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Climate resilience in agriculture: Strategies for future-proofing farmlands

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By adopting these, farmers can build robust agricultural systems capable of thriving amidst climatic uncertainties

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Agriculture, which sustains over 8 billion people worldwide, is increasingly threatened by climate change, and this could reduce global crop yields by 2050, just as the world population approaches nearly 10 billion. Additionally, extreme weather events such as droughts and floods are becoming more frequent and severe, posing further risks to agricultural productivity. Given these challenges, it is crucial to develop and implement strategies to enhance agriculture's climate resilience.

Sustainable soil management

Soil health is fundamental to agricultural productivity and climate resilience. Soil microbial communities play a key role in addressing climate change by safeguarding our food supply, cleaning water, and supporting our immune systems. Soils accumulate and store carbon over time, significantly contributing to climate change mitigation. However, the rapid loss of fertile soil poses a major challenge to feeding the projected 10 billion people by 2050.

Regenerative practices are vital for soil health. These include applying mulch, practicing no-till farming, and using organic inputs like vermicompost, jeevaamrutam, and biochar. Planting cover crops and managing natural grasses also enhance soil health. These practices collectively improve soil structure, nourish microorganisms, provide essential nutrients, and add carbon to the soil, promoting overall soil health and resilience.

Water management

Agriculture is the largest consumer of freshwater globally, and inefficient water use can lead to resource depletion. Sustainable water management practices are essential to conserving water by minimizing waste and using available resources

efficiently. Techniques such as water harvesting structures, swales, trenches, and bioswales help boost soil moisture, reduce erosion, and promote sustainable water use, contributing to a healthier ecosystem.



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A notable example of sustainable water management is the restoration of the Arvari River in Rajasthan. The river had been dry for 60 years, with water quickly draining away during monsoon rains due to a degraded basin. In 1986, Rajendra Singh, known as the “Water Man of India,” and his organisation Tarun Bharat Sangh began rebuilding traditional water harvesting structures called johads. These small earthen check dams capture and conserve rainwater, improving percolation and recharge of groundwater. By 1995, the Arvari River became perennial again, benefiting 70 villages. This initiative expanded to over 9,000 water harvesting structures, rejuvenating four other dry rivers in the area.

Practicing biodiversity

Biodiversity is central to regenerative agriculture. Incorporating native plant varieties and conserving natural areas encourages the return of beneficial insects, birds, and wildlife, creating an ecological balance that naturally controls pests. This reduces reliance on chemical inputs and enhances overall ecosystem resilience. By fostering a diverse range of species, farmers can build more resilient systems capable of withstanding climatic and biological stresses.

Agroforestry

Agroforestry, which integrates trees and shrubs into agricultural landscapes, plays a crucial role in enhancing carbon sequestration. This practice provides shade and windbreaks for crops and significantly contributes to climate change mitigation. Trees absorb CO₂ from the atmosphere through photosynthesis, storing it in their biomass and the surrounding soil. Their extensive root systems stabilise the soil, prevent erosion, and promote the accumulation of organic matter. By integrating trees into farmlands, agroforestry systems create carbon sinks, reducing atmospheric CO₂ levels and contributing to global efforts to combat climate change.

Precision agriculture

Precision agriculture leverages advanced technology to optimise farming practices, significantly enhancing efficiency and resilience. For instance, IoT devices like Fasal collect real-time data on weather, soil moisture, and crop conditions. This data-driven approach enables farmers to make informed decisions about irrigation, fertilization, and pest control, maximising crop yields and minimizing resource wastage. By providing precise insights and actionable recommendations, Fasal helps farmers adapt to changing environmental conditions, reduce input costs, and increase overall productivity. Integrating such cutting-edge technologies in agriculture boosts farm profitability and contributes to sustainable farming practices, ensuring long-term food security and environmental health.

Strengthening local food systems

Strengthening local food systems enhances resilience by reducing dependency on external inputs and markets. When farmers grow their own food, they gain satisfaction from knowing its origin and nutritional value. Locally grown food reduces carbon emissions associated with long-distance transportation, contributing to environmental

sustainability. Moreover, freshly harvested food retains more nutrients than food that has traveled long distances. This localised approach supports consumer health, fosters community ties, and strengthens local economies. Emphasizing self-reliance and minimizing the carbon footprint, local food systems contribute to a sustainable and resilient agricultural framework, ensuring fresher produce and a reduced environmental impact.

Conclusion

Climate resilience in agriculture is essential for ensuring food security, sustainable livelihoods, and environmental sustainability. Practices like sustainable soil management, water conservation, biodiversity enhancement, agroforestry, precision agriculture, and strengthening local food systems offer viable solutions. By adopting these strategies, farmers can build robust agricultural systems capable of thriving amidst climatic uncertainties, ensuring a secure and sustainable future for agriculture.

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