts due to increased summer temperatures and decreased precipitation (Fig. 4). The issue could also arise for animals' dependence on grain if crop production is affected by drought. Climate change could lead to a rise in the occurrence of parasites and illnesses impacting livestock. The earlier start of spring and milder winters may enable certain parasites and pathogens to thrive. In regions experiencing higher levels of precipitation, moisture-dependent pathogens could flourish [1]. Increasing carbon dioxide levels can boost pasture productivity but decrease quality. Plants consumed by livestock benefit from CO_2 growth, but forage quality diminishes. Cows may need to eat more for the same nutrition. Floods can limit grazing land, reducing grass for cattle.

Figure 4. Impact of Flood on Cattle Ranch

3.3 Impacts on Fisheries

Several fisheries are already dealing with various challenges, such as overfishing and water pollution. These pressures could be exacerbated by climate change. Temperature fluctuations may result in notable consequences. Changes in the amount and varieties of fish and other seafood could harm commercial fishing, while higher water temperatures could endanger human health by raising the possibility of infectious illnesses. Extreme temperatures in the ocean and increased acidity in the ocean are endangering coral reefs, which serve as the basis for numerous global fisheries [8]. The distributions of numerous fish and shellfish species could potentially shift. Several marine species possess specific temperature ranges within which they can survive (Fig 5). For instance, cod in the North Atlantic need water temperatures under 54°F. Sea-bottom temperatures higher than 47°F can also diminish the reproduction ability and survival of young cod. In this century, temperatures in the area are expected to surpass both thresholds. Numerous aquatic species could locate cooler regions in streams and lakes or migrate towards the north along the coast or in the ocean. Nevertheless, when entering unfamiliar territories, these species could potentially compete with other species for food and resources, as detailed on the Ecosystems Impacts page. Certain illnesses harming aquatic organisms can become more common in higher-temperature water [9].

Figure 5. Impact of extreme Drought on aquatic animals

IV. ADAPTING TO CLIMATE CHANGE: STRATEGIES TO ENHANCE FOOD SECURITY IN IGBILE

There are two methods for addressing climate change mitigation and adaptation. For a community like Igbile that has a minimal role in contributing to climate change but faces significant risks from its impacts, it is crucial to prioritize adaptation strategies. There are various methods to reduce both the present and future impacts of climate change. Yet, the degree to which these methods are utilized is contingent upon a nation's susceptibility to climate and weather fluctuations. The required strategy for adaptation in the Igbile community comprises:

1. Nigerian and Ogun State governments should prioritize climate change and vulnerability assessment to develop adaptive strategies, boost responsiveness, and reduce risks nationwide.

2.Utilizing drought-resistant and high-yielding crop varieties, conservation tillage to retain soil moisture, and crop rotation and intercropping to improve soil fertility.

3. Advancing irrigation systems, collecting rainwater, employing water-efficient technologies, and building water storage structures to secure water supply in droughts.

4. Teaching farmers climate-smart practices, implementing outreach programs, and fostering farmer collaboration for climate adaptation and resilience.

5. Promoting partnerships between research institutions and farming communities to develop new climate-resilient technologies in agriculture, investing in innovative practices like precision agriculture and digital farming tools.

V. CONCLUSION

Many agree that shifts in temperature and rainfall can harm the food security of vulnerable populations without adaptation. Many of the effects are challenging to measure and rely on various assumptions. The study indicates that, on a worldwide scale, climate change will decrease crop yields and the amount of land suitable for farming, especially in tropical regions where food security issues are most prevalent.

Several quantitative assessments also suggest that food prices will increase because of climate change, affecting the purchasing power of poor farmers. The level of economic development will ultimately determine the effects of these food price increases. Climate change may also lead to a rise in the levels of undernourished children, particularly in the least developed nations. Some consequences could result from distant shifts in climate, as they rely on rivers supplied by rainfall, snowmelt, and melting glaciers from other regions. The data suggests that there will be an uneven distribution of the effects of climate change on food security, affecting the populations most at risk of hunger.

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