

# ***Building Agricultural Resilience: Navigating the Challenges of Climate Change***

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**OPEN ACCESS**

## **Keywords**

Climate change, Resilience, Adaptation, Mitigation

### *How to cite this article:*

Tahasildar, N., Manjuprakash., Priyanka, G., Jagalur, V. K., Sushma. and Mujavar, S. R. 2026. Building Agricultural Resilience: Navigating the Challenges of Climate Change. *Vigyan Varta* 7 (06): 202-205.

## **ABSTRACT**

Climate change is posing a serious threat to global agriculture, affecting crop production, livestock, fisheries and overall food security. Rising temperatures, erratic rainfall and extreme weather events are leading to significant yield loss in major food crops and leading to economic instability among farmers. Climate-resilient agriculture has emerged as a sustainable approach to address these challenges by enhancing adaptive capacity, improving productivity and reducing greenhouse gas emissions. This article highlights the impact of climate change on agriculture and discusses key adaptation strategies, extension services and institutional support systems necessary for building resilience in agriculture.

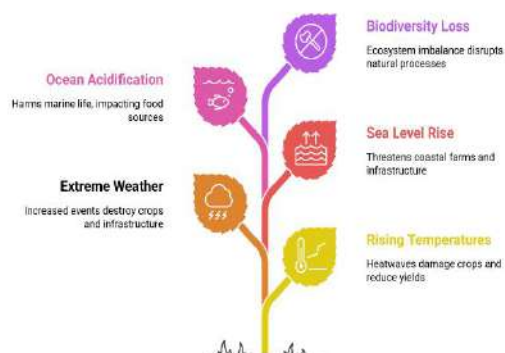
## **INTRODUCTION**

**A**griculture is a vital sector in India providing livelihood support to a large (800 million people) section of

population and ensuring food security. It is highly dependent on climatic factors such as temperature, rainfall, humidity and seasonal

patterns. In recent years climate change has emerged as a major challenge affecting agricultural systems. Rising temperatures, irregular rainfall, frequent droughts, floods and extreme weather events are increasingly observed. These changes reduce crop productivity and increase the vulnerability of farmers especially small and marginal farmers. Climate change also affects soil health, scarcity of water resources, increasing incidence of pest and disease and also affects livestock productivity. Higher temperature lead to heat stress while erratic rainfall causes both water scarcity and flooding. India is highly vulnerable to climate variability particularly in dryland regions like Karnataka. Farmers are already experiencing crop failures declining groundwater levels and increased pest outbreaks. In this situation building agricultural resilience is essential. Climate-resilient agriculture helps farming systems to withstand adapt to and recover from climate stress. Therefore, adoption of climate-smart practices and strengthening extension services are necessary for sustainable agriculture. (Rajesh *et al.*,2024)

### Challenges of climate change:



**Figure 1. Challenges of climate change**

To overcome the challenges mentioned in Figure 1, it is essential to build climate resilience across different sectors. Climate resilience is not limited to crop production alone but also involves a comprehensive approach including agriculture, horticulture,

livestock, fishery, forestry and storage and processing systems. Therefore, an integrated approach involving all these sectors is necessary to effectively respond to climate change and ensure sustainable agricultural development. (Priya *et al.*, 2025)

## 1. Strategies for climate change adaptation

### Integrated Farming System (IFS)

- Combines crops, livestock and other subsidiary enterprises
- Improves resource use efficiency
- Enhances farm income and sustainability

### Zero Tillage

- Minimizes soil disturbance
- Conserves soil moisture
- Reduces soil erosion and carbon loss

### Weather Forecasting and Dissemination

- Provides timely weather information
- Helps in decision making in major agricultural operations like, sowing, irrigation, harvesting and marketing
- Reduces risk from extreme weather events

### Water Saving Technologies

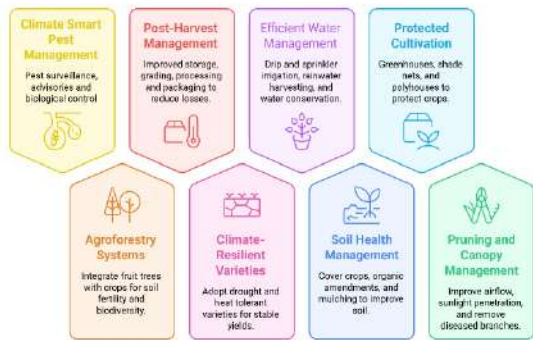
- Promotes drip and sprinkler irrigation
- Efficient use of available water resources
- Supports crop growth during water scarcity

## 2. Climate change mitigation strategies in horticulture

Climate change is increasingly affecting horticultural production through erratic weather, water scarcity and rising pest and

disease incidences. To overcome these challenges, adopting climate-resilient strategies is essential for sustaining productivity and farm income. The following Figure 2 outlines the major approaches that support resilience and long-term

sustainability in horticulture. (Dutta *et al.*,2023)



**Figure 2. Key strategies for climate resilient horticulture**

### 3. Strategies for climate resilient livestock

#### 1. Shelter Management

- Protects animals from high and low temperatures
- Reduces effects of humidity, solar radiation, wind and rain
- Provides a comfortable environment for livestock

#### 2. Water Management

- Ensures availability of clean drinking water
- Rainwater harvesting and storage systems
- Maintains productivity during dry periods

#### 3. Feeding Management

- Provides balanced nutrition for animals
- Addresses feed and fodder scarcity in drylands

- Improves productivity and health

#### 4. Grazing Management

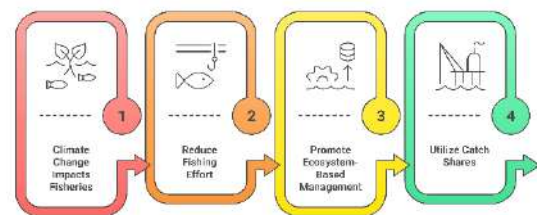
- Rotational grazing practices
- Maintains natural vegetation
- Reduces environmental stress

#### 5. Health Monitoring

- Regular monitoring of animal health
- Early disease detection
- Timely veterinary care to reduce losses

### 4. Adaptation Measures for Climate Resilient Fisheries

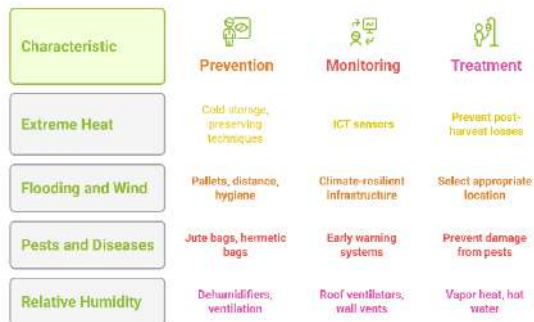
Climate change is significantly affecting fisheries by altering water temperature, marine ecosystems and fish availability. To reduce these impacts and ensure sustainable fish production, several adaptation measures can be adopted as shown in Figure 3.



**Figure 4. Adaptation measures for climate resilient fisheries**

#### 5. Climate resilient storage system

Climate change has a significant impact on post-harvest management by increasing risks such as heat stress, humidity, pests and extreme weather events. These factors lead to storage losses, deterioration in quality and economic losses for farmers. Therefore, adopting climate-resilient storage systems is essential to protect agricultural produce, maintain quality and reduce post-harvest losses. Proper storage practices help ensure food security and improve farmers' income.



**Figure 5. Climate resilient storage system**

## Extension services to build climate resilience

### 1. Plant Clinics

Diagnose and provide solutions for crop related problems

### 2. Farmer Field School (FFS)

Practical learning and skill development

### 3. Village Knowledge Center

Access to agricultural information and technologies

### 4. ICT Supported Network

Dissemination of real-time information and advisories

### 5. Rural Advisory Services

Provide location-specific guidance to farmers

## CONCLUSION:

Climate change is a major challenge such as rising temperatures, erratic rainfall, extreme weather events and increasing pest and disease incidence affecting all sectors of agriculture including crops, horticulture, livestock,

fisheries, forestry and post-harvest systems. As a consequence, it is threatening productivity, livelihoods and food security. An integrated and holistic approach that combines adaptation and mitigation strategies across all agricultural sectors is essential for ensuring long-term sustainability. Therefore, building agricultural resilience is not just a necessity but a key strategy to ensure food security, environmental sustainability and improved livelihoods for present and future generations.

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