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Popular Article

Climate-resilient crops: a key to sustainable agriculture in a changing climate

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Climate-Resilient Crops ensuring Food Security in a Changing Climate are crucial for sustainable agriculture. Climate-resilient crops are varieties developed to withstand environmental stresses such as drought, floods, heat and salinity. Increasing impact of Climate Change, these crops help ensure stable agricultural production and food security. They are developed through plant breeding, biotechnology, and selection of tolerant varieties. Traits like stress resistance and adaptability enable them to perform well under adverse conditions. Technologies like soil moisture sensors, AI-based irrigation, and drip irrigation enhance efficiency and reduce waste. Research focuses on advanced sensors, climate adaptation, and renewable energy integration.

What is Climate-Resilient crops?

Climate-resilient crops are specially bred or genetically modified plants that can withstand weather conditions such as:

Drought – Crops that need less water and survive long dry periods.

Floods – Plants that can grow even when fields are waterlogged.

Heatwaves – Crops that can tolerate high temperatures without losing productivity.

Salinity – Crops that can grow in soils with high salt levels, common in coastal areas.

Pest and Disease Resistance – Crops that are less vulnerable to insects and plant diseases caused by climate changes.

Climate-Resilient Agriculture

Indian Council of Agricultural Research (ICAR) is implementing a project, National Innovations in Climate Resilient Agriculture (NICRA), studies the impact of climate change on agriculture including crops, livestock, horticulture and fisheries. It also develops and promotes climate resilient technologies, which helps the regions prone to extreme weather



conditions like droughts, floods, frost, heat waves, etc. The studies conducted under NICRA showed that in the absence of adaptation measures, climate change is likely to reduce yield of rainfed as well as irrigated rice, wheat, Kharif maize etc. Under NICRA, risk and vulnerability assessment of agriculture to climate change has been carried out at district-level for 651 predominantly agricultural districts as per Intergovernmental Panel on Climate Change (IPCC) protocols. Out of 310 districts identified as vulnerable, 109 districts have been categorized as 'very high' and 201 districts as 'highly' vulnerable.

Importance of Climate-Resilient Crops: Climate-resilient crops play a vital role in ensuring food security, farmer livelihoods, and sustainable agriculture. Some key benefits include:

Adaptation to Extreme Weather: These crops can tolerate drought, high temperatures, and floods, reducing the risk of crop failure.

Stable Yields: Even under unfavourable climatic conditions, climate-resilient varieties can maintain consistent production.

Reduced Input Requirements: Many resilient crops require less water, fertilizers, and pesticides, making them environmentally sustainable.

Support for Smallholder Farmers: Farmers in climate-vulnerable regions benefit from crops that are better suited to unpredictable weather patterns.

Climate Resilient Crops That Can Grow Anywhere

1. Drought-Resistant Crops

Drought-resistant crops are specially bred or genetically modified to survive with minimal water. These crops can grow in dry and arid regions, reducing the impact of water shortages on food production. Sorghum is a highly drought-tolerant grain that thrives in semi-arid regions. It has deep roots that help it extract moisture from dry soils, making it a staple food in Africa and parts of Asia. Pearl millet, finger millet and foxtail millet are small-grain cereals that require very little water. They are rich in nutrients and can survive high temperatures, making them ideal for areas with unpredictable rainfall. Drought-Tolerant Maize has developed special maize (corn) varieties that use water efficiently. These varieties can maintain good yields even when rainfall is low, ensuring food security in regions.

2. Flood-Tolerant Crops

Flooding can damage crops by depriving their roots of oxygen. Flood-tolerant crops have been developed to withstand waterlogging and continue growing even when submerged for extended periods. Scuba Rice (Submergence-Tolerant Rice) special variety of rice can survive under water for up to two weeks. It is particularly useful in flood-prone areas of South and Southeast Asia. Water-Resistant Wheat varieties are being developed to tolerate short-



term flooding without affecting grain production. These varieties ensure stable wheat yields in regions where excessive rainfall is a challenge.

3. Heat-Resistant Crops

High temperatures can reduce crop productivity by affecting plant growth and increasing water evaporation. Heat-resistant crops are bred to tolerate extreme temperatures while maintaining good yields. Rising global temperatures have led to the development of wheat varieties that can grow in hot climates. These wheat types prevent heat stress from reducing grain quality and yield. Cowpea (Black-Eyed Peas) is a legume known for its ability to grow in hot and dry conditions. It is widely cultivated in Africa and Asia as a protein-rich food source that withstands high temperatures.

4. Salt-Tolerant Crops

Soil salinity is a major problem in coastal regions and irrigated farmlands. Salt-tolerant crops can grow in saline soils, helping farmers cultivate land that would otherwise be unsuitable for agriculture. Quinoa originally grown in the Andean region, quinoa is an ancient grain that thrives in salty and nutrient-poor soils. It is rich in protein and essential amino acids, making it a valuable food source. Salt-Tolerant rice varieties were developed that can survive in high-salinity environments. These rice strains help farmers in coastal regions where seawater intrusion affects soil quality.

5. Pest and Disease-Resistant Crops

Changing climates can increase the spread of pests and plant diseases. Pest- and disease-resistant crops help reduce the need for chemical pesticides, making farming more sustainable and cost-effective. Bt cotton is genetically modified cotton variety contains a natural insect-resistant gene, protecting it from bollworm attacks. It reduces pesticide use and increases cotton yields. Banana plantations worldwide are threatened by fungal infections like Panama disease; researchers are developing banana varieties resistant to such diseases.

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