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South Asian Climate Crisis: A Comparative Study of Climate-Induced Food Insecurity in Pakistan, India, and Bangladesh

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This research aims to conduct a comparative analysis of food insecurity caused by climate change in South Asian nations, with a particular emphasis on Bangladesh, India, and Pakistan. This discovery is important because food security is increasingly threatened by climate change, particularly in vulnerable South Asian countries. Understanding the complex effects of climate change on food security is essential for developing effective policy and mitigation initiatives, especially in light of the world's expanding population and agrarian economy. This research uses qualitative approach, integrating qualitative evaluations to fully examine the various aspects of food insecurity brought on by climate change in the three states. The research attempts to provide a comprehensive knowledge of the intricate interactions between food security and climate change by combining quantitative and qualitative techniques. These insights may then be used to guide evidence-based policies and initiatives. The objective of this comparative study is to provide significant knowledge to the conversation about sustainable food systems and climate change adaptation in the context of South Asia.

Keywords: *Climate crises, Food insecurity, Agricultural output, Pakistan, India, Bangladesh.*

INTRODUCTION

South Asia is home to 25% of the world's population now, and by 2050, the number will be increasing by 40%. Feeding a growing population will be a significant concern in the future. Due to its rapid population increase, depletion of natural resources, and enduringly high rates of poverty and food insecurity, South Asia is one of the most vulnerable regions to climate change (Yan, 2022). According to IPCC 2001, climatic projections for the future show an increase in the frequency and severity of extreme weather events like floods and droughts; these occurrences are projected to affect a large number of people in the region. According to reports, the frequency of storms with more than 100 mm of rain in a single day has risen by 10% every ten years (UNEP 2007).

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The likelihood of heavy rainfall episodes occurring over a few days combined with the tendency for an increase in intense rainfall will probably have an effect on soil moisture levels and water recharge rates. Nevertheless, a decade of drought is also noted, with several Asian regions being impacted. Conditions in areas that are already water stressed are made worse by these factors, which also distort and degrade water availability across regions. Many of the region's countries are already concerned about the rapid depletion of their water resources.

According to Human Development Report (HDR, 2006) by the end of 2050, 2.5 billion people in South Asia alone would experience water scarcity and stress. There are variety of climate-related issues that affect South Asian countries, such as unpredictable monsoons, rising temperatures, and an increase in the frequency of extreme weather events. These changes in the climate have a significant impact on agriculture, resulting in lower crop yields, food insecurity, and disturbances to rural livelihoods. The report also emphasizes how climate change is influencing water supplies, with changed precipitation patterns making it harder to get clean water and making water scarcity worse.

In the last 20 years, at least one natural disaster has impacted 750 million people in South Asia, according to the World Bank. These natural disasters are expected to increase in frequency and intensity as the climate warms, potentially causing enormous loss and damage for South Asia. The Intergovernmental Panel on Climate Change (IPCC) has shown in several publications that South Asia is especially susceptible to extreme weather events. A significant 2022 IPCC report on climate impacts highlighted the economic harm caused by heat waves, cyclones, floods, and other natural disasters as well as more gradual issues like falling agricultural output.

A 2019 study estimates that by 2050, loss and damage caused by climate change would cost South Asia USD 518 billion. This figure may increase to USD 997 billion by 2070. According to a different 2018 study, India's GDP would decrease by 5.53% by 2067 and by 2.09% by 2037 for every 3 degrees Celsius of global warming. Extreme weather events are already costing South Asia a lot of money. According to a study by the NGO Germanwatch, India was ranked seventh among the nations most affected by extreme weather in 2019, with massive floods that year resulting in damage estimated at USD 10 billion, 1,800 fatalities, and 1.8 million displaced people.

Tropical cyclones cause enormous harm to South Asian nations like India every year. Homes and livelihoods continue to be destroyed with each storm, despite the fact that the number of fatalities has been substantially reduced thanks to increasingly accurate weather predictions. When super storm Amphan struck Bangladesh and India in 2020, it is estimated that 14 billion USD were lost, and 2.5 million people in Bangladesh and 2.4 million in India were forced to flee their homes. As the climate warms, these kinds of extreme weather occurrences are expected to grow more frequent and intense, making it more difficult for meteorologists to offer warnings in time before a storm forms.

Research Objective

1. To evaluate the effects of shifting climatic patterns on food security and agricultural output with special focus on wheat production in growing South Asian countries, including unpredictable monsoons and harsh weather.

Research Question

1. How do extreme weather events and shifting climatic patterns affect food security and agricultural output (Wheat Production) in growing South Asian economies of Pakistan India and Bangladesh?

LITERATURE REVIEW

Azam's research study (2011) aims to investigate the problems and effects of tourism growth on the environment in developing nations, with a specific emphasis on South Asia. With a third of the world's population living there, South Asia is seeing a sharp increase in tourism as a result of its abundant natural and cultural resources. Numerous tourism sites are extremely sensitive to the effects of climate change since the business not only depends heavily on the natural environment but also has the power to dramatically alter it. Due to these issues, developing countries must take action to regulate tourism in order to protect the environment. However, these actions are hampered by their inadequate institutional frameworks, unstable political environments, and unequal social and economic systems.

Alauddin (2004) explains that the quest for economic growth in South Asia has resulted in considerable harm to the environment. The development process in the area has been both environmentally demanding and depleting. Future development and expansion are probably going to be hampered by environmental issues. In comparison to other parts of the world, the report offers an analytical summary of South Asia's environmental issues. The article makes the case that the current development process is unsustainable and examines the connection between biodiversity conservation and human welfare. The study concludes by emphasizing the necessity of a variety of policy choices to environmentalize the economic development of South Asia. Market-based as well as non-market-based tools ought to be used in these policy options.

Malik (2022) explores that every year, there are more threats associated with climate change, and as summer approaches and the monsoon season arrives, we anticipate that South Asian nations and their citizens will once more be impacted by heat waves, torrential downpours, and flooding. The cyclical nature of these disasters highlights the urgency of prompt action on a number of fronts, including reducing greenhouse gas emissions, upgrading infrastructure, and providing funding to developing nations so they may create more effective mitigation and adaptation plans. The fact that South Asian developing nations, despite having minimal greenhouse gas emissions, are annually threatened by extreme weather conditions that result in an unacceptable number of deaths demonstrate how differently industrialized and developing nations are impacted by climate change.

Yan and Alvi (2022) investigate that climatic change is causing a drop in cereal output in South Asia. Climate change will ultimately result in a decline in general wellbeing as food prices rise and local consumption and GDP decline. In order to yield significant advantages for both food security and the adaptation and mitigation of climate change, an integrated approach that incorporates adaptive, mitigation priority, and long-term methods is necessary.

Chatterjee (2011) explains in detail about climate change and its connection with food security in context of South Asia. Even though South Asia's per capita global carbon emissions are negligible, the region is severely affected by climate change. Its topography is primarily geographically based. Due to rising temperatures, high-altitude nations like India, Pakistan, and Nepal see glacier retreat. Sea level rise affects low-lying nations like Bangladesh and some coastal areas of India. Moreover, periodic natural disasters like flash floods and droughts have a negative impact on agriculture, making the region's food security worse.

Research Gap

All the literature studied for this paper show different aspect of South Asian climate crises but none of them specifically focused on wheat production in the three countries of South Asia, Pakistan, India and Bangladesh in the last one decade from 2013 2023. This paper shows an in-depth analysis about climate change impact on wheat production in the targeted countries.

RESEARCH METHODOLOGY

This study is descriptive; and qualitative research approach is applied to it. Sample for data collection is all the three countries of South Asia. Secondary data is collected from the available reports of government institution for the ten years 2013 to 2023. To draw the conclusion, comparative analysis is applied to the collected data.

Linkage between Climate Change and Food Security

Since climate is the main factor influencing agricultural productivity, there is a fundamental relationship between climate and food supply. Given that agricultural systems are closely regulated ecosystems that rely significantly on weather patterns and that agriculture plays a fundamental role in human well-being, the primary concern regarding climate change is its possible effects on agricultural production. A significant amount of research has been conducted on the potential physical effects of climate change on agriculture, including changes in crop and livestock yields, as well as the potential economic ramifications of these yield changes. This worry has led to these findings (Chatterjee, 2011)

The number of climate-related disasters in the region has climbed from 100 to over 300 between 1980 and 2012, impacting over 230 million people annually and contributing to 51% of the 1.16 million documented fatalities worldwide. The security of food and livelihoods are significantly impacted by extreme weather occurrences. Droughts, floods,

and storms across the continent between 2002 and 2011 caused losses exceeding US$ 60 billion year. Over 10 million people in Asia were displaced from their homes by climate-related disasters in 2011 alone (ADB, 2012). Based on historical data, crop and climate models predict that South Asia loses 4–5 million tons of wheat for every degree Celsius that the temperature rises.

This is particularly true if temperature rises occur during critical phases of crop development. Recent data supports the theory that the 2002 Indian drought was responsible for a 15% or more decrease in rice production, a loss of this magnitude not witnessed since the 1980s (Krishna.etal,2015). In 2004, during the planting season, the Indo-Gangetic Plains experienced an average temperature increase of 3-6 degrees Celsius. This was a more recent occurrence. Due to this tendency, wheat began to mature 10–20 days sooner than usual, which led to reductions in production of up to four million tons. (Aggarwal and Kumar, 2011).

Comparative Analysis between Pakistan, Bangladesh and India

Pakistan

Pakistan has been listed as the 12th most negatively impacted country by climate change impacts on livelihoods and agriculture. Pakistan is particularly vulnerable to climate change. Because fossil fuels have an effect on the retention of heat in the high atmosphere, greenhouse gas emissions (GHG) from their widespread use are most likely the primary cause. This increase in global temperature exacerbated the phenomena of global warming and set off the global repercussions of climate change. Pakistan's economy is centered on agriculture, and about 25 million people work there. Moreover, with an annual population growth of roughly 2%, Pakistan is the sixth most populous country in the world (Awan and Yaseen, 2017).

Although correlations between climate and agricultural output can be seen over large geographic regions, there are notable regional variances due to Asia's complicated geography. An examination of the past relationship between climate variables (temperature, precipitation, wind speed, and humidity) and wheat production in Pakistan, for example, reveals that while changes in the climate have increased wheat production in the Punjab and Sindh regions, they have also caused losses in Khyber Pakhtunkhwa and Balochistan (Khattak and Shabbir, 2012). Our main crop production system—wheat, maize, cotton, rice, and sugarcane—is under threat from climate change. By 2040, temperatures are expected to rise by 3°C, and by the end of the century, they are expected to have climbed by 5–6°C, which will result in a 50% reduction in wheat productivity The nations of South Asia Pakistan will suffer more of a loss because of its location. According to study, climate change will have a major impact on all main crops. The earth's temperature, precipitation, and agricultural growth phases are all drastically altered by the effects of climate change (Ghanem, 2010).

Pakistan's total wheat requirement is estimated to be 30.8 million tons, making it the main source of fiber in the country's diet and a significant factor in determining overall

food security. There was a shortage of over two million tons this season compared to the aim of 28.9 million tons due to heat waves in mid-March and rising fertilizer costs. In a turbulent global market, imports of wheat cover supply and demand shortages. For a nation where chronic food insecurity affects 40% of the population, this is a major reason for concern. (Malik, 2022)

India

India's climate changes have an unmatched effect on the impoverished and marginalized populations. Most Indians living in rural areas depend on rain-fed agriculture. Climate change has had a detrimental effect on Indian farmers' and fishermen's livelihoods during the last few decades. Moreover, research using climatic model simulations shows that future climate fluctuations will have a detrimental effect on agricultural productivity. As per the June 2019 United Nations World Population Prospects, it is projected that the Indian population will rise from 1.36 billion in 2019 to 1.5 billion by 2030 and 1.64 billion by 2050. Entire Population Provision of Food and Nutritional Security Requires Considerable Planning And Successful Execution. Temperature increases and heavy precipitation are two climate factors that might affect productivity by altering physiological processes. They will also have an impact on the availability of water, the frequency of pest infestation, and the fertility of the soil.

The challenges India faces in ensuring long-term food security are compounded by the impact of climate change, which has numerous implications for food production. One possibility is that it could result in notable increases in the variability of monsoon rainfall both intra-seasonally and between years. Based on the current policy scenario of the International Energy Agency and other energy sector economic models, World Bank estimates indicate that for a global mean warming of 4°C, there will be a 10-percent increase in annual mean monsoon intensity and a 15-percent increase in year-to-year variability in monsoon precipitation (World Bank,2013)

About 65% of India's cultivable land is dependent on rainfall. The majority of districts most vulnerable to climate change are found in Uttar Pradesh, Madhya Pradesh, Gujarat, Maharashtra, Rajasthan, and Karnataka. It has been shown that wheat and rice, two crops essential to Indian nutrition, are more vulnerable to climate change. According to Lobell et al. (2012), wheat growth in northern India is extremely sensitive to temperatures above 34°C. Given that agriculture is the primary means of reducing poverty, the anticipated negative effects of climate change have substantial ramifications. The worldwide food crises of 2007 and 2008 have shown that any future food crisis made worse by climate change will have a significant negative impact on the food-insecure populations in developing countries. Crop rotation and mixed cropping, as opposed to mono cropping, can assist farmers scale up their operations and lessen their vulnerability to monsoons and extreme weather (Suri, 2022).

Bangladesh

Bangladesh is an agrarian and riparian state, farming is the foundation of both the national economy and way of life. Even at the subsistence level, the agriculture sector is now highly mechanized and semi-labor intensive, although it still significantly depends on natural water sources, particularly when growing the Aman variety of rice. The biggest threats to this industry—as well as food security in Bangladesh—are climatic variability and changes. By 2050, crop production is predicted to drop by as much as 30%, bringing the terrifying prospect of extreme food insecurity and starvation. Because of climate risks, food production, distribution, and availability continue to be sources of concern. Bangladesh has been identified by the World Bank as one of the nation's most susceptible to natural disasters and climate change globally (Islam,et.al 2022).

In Bangladesh, over the past 250 years, there has been a significant increase in per capita farmland over atmospherically controlled CO2 and other greenhouse gas levels, combustion of fossil fuels, and degradation of forests (IPCC, 2007). According to Islam et al. (2019), land use and land cover in Bangladesh are changing at the same time as the country's climate phenomena, making annual changes more unpredictable. Due to its shifting status as the greatest global concern over the past century, CC has drawn attention from all around the world (Rahman et al., 2009; Hossain et al., 2019). Rising temperatures, variable rainfall, and a notable 30% increase in natural disaster activity are the primary signs of climate change. One of the indicators is also the changing season. The temperature is rising steadily. The examination of temperature data from 1990 to 2011 also clearly shows that there is an increase in the difference between the maximum and minimum. A large gap indicates an abrupt climate change. Global rainfall patterns are predicted to drastically alter as a result of climate change. There has been less rainfall than usual. (Amir, 2013).

Bangladesh's agriculture, and production have been significantly impacted by seasonal features, which are often shaped by factors like humidity, sunshine duration, temperature variance, and rainfall amounts. Different types of natural hazards, including seasonal, tidal, and flash floods, waterlogging, tropical cyclones, uneven droughts, soil and water salinity intrusion, and storm surges, frequently control and change crop production in the nation (Islam et. Al, 2020). FAO (2008) states that there are four fundamental components of food security: accessibility, consumption, stability, and availability for all. From the national to the international levels, climate change is having a significant impact on the socioeconomic, political, and temporal elements of developing nations. Stability in Bangladesh's coastal regions is threatened by shrinking agricultural land and restricted access to food, energy, and water. Floods, cyclones, salinity, storms, and erosion are examples of climate threats that make people more susceptible to achieving food security. According to Roksana et al., (2014), Bangladesh's poverty rate grew by 8.5% between 2005 and 2008 as a result of a high rate of inflation and rapidly rising rice prices. Multifaceted strategies originating from all facets of the local community, NGO, and government would constitute stability.

Comparative analysis of five year wheat production in south Asian countries.									
Year	Area (1000 Ha)			Production 1000 ton			Yield T/Ha		
	Bangladesh	India	Pakistan	Bangladesh	India	Pakistan	Bangladesh	India	Pakistan
2013/2014	410	30,003	8,660	1280	93,506	24,211	3.1	3.1	2.8
2016/2017	420	30,220	9,224	1290	87,000	25,633	3.1	2.9	2.8
2019/2020	340	29,319	8,678	1200	103,600	24,349	3.5	3.5	2.8
2021/2022	315	31,125	9,168	1085	109,586	27,464	3.4	3.5	3.0
2022/2023	310	30,459	9,000	1100	104,000	26,400	3.5	3.4	2.9

Source: Foreign Agriculture service (US Department of Agriculture)

The table presents a ten -year average of wheat production in Bangladesh, India, and Pakistan over the course of ten years, from 2013 to 2023. The information contains the yield in tons per hectare (Yield), the total production in thousand tons (Production), and the area under cultivation in thousand hectares (Area). If we consider population growth and wheat production in all the three countries then there is a slight increase in wheat production and a high population growth in overall South Asian region. One key indicator of agricultural productivity is yield per hectare. When compared to India and Pakistan, Bangladesh continuously maintains a greater output per hectare but not according to the need of growing population. Pakistan's output per hectare has been declining, especially from 2013/2014 to 2019/2020, while India's yield varies somewhat.

RECOMMENDATIONS

1) In order to improve agricultural output and food security, the government should instruct farmers on climate-related issues and the adoption of climate-resilient agricultural techniques.
2) The government should encourage the use of renewable energy in the agricultural sector by offering subsidies and raising farmer awareness of sustainable agricultural practices in order to sustainably increase agricultural productivity while reducing the negative environmental effects of agricultural production.
3) It is recommended that the governments of the countries in South Asia foster regional collaboration to advance integrated policy planning and institutional harmonization. This would help to guarantee a sustainable environment, robust agro-production systems, and food security in the area.
4) It is possible to argue that certain policy decisions should be made in order to address pressing challenges by addressing climate change and, eventually, guaranteeing sustainable agriculture and food security.

CONCLUSION

To sum up, this study explores the complex dynamics of food insecurity caused by climate change in South Asia, with a particular emphasis on Bangladesh, India, and Pakistan. The results highlight how urgently coordinated actions are needed to solve the escalating problems brought on by the climate crisis in South Asia. Variations in wheat yield and production indicate how vulnerable these nations' agricultural sectors are to the negative effects of climate change. The study emphasizes on the significance of region-specific adaptation and mitigation techniques while highlighting the connections between agriculture, food security, and climate change. In order to promote resilience and sustainable agricultural practices and ultimately lessen the threat of food insecurity in the region, cooperative efforts at the local, national, and international levels are essential as these countries struggle with the effects of shifting climatic patterns. The study offers insightful information that can help practitioners, researchers, and policymakers develop practical plans to manage the intricate relationship between food security and climate change in South Asia.

REFERENCES

ADB (2012). Addressing climate change and migration in Asia and the Pacific. Manila: ADB.

Aggarwal, C. (2015) "*Climate impacts on food security and livelihoods in Asia"* Retrieved from https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/wfp_primer_cc-and-food-security_asia.pdf.

Ahmed, A. (2013) *Climate Change and Its Impact on Food Security in Bangladesh: A Case Study on Kalapara, Patuakhali, Bangladesh, Earth Science & Climate Change* , 4-5.

Alam, M. (2014). Strategic Approaches to Food Security in Bangladesh. J. Econ. *Sust. Dev. 5* (1) 42-50.

Alufin, M. (2004). Environmentalizing economic development: a South Asian perspective. *Ecological Economics, 51* (3), 251-270.

Alvi, S. (2022), *"Food security in South Asia under climate change and economic policies"*. International Journal of Climate Change Strategies and Management, *14* (3), 237-251. https://doi.org/10.1108/IJCCSM-10-2021-0113

FAO. (2008). *Climate Change and Food Security: A Framework Document. Rome, Italy, Food and Agriculture Organization of the United Nations.* Retrieved from: www.fao.org/forestry/15538- 079b31d45081fe9c3dbc6ff34de4807e4.pdf

Ghanem, H. (2010). Addressing Food Insecurity in Protracted Crises (Food and agriculture organization of the United Nations *(FAO).*

HDR. (2006) *Human Development Report*, Retrieved from https://hdr.undp.org/content/human-development-report-2006.

IPCC. (2022), Retrieved from https://www.ipcc.ch/report/sixth-assessment-report-working-group-ii/.

IPCC. (2007). Climate Change: Impacts, Adaptation, and Vulnerability. In Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. *Cambridge University Press*, Cambridge, UK.

Islam, K. (2022). Investigating the effect of climate change on food loss and food security in Bangladesh. *SN Bus Econ* **2**, 4. https://doi.org/10.1007/s43546-021-00177-z

Khadka, M. (2011).*Climate Change and Food Security in South Asia*. Retrieved from file:///C:/Users/Dell/Downloads/climate_change_and_food_security_in_south_asia.pdf

Ma, M. (2019). Assessing inconsistency in global land cover products and synthesis of studies on land use and land cover dynamics during 2001 to 2017 in the southeastern region of Bangladesh. *Journal of Applied Remote Sensing*, *13*(04), 1.

Malik,S.(2022). *Climate Change and Food Insecurity in Pakistan***.** Retrieved from https://southasianvoices.org/climate-change-and-food-insecurity-in-pakistan.

Monasterio, J. (2012). *Extreme heat effects on wheat senescence in India. Nature Climate Change 2,* 186–189. https://doi.org/10.1038/nclimate1356.

Nehal,S. (2022). *Climate change poses the biggest risk to food security in India*. Retrieved from https://www.orfonline.org/expert-speak/climate-change-poses-the-biggest-risk-to-food-security-in-india/.

Parvin, M. (2009). Impact of irrigation on food security in Bangladesh for the past three decades. *Journal of Water resource and Protection*, *3,* 216–225.

S.N, Kumar. (2011). Impacts of climate change on growth and yield of rice and wheat in the Upper Ganga Basin. New Delhi: WWF India.

Sarker, T. (2011). ASERS Publishing, *Journal of Environmental Management and Tourism. 01* (03), 4-13.

Shabbir, R. (2012). Temporal analysis of wheat yield and climatic trends in Pakistan. Elixir Agriculture. 52, 11598-11603

Song, Z. (2020). Climate Change and Food Security: A review of current and future perspective of China and Bangladesh, Indonesian. *Journal of Environmental Management and Sustainability, 4*, 90-101.

Turn Down The Heat (2013). Climate Extremes, Regional Impacts, And The Case For Resilience. World Bank.

Yaseen, G. (2017). Global climate change and its impact on agriculture sector in Pakistan. Am. J. *Trade Policy*, *4*, 41-48.