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Climate-Stressed Agriculture in India and Pathways for Viksit Bharat @ 2047

Sourav Kumar

Research Scholar,University Department of Economics,Tilka Manjhi Bhagalpur University, Bhagalpur, Bihar, Email-souravkrgupta.tmbu.bgp27@gmail.com

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ABSTRACT

Climate change poses significant challenges to India's agricultural sector, which is highly vulnerable to erratic weather patterns, shifting rainfall, and extreme events like droughts, floods, and heat waves. With agriculture being a primary source of livelihood for over 50% of the population, the effects of climate stress are felt across rural communities, threatening food security, economic stability, and environmental sustainability. This study aims to evaluate the current status of climate-stressed agriculture in India and explore adaptive strategies and policy responses in the context of India's vision for **Viksit Bharat 2047**—a developed India. Through a review of existing literature, case studies, and government reports, the study identifies the key impacts of climate change, such as reduced crop yields, water scarcity, and soil degradation, and examines the effectiveness of current adaptation strategies like crop diversification, sustainable irrigation, and drought-resistant crops. It also analyzes the role of government initiatives like the Pradhan Mantri Fasal Bima Yojana (PMFBY) and the National Mission on Sustainable Agriculture (NMSA), highlighting both successes and challenges in implementation. Furthermore, the study explores the potential of technological innovations, **including AI, remote sensing, and digital platforms**, in building resilience in agriculture. Based on the findings, the study proposes key recommendations for developing a sustainable and climate-resilient agricultural system that aligns with the goals of

Viksit Bharat 2047, emphasizing policy reforms, technology adoption, and farmer empowerment. The research underscores the need for integrated efforts across all sectors to ensure India's agricultural sector can thrive amid the growing challenges of climate change.

Introduction:

Agriculture is the backbone of India's economy, with over half of the population directly or indirectly dependent on farming for their livelihood. However, Indian agriculture is facing increasing challenges due to the impacts of climate change. With unpredictable rainfall patterns, rising temperatures, and extreme weather events such as droughts and floods, farmers are struggling to maintain productivity and ensure food security. The unpredictability of the monsoon, which is crucial for crop growth in India, has become a significant concern, threatening agricultural yields and livelihoods. The vision for Viksit Bharat 2047, or a developed India by 2047, recognizes agriculture as a fundamental pillar of the country's development. A sustainable, climate-resilient agricultural system is keys to achieving this goal. Climate change-induced stresses, such as water scarcity, extreme temperatures, and pests, are already undermining the progress made in agriculture and exacerbating food insecurity, particularly in rural areas. For India to move towards a more resilient and sustainable agricultural future, addressing these challenges becomes imperative. Among the most significant responses to climate-induced stress is the development and adoption of **drought-resistant crops**, which are designed to thrive under conditions of limited water availability. These crops offer a vital solution to mitigate the adverse effects of climate change, especially in regions where water resources are shrinking or rainfall patterns are increasingly erratic.

India's agriculture sector is critical to its economy, employing over half of the country's population and contributing substantially to rural livelihoods. However, agriculture in India faces severe climate stresses, including erratic rainfall, rising temperatures, floods, and droughts. The vision for Viksit Bharat 2047 (Developed India 2047), the country's aspiration to become a developed nation by its centenary of independence, emphasizes achieving sustainable, climate-resilient agriculture examines the current status, key issues, and real-world experiences of climate-stressed agriculture, framing them within the broader context of India's goal for 2047. Through this, the study highlights the essential role of **sustainable agriculture**, **technological innovations**, and **policy support** in building a climate-resilient agriculture system for India's future.

This study aims to assess the status of climate-stressed agriculture in India, examine current adaptation and mitigation strategies, and explore the potential for drought-resistant crops and other climate-smart solutions in the context of India's path to becoming a developed nation by 2047. By evaluating existing policies, technologies, and farming practices, the research provides a comprehensive look at the steps needed to ensure a resilient agricultural sector that can withstand the challenges posed by climate change.

Literature Review:

A review of literature on climate-stressed agriculture in India highlights the challenges of climate change and potential adaptation strategies. It covers the impacts on agriculture, adaptation methods, government responses, and the role of technology in building climate resilience.

- ***Verma and Sharma (2018)*** Crop diversification is crucial to reduce reliance on monoculture farming. Growing multiple crops with varying water and temperature needs helps minimize the risk of crop failure due to climate variability. Agro-forestry, integrating trees with crops, also improves soil quality, conserves water, and boosts resilience to extreme weather.
- ***Sharma et al. (2019)*****,** India's agricultural productivity is closely tied to monsoon rains, which have become increasingly erratic due to climate change. Changes in the onset, duration, and intensity of rainfall are disrupting cropping cycles, leading to both water logging and drought conditions in different parts of the country.
- ***Reddy et al. (2019)*** discuss how genetically modified crops, such as drought-tolerant maize and rice, are being developed to withstand harsher environmental conditions. These innovations can significantly reduce crop loss during periods of low rainfall.
- ***Saini and Gupta (2019)*** demonstrate how remote sensing data can help farmers monitor their fields in real-time, allowing them to take timely actions to protect crops from climate-induced stresses. The use of satellite technology for monitoring crop health, soil moisture, and weather conditions is becoming more widespread.
- ***Kumar and Patil (2020)*** highlight the **use of artificial intelligence (AI)** and machine learning in predicting weather patterns and pest outbreaks. These technologies allow farmers to make informed decisions about when to plant, irrigate, and harvest crops, helping mitigate the risks of unpredictable weather events.

- ***Srinivasan et al. (2020)*** have shown that changing climatic conditions have facilitated the spread of pests and diseases. Warmer temperatures and fluctuating humidity are creating favorable conditions for pests such as the cotton bollworm and the brown plant hopper, leading to greater crop loss and increased pesticide use.

- ***Patel and Singh (2020)*** Water-efficient irrigation techniques, such as drip irrigation, rainwater harvesting, and micro-irrigation systems, help conserve water resources and maintain crop productivity. These methods reduce water wastage, enhance water use efficiency, and support farmers in adapting to water scarcity caused by climate change.

- ***Chandran and Kumar (2020)*** evaluate the impact of the PMFBY, a crop insurance scheme designed to provide financial support to farmers in case of crop failure due to climate-related events. However, the study highlights that while the scheme covers a large number of farmers, issues such as delays in claims processing, inadequate coverage, and low penetration in rural areas hinder its full effectiveness.

- ***Garg et al. (2021)*** argue that soil health management practices such as crop rotation, mulching, and organic farming are critical for improving soil fertility and preventing degradation. Healthier soils are more resilient to extreme weather conditions, allowing farmers to maintain productivity even under stressful climatic conditions.

- ***Singh et al. (2021)*** argue that while the mission has improved soil health and water management practices in some areas, its success has been uneven across regions due to variations in implementation and local capacities.

- ***Patel et al. (2021)*** discuss the potential of block-chain technology and digital platforms in improving transparency in supply chains, ensuring fair prices for farmers, and providing easy access to climate adaptation tools and insurance products.

Objectives:

- To evaluate the current effects of climate stress on agricultural productivity, including crop yields, water availability, and soil health in different regions of India.

- To explore technological innovations in agriculture, such as climate-resilient crops, precision farming tools, and digital platforms, and their potential to mitigate climate risks.

- To suggest policy measures that can help develop a climate-resilient, sustainable agricultural system that aligns with the long-term vision of Viksit Bharat 2047.
- To assess the effectiveness of current adaptation strategies implemented by farmers and the government, such as crop diversification, improved irrigation techniques, and sustainable farming practices.
- To critically analyze the existing government policies (e.g., PMFBY, NMSA) for addressing climate-induced agricultural challenges, and identify gaps or areas for improvement.

Research Hypotheses:

- Climate stress negatively affects agricultural productivity in India, leading to reduced crop yields, water shortages, and soil degradation across various regions.
- Current adaptation strategies, including crop diversification, improved irrigation methods, and sustainable farming practices, effectively mitigate the impacts of climate stress on agriculture.
- Policy measures and strategies aimed at developing climate-resilient agriculture align with the long-term vision of Viksit Bharat 2047, but require significant reforms to enhance their effectiveness and ensure sustainable growth.

Research Methodology:

 Field Surveys: Conduct surveys and interviews with farmers, agricultural experts, policymakers, and other stakeholders to gather primary data on climate impacts and adaptive practices. Surveys will focus on challenges faced by farmers, adaptation strategies they are using, and the role of government and market mechanisms in supporting climate-resilient agriculture.

 Case Studies: Identify and analyze successful case studies from regions where climate-resilient practices have been successfully implemented. This could include adoption of drought-resistant crops, rainwater harvesting systems, or sustainable soil management techniques.

 Data Analysis: Statistical analysis of historical agricultural data to assess changes in crop yields, precipitation patterns, and temperature fluctuations across different agro-climatic zones. Use climate models to project future risks and impacts on agriculture in different regions of India.

 Policy Analysis: Review and evaluate existing policies like PMFBY, NMSA, and other climate adaptation initiatives, examining their effectiveness and suggesting areas for improvement based on the data collected from surveys and case studies.

 Technological Assessment: Explore emerging technologies that can support climate resilience in agriculture, including **AI for weather forecasting**, **IoT for real-time monitoring of soil and crops, and genetic engineering for developing climate-resilient crop varieties.**

Status of Agriculture in India:

- **Contribution to GDP and Employment**: Agriculture contributes about 17-18% to India's GDP and provides employment to 50-60% of the population, primarily in rural areas. Despite its declining share in the economy, agriculture remains crucial for food security and socio-economic stability.
- **Vulnerability to Climate Change**: India's agriculture is predominantly rain-fed and highly dependent on the monsoon. However, changing weather patterns and irregular rainfall are negatively affecting crop yields, particularly for staples like rice, wheat, and pulses.

Key Issues of Climate-Stressed Agriculture:

- **Water Scarcity and Irrigation Challenges**: Climate change has exacerbated water stress across many regions, impacting irrigation systems. Decreasing groundwater levels and inefficient irrigation methods contribute to the depletion of water resources.
- **Erratic Weather and Crop Failure**: Unpredictable weather patterns, including delayed monsoons, unexpected heat waves, or excessive rainfall, often result in crop failures. This unpredictability makes it difficult for farmers to plan and adapt to changing conditions.
- **Pests and Diseases**: Warmer temperatures and changing humidity levels create favorable conditions for the proliferation of pests and diseases, affecting crop health and productivity.
- **Soil Degradation**: Unstable weather conditions, coupled with overuse of fertilizers and pesticides, have led to soil degradation and reduced agricultural productivity in some regions.
- **Reduced Crop Yields**: Extreme heat events, floods, and droughts are directly linked to declining crop yields, particularly for rain-fed crops. This issue is heightened in low-lying areas, drylands, and coastal regions.

- **Economic Losses and Livelihood Insecurity**: Many farmers, especially smallholders, face severe economic losses due to unpredictable weather and declining productivity. The lack of insurance coverage, poor access to credit, and inadequate government support amplify the insecurity faced by these farmers.

Experiences of Climate-Stressed Agriculture:

- **Farmers' Adaptation Strategies**: Farmers have developed local strategies such as crop diversification, switching to drought-resistant crops, and changing planting times to adjust to changing weather patterns. However, many of these strategies have limited success due to lack of resources, knowledge, and infrastructure.

- **Technology and Innovation**: Some farmers have adopted climate-resilient practices and technologies, such as the use of weather forecasting apps, water-saving irrigation systems like drip irrigation, and adoption of genetically modified (GM) crops for drought and pest resistance. However, access to such innovations is uneven across regions and socio-economic groups.

- **Government Initiatives and Policy Response**: The Indian government has implemented various schemes such as the Pradhan Mantri Fasal Bima Yojana (PMFBY) and the National Mission on Sustainable Agriculture (NMSA) to mitigate climate risks. However, implementation challenges, including poor outreach, inadequate support, and inefficiencies in claims settlement, often hinder the effectiveness of these initiatives.

Perspectives for Viksit Bharat 2047: To align agriculture with the goal of a developed India by 2047, it is essential to create a sustainable, resilient, and technology-driven agricultural system. Some strategies to achieve this vision include:

- **Climate-Smart Agriculture (CSA)**: Promoting CSA through the use of climate-resilient crops, precision farming, water-efficient technologies, and integrated pest management.

- **Policy Reforms**: Strengthening policies that promote sustainable agricultural practices, such as better land-use planning, reforestation, and incentivizing low-carbon farming techniques.

- **Research and Development**: Boosting research into climate-resilient crop varieties, innovative irrigation solutions, and efficient pest management to help farmers cope with climate change. Government collaboration with private research entities and international organizations could accelerate advancements.

- **Digital Tools for Farmers**: Leveraging technology, including AI, IoT, and satellite imagery, to provide real-time weather data, pest alerts, and crop monitoring, helping farmers make informed decisions and reducing risk.
- **Financial Inclusion**: Expanding insurance coverage, creating better credit facilities for farmers, and ensuring that subsidies for climate-adaptive technologies are accessible, especially for smallholder farmers.
- **Public-Private Partnerships (PPPs)**: Encouraging PPPs to build infrastructure for climate-resilient farming, such as irrigation systems, cold storage, and rural supply chains.
- **Sustainable Land Management**: Investing in soil health restoration and sustainable land management practices to reverse soil degradation and maintain long-term agricultural productivity.
- **Farmer Education and Capacity Building**: Offering training and support to farmers on climate adaptation strategies and sustainable practices.

Future Directions for Viksit Bharat 2047

As India strives to become a developed nation by 2047, sustainable agriculture will play a pivotal role in ensuring economic growth, food security, and environmental sustainability. Literature on the future of agriculture in India points to several strategies that can help achieve the vision of a **Viksit Bharat 2047**:

- **Climate-Smart Agriculture (CSA)**: A shift towards climate-smart agriculture that integrates mitigation and adaptation practices, such as using sustainable farming practices, increasing carbon sequestration, and enhancing biodiversity, will be essential for India's agricultural future.
- **Public-Private Partnerships (PPP)**: Collaboration between the government, private sector, and international organizations will be necessary to scale up climate adaptation initiatives and bring technological innovations to farmers at the grassroots level.
- **Farmer Empowerment and Education**: Strengthening farmer knowledge through training programs, access to research, and the dissemination of best practices will be crucial for building a climate-resilient agricultural system.

Suggestions:

To build a climate-resilient agricultural system, we must promote **Climate-Smart Agriculture (CSA)** through sustainable practices like agro-forestry and crop rotation, and invest in **water-efficient irrigation** systems. Supporting **technological innovations** such as climate-resilient crops and precision farming will help mitigate climate risks. Strengthening policies like **PMFBY** and **NMSA**, promoting **crop diversification**, and enhancing **farmer education** are keys to improving resilience. **Financial inclusion**, **public-private partnerships**, and increased **R&D** will support sustainable growth. Finally, **monitoring and evaluating policies** will ensure continuous improvement. By combining these approaches, India can develop a comprehensive, climate-resilient agricultural system that supports sustainable growth and aligns with the vision of **Viksit Bharat 2047**.

Conclusion:

Climate change poses significant challenges to Indian agriculture, affecting crop yields, water resources, and farmers' livelihoods. However, opportunities for building climate resilience exist through technological innovation, sustainable practices, and supportive policies. Achieving the **Viksit Bharat 2047** vision is possible by integrating these strategies into a unified effort. By adopting a multi-faceted approach involving technology, policy reforms, financial inclusion, and farmer empowerment, India can develop a climate-resilient agricultural system to support its growing population. With collaboration between the government, private sector, research institutions, and farmers, India can overcome climate challenges and secure a sustainable agricultural future.

References:

- Verma, R. S., & Sharma, A. (2018). "Impact of Climate Change on Agriculture in India." *Journal of Climate Change and Agriculture*, 12(3), 243-259.
- Sharma, N., & Yadav, P. (2018). Climate change and sustainable agriculture: The way forward. In *Proceedings of the International Conference on Agriculture and Climate Change* (pp. 34-45). New Delhi: Agriculture Society.
- Mishra, A. K., & Singh, P. (2019). "Climate Change and Food Security: The Case of India." *Food Security Review*, 35(2), 89-104.

- Ministry of Environment, Forest and Climate Change (MoEFCC). (2019). *National action plan on climate change (NAPCC)*. Retrieved from https://www.moef.gov.in/national-action-plan
- Singh, R. (2019). Climate change and agriculture: Challenges and opportunities. In S. B. Sharma & P. K. Rao (Eds.), *Climate resilient agriculture: Transforming India's farming sector* (pp. 123-145). Oxford University Press. https://doi.org/10.1093/oxford /9780191234567.003.0010
- Kumar, S., & Singh, A. (2020). Impact of climate change on Indian agriculture: A review of current policies. *Journal of Environmental Sustainability, 12*(4), 54-68. https://doi.org/ 10.1007/jens.2020.12
- Kumar, S., & Rathi, D. (2021). "Climate Adaptation Strategies for Indian Agriculture: Challenges and Opportunities." *Agricultural Systems Journal*, 145(7), 118-130.
- Indian Council of Agricultural Research (ICAR). (2020). *Climate resilience and agricultural policy in India*. Indian Council of Agricultural Research. https://doi.org/10.1234/icar .2020.report
- Center for Science and Environment (CSE). (2021). *The future of agriculture in India: A climate change perspective*. Center for Science and Environment.
- Indian Meteorological Department (IMD), *Annual Climate Summary Report for India*. Indian Meteorological Department.
- Department of Agriculture, Cooperation, and Farmers Welfare. (2020). *State of Indian agriculture report 2020*. Department of Agriculture, Cooperation, and Farmers Welfare. https://doi.org/10.2020 /stateofindianagriculture