



# **DAILY EDITORIAL ANALYSIS**

**TOPIC**

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**CHANGING RAINFALL PATTERNS  
THREATEN AGRICULTURE**

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## CHANGING RAINFALL PATTERNS THREATEN AGRICULTURE

### Context

- Agriculture is increasingly vulnerable to the impacts of climate change including the alteration in rainfall patterns, which disrupts traditional farming practices and threatens food security.

### Overview of Indian Agriculture (2025)

- **Performance of the Agriculture Sector:**
  - ♦ **Growth Rate:** 3.5% in the second quarter of FY25;
  - ♦ **Contribution to GDP:** Approximately 16% to India's GDP;
  - ♦ **Workforce:** Nearly 46% of the population;
- **Increased Budget Allocation:**
  - ♦ **Union Budget 2025:** 1.52 trillion to the agriculture and allied sectors (increase from 1.22 trillion in the previous fiscal year).

### Impacts of Climate Change on Indian Agriculture

- **Rising Temperatures and Declining Yields:** Studies suggest that for every 1°C rise in temperature, wheat yields could decline by 4-5%, while rice and maize could suffer similar losses.
  - ♦ Rainfed rice yields in India could decrease by up to 47% by 2080 if adaptation measures are not implemented.
  - ♦ According to the **World Economic Forum (2024)**, India's economy could suffer a **16% drop in agricultural output by 2030**, which would translate to a **2.8% GDP loss**.
  - ♦ **In Punjab and Haryana**, unseasonal rains have led to lower wheat production.
  - ♦ **In Maharashtra**, erratic rainfall patterns have impacted sugarcane and cotton yields.
  - ♦ Flood-prone states like **Bihar and Assam** have seen paddy crops destroyed by excessive monsoon rains.
- **Erratic Rainfall Patterns:** The **Indian monsoon (accounts for nearly 70% of the country's annual rainfall)** has become increasingly unpredictable.
  - ♦ Delayed or deficient monsoons lead to late sowing, affecting crop cycles and yields.
  - ♦ Excess rainfall causes waterlogging, damaging crops like paddy and sugarcane.
- **Increased Frequency of Extreme Weather Events:** More frequent droughts are reducing water availability for irrigation.
  - ♦ Cyclones in coastal states such as Odisha, West Bengal, and Andhra Pradesh damage crops and disrupt supply chains.
  - ♦ Hailstorms and unseasonal rains destroy standing crops, leading to financial losses for farmers.
  - ♦ According to the **World Economic Forum (WEF)**, India lost 33.9 million hectares of crops due to excess rains and an additional 35 million hectares due to drought between 2015 and 2021.
- **Soil Degradation and Loss of Fertility:** Increased soil erosion due to heavy rains and flooding.
  - ♦ Higher temperatures accelerate soil nutrient depletion.
  - ♦ Increased salinity in coastal areas due to rising sea levels negatively affects soil quality.
- **Water Scarcity and Irrigation Challenges:** Over 50% of India's agriculture depends on monsoons, making it highly vulnerable to erratic rainfall.
  - ♦ Declining groundwater levels in states like Punjab, Haryana, and Rajasthan threaten irrigation.
  - ♦ Excessive groundwater extraction has led to alarming depletion levels, especially in states like Gujarat, Rajasthan, and Tamil Nadu.
- **Pest and Disease Outbreaks:** Rising temperatures create a favorable environment for pests like the fall armyworm and locusts, which destroy crops.
  - ♦ Higher humidity increases fungal and bacterial diseases in crops such as wheat, rice, and vegetables.

### Government Response and Policy Measures

- **National Action Plan on Climate Change (NAPCC):** Includes the National Mission for Sustainable Agriculture (NMSA) to promote climate-resilient farming.
- **Pradhan Mantri Krishi Sinchayee Yojana (PMKSY):** Focuses on improving water efficiency in irrigation.
- **Soil Health Card Scheme:** Helps farmers monitor soil nutrients and improve fertility.
- **Crop Insurance Schemes:** Pradhan Mantri Fasal Bima Yojana (PMFBY) provides financial protection against crop losses.
- **Promotion of Climate-Resilient Crops:** Research institutions are developing drought-resistant and heat-tolerant crop varieties.
- **Sub-Mission on Agricultural Extension (SMAE):** It focuses on disseminating knowledge, improving farm practices, and **promoting sustainability**.
- **National Mission on Sustainable Agriculture (NMSA):** It emphasizes climate-resilient farming practices, addressing the challenges posed by changing weather patterns.
- **Rashtriya Krishi Vikas Yojana (RKVY):** Supports climate-resilient infrastructure and promotes sustainable agricultural practices.
- **Paramparagat Krishi Vikas Yojana (PKVY):** Encourages organic farming as a sustainable adaptation strategy to climate variability.
- **Weather Forecasting and Early Warning Systems:** The IMD has enhanced its forecasting capabilities to provide accurate and timely weather updates, helping farmers plan better.

### Climate Proofing Strategies For Agriculture in India

- **Climate-Smart Crop Varieties:** Development of drought-resistant, flood-resistant, and heat-tolerant crop varieties by institutions like Indian Council of Agricultural Research (ICAR).
  - ♦ Promotion of traditional and indigenous crop varieties that are naturally resilient.
- **Sustainable Water Management:** Adoption of micro-irrigation systems such as drip irrigation and sprinkler irrigation to improve water use efficiency.
  - ♦ Watershed management and rainwater harvesting to mitigate water stress in dry regions.
  - ♦ Promotion of **System of Rice Intensification (SRI)** to reduce water consumption in paddy cultivation.
- **Agroforestry and Soil Conservation:** Encouraging agroforestry models where trees are integrated into farmlands to enhance carbon sequestration and soil fertility.
  - ♦ **Zero-tillage farming** and cover cropping to maintain soil health and prevent erosion.
  - ♦ Use of organic fertilizers and biochar to enhance soil resilience.
- **Digital and Technological Interventions:** Use of AI-based weather forecasting and mobile advisory services to help farmers prepare for adverse weather conditions.
  - ♦ Precision farming using drones and sensors to optimize resource use.
  - ♦ **E-marketing platforms like eNAM** to provide better price realization and reduce climate-induced income shocks.
- **Livelihood Diversification & Crop Insurance:** Promoting integrated farming systems (livestock, fisheries, and horticulture) to reduce sole dependency on crops.
  - ♦ Strengthening Pradhan Mantri Fasal Bima Yojana (PMFBY) to provide financial security against climate-related crop losses.
- **Policy Support:** Government initiatives like the **National Innovations in Climate Resilient Agriculture (NICRA)** focus on research, capacity building, and technology dissemination to address climate challenges.

### Case Studies

- **NICRA Villages:** NICRA program has demonstrated climate-proofing techniques in over 446 villages, showcasing the effectiveness of integrated approaches.
- **Climate-Smart Farming:** Initiatives by organizations like the **Environmental Defense Fund** have promoted low-carbon farming practices, reducing greenhouse gas emissions while enhancing productivity.

**Conclusion**

- Changing rainfall patterns pose a significant threat to agriculture, demanding urgent action to safeguard the livelihoods of millions of farmers and ensure food security.
- By adopting climate-resilient practices, improving water management, and supporting farmers through policy interventions, India can mitigate the impact of climate change on its agricultural sector.
- The journey toward sustainable farming is challenging but essential for the nation's future.

Source: BS

**Mains Practice Question**

**[Q]** How can governments and farmers collaborate to adapt to changing rainfall patterns and mitigate the challenges posed by climate change to agricultural sustainability?

