



## Climate Resilient Agriculture

**For Prelims:** [Drought](#), [Agricultural productivity](#), [Watershed development](#), [Groundwater](#), [Heatwaves](#), [Pink bollworm](#), [Cyclone Diaperjoy](#).

**For Mains:** Major Impacts of Climate Change on Indian Agriculture.

### Why in News?

Research conducted in the [drought-prone](#) Jalna district of Maharashtra sheds light on the effectiveness of **different interventions in enhancing the [climate resilience](#) of farming systems.**

### What are the Major Findings of the Research?

#### ▪ About:

- The research, published in the **International Journal of Water Resources Development**, explores the impact of various agricultural development interventions over a 15-year period in two semi-arid villages, Babai and Deulgaon Tad of Maharashtra.
- The villages were selected as two farming systems:
  - One where interventions were aimed at improving **agricultural productivity and irrigation infrastructure (Babai)**
  - Another where interventions targeted the building of **adaptive capacities besides improving [agricultural productivity](#) (Deulgaon Tad).**

#### ▪ Findings:

- **[Watershed development](#) interventions resulted in intensified agriculture** and altered cropping patterns.
  - However, over time, **these approaches led to declining [groundwater](#) tables and deteriorating soil health.**
- **Conventional agricultural development pathways** showed limited success in semi-arid regions.
- **Climate resilience indicators improved when productivity-enhancing interventions were combined with water management**, soil health, livelihood diversification, and food and nutrition security.
  - Monitoring, evaluation, learning, and adaptive decision-making were key components for enhancing resilience.
- **Babai had better water resources**, resulting in higher resilience compared to Deulgaon Tad in 2007. Babai's resilience was attributed to **access to adequate water throughout the year and better soil quality.**
  - However, there has been **no substantial change in the overall resilience of Babai over the years**, according to the research.
- Deulgaon Tad, with lower resilience in 2007, **witnessed improvements across all resilience attributes due to interventions focusing on adaptive capacities** and natural resource management.

## What are the Major Impacts of Climate Change on Indian Agriculture?

- **Changes in Rainfall Patterns:** Climate change has led to altered rainfall patterns, including changes in **timing, intensity, and distribution of rainfall**.
  - This can result in **droughts, floods, and erratic rainfall, affecting agricultural productivity**.
  - For instance, in **2019, India experienced delayed and deficient monsoon rains**, leading to reduced crop yields in many regions.
- **Increased Temperature:** Rising temperatures can have adverse effects on crop growth and development.
  - **High temperatures during the growing season can decrease crop yields and reduce the nutritional value of crops**. Heat stress can also impact livestock health and productivity.
  - In recent years, **heatwaves in India have affected crop yields**, particularly for heat-sensitive crops like wheat and rice.
- **Shifting Pest and Disease Patterns:** Climate change influences the distribution and abundance of pests and diseases, posing challenges to agricultural pest management.
  - Changes in temperature and rainfall patterns can favour the spread of certain pests and diseases, impacting crop health.
  - For instance, the increased incidence of pests like the **pink bollworm has affected cotton production in India and Locust swarms from Somalia due to erratic rain**.
- **Water scarcity:** Climate change affects water availability, particularly in regions dependent on rainfall or snowmelt for irrigation.
  - **Changes in precipitation patterns and melting glaciers** can lead to water scarcity, especially during critical crop growth stages. This can result in reduced agricultural productivity and increased competition for water resources.
- **Changes in Cropping Patterns:** Climate change can influence the suitability of different crops in certain regions. **As temperature and rainfall patterns shift, farmers may need to adapt their cropping patterns to ensure productivity**.
  - Some crops may become less viable, while others may become more suitable.: **On all-India basis, climate change is projected to increase coconut production**.
- **Increased Extreme Weather Events:** Climate change has been linked to an increase in extreme weather events, such as **cyclones, storms, and hailstorms**. These events can cause significant damage to crops, livestock, and infrastructure, leading to yield losses and economic hardships for farmers.
  - For example, the recent Cyclone Biporjoy.

## Way Forward

- **Input Intensive to Knowledge Intensive Agriculture:** India is known for its diversity of farming practices. It is important to **get diverse points of view engaged in a national-level dialogue to find suitable solutions for the future**.
  - Also, the **Advanced world is moving towards precision farming using sensors and other scientific tools for exact practices** and application of inputs.
  - A **smart and precise move towards high-tech farming in India** will reduce average cost, raise farmers' income, and address many other challenges of scale.
- **Intercropping and Agroforestry:** Growing different crops together in the same field or **integrating trees with crops can enhance biodiversity, reduce soil erosion, and increase climate resilience**. For instance, **intercropping legumes with cereals not only provides additional income but also improves soil fertility through nitrogen fixation**.
  - Also, encouraging the **cultivation of non-traditional crops** that are more resilient to climate extremes can reduce dependence on a single crop and mitigate risks.
  - For example, **promoting drought-tolerant millets** can help farmers cope with changing climatic conditions.
- **Climate-Smart Water Management:** Efficient water management is crucial for climate resilience in agriculture, especially in water-stressed regions. Implementing climate-smart water management practices can enhance agricultural productivity while conserving water resources.
  - **Constructing ponds, check dams, and farm ponds** to capture and store rainwater can

- help recharge groundwater and provide irrigation during dry spells.
- **Farmers can utilise this stored water during droughts or for supplementary irrigation**, thereby reducing dependence on erratic rainfall patterns.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### **Prelims**

#### **Q.1 How is permaculture farming different from conventional chemical farming? (2021)**

1. Permaculture farming discourages monocultural practices but in conventional chemical farming, monoculture practices are predominant.
2. Conventional chemical farming can cause an increase in soil salinity but the occurrence of such phenomenon is not observed in permaculture farming.
3. Conventional chemical farming is easily possible in semi-arid regions but permaculture farming is not so easily possible in such regions.
4. Practice of mulching is very important in permaculture farming but not necessarily so in conventional chemical farming.

**Select the correct answer using the code given below.**

- (a) 1 and 3
- (b) 1, 2 and 4
- (c) 4 only
- (d) 2 and 3

**Ans: (b)**

#### **Q.2 Which of the following is the chief characteristic of 'mixed farming'? (2012)**

- (a) Cultivation of both cash crops and food crops
- (b) Cultivation of two or more crops in the same field
- (c) Rearing of animals and cultivation of crops together
- (d) None of the above

**Ans: (c)**

#### **Q.3 With reference to micro-irrigation, which of the following statements is/are correct? (2011)**

1. Fertilizer/nutrient loss can be reduced.
2. It is the only means of irrigation in dry land farming.
3. In some areas of farming, receding of ground water table can be checked.

**Select the correct answer using the codes given below:**

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

**Ans: (c)**

### **Mains**

**Q.1** What are the present challenges before crop diversification? How do emerging technologies provide an opportunity for crop diversification? **(2021)**

**Q.2** How has India benefited from the contributions of Sir M. Visvesvaraya and Dr. M. S. Swaminathan in

the fields of water engineering and agricultural science respectively? (2019)

**Source: DTE**

PDF Refernece URL: <https://www.drishtiias.com/printpdf/climate-resilient-agriculture-1>

