

5. Sustainable Agriculture in India - Economy

The National Mission for Sustainable Agriculture is promoting sustainable and climate-resilient agriculture through efficient water use, soil health management, and resilient farming practices.

1. Background

Indian agriculture achieved remarkable success through the Green Revolution of the 1960s–70s transforming India from chronic food shortages and dependence on imports to self-sufficiency and even export surplus in wheat and rice production. However, this achievement came at significant environmental costs including groundwater depletion from intensive irrigation, soil degradation from excessive chemical fertilizer and pesticide use, loss of biodiversity from monoculture cropping patterns, and ecosystem disruption from unsustainable farming practices prioritizing short-term productivity over long-term sustainability. As climate change intensifies with increasing frequency of droughts, floods, erratic monsoons, and extreme weather events, agriculture faces compounded challenges threatening food security, farmer livelihoods, and environmental health simultaneously.

Sustainable agriculture emerged as an alternative paradigm focusing on producing food continuously without harming the environment or ecosystem health, maintaining soil productivity and fertility over generations, and ensuring farmers can sustainably manage resources, inputs, and labor over the long term without degrading natural capital. Recognizing these imperatives, the Government of India launched the National Mission for Sustainable Agriculture in 2014–15 under the National Action Plan on Climate Change to address climate change impacts on agriculture and ensure long-term food and livelihood security. From 2018–19, NMSA became a sub-mission under Green Revolution–Krishonnati Yojana, and from 2022–23 it was integrated into Pradhan Mantri Rashtriya Krishi Vikas Yojana strengthening climate-resilient and sustainable agriculture. Additional initiatives including NICRA (National Innovations in Climate Resilient Agriculture) promote climate-resilient varieties, intercropping, agroforestry, and zero-till sowing. Despite progress, challenges persist including soil health decline from overuse of fertilizers and pesticides reducing organic carbon levels, water stress from excessive groundwater extraction and limited irrigation coverage, small landholdings averaging 1.08 hectares hindering mechanization and modern technique adoption, climate change impacts, and inadequate market and credit access for small farmers.

2. Understanding Sustainable Agriculture

Definition and Scope

1. Sustainable agriculture means producing food continuously without harming the environment or ecosystem health over generations.
2. It focuses on maintaining soil productivity and fertility through organic matter retention, crop rotation, and reduced chemical inputs.
3. It ensures farmers can sustainably manage resources, inputs, and labor over the long term without depleting natural capital.

3. Significance of Sustainable Agriculture

Food Security

1. Ensures long-term agricultural productivity while conserving natural resources including soil, water, and biodiversity.
2. Prevents land degradation and desertification that reduce productive agricultural land.

Climate Resilience

1. Builds capacity to withstand droughts, floods, heatwaves, and other extreme weather events becoming more frequent due to climate change.
2. Diversified cropping systems reduce vulnerability to climate shocks affecting single crops.

Livelihoods Support

1. Supports nearly 46% of India's population dependent on agriculture for livelihoods and income.

2. Sustainable practices reduce input costs through reduced chemical dependency, improving farmer profitability.

Environmental Protection

1. Reduces soil erosion, groundwater depletion, chemical pollution, and loss of biodiversity.
2. Promotes ecosystem services including pollination, natural pest control, and soil carbon sequestration.

Global Leadership

1. India's promotion of millets ("Shree Anna") highlights climate-resilient crops requiring less water and inputs.
2. International Year of Millets 2023 showcased India's sustainable agriculture leadership globally.

4.Challenges

Soil Health Decline

1. Overuse of fertilizers and pesticides has reduced organic carbon levels in soil, diminishing fertility and water-holding capacity.
2. Soil degradation affects 97.85 million hectares (29.7% of India's area) according to ISRO data.
3. Intensive monoculture depletes soil nutrients requiring increasing fertilizer applications in vicious cycles.

Water Stress

1. Excessive groundwater extraction, particularly in Punjab, Haryana, and Rajasthan, depletes aquifers faster than natural recharge rates.
2. Limited irrigation coverage leaves 52% of cultivated area dependent on erratic monsoons.
3. Water-intensive crops like rice and sugarcane are grown in water-scarce regions due to policy distortions.

Small Landholdings

1. Average landholding size of 1.08 hectares and fragmented farms hinder mechanization, modern technology adoption, and economies of scale.
2. Small farmers face higher per-unit production costs and limited bargaining power in markets.

Climate Change Impacts

1. Increasing frequency of extreme weather events including droughts, floods, unseasonal rainfall, and heatwaves disrupts agricultural cycles.
2. Shifting agro-climatic zones affect traditional cropping patterns requiring adaptation strategies.

Market and Credit Access

1. Small farmers struggle with fair prices due to intermediary exploitation and lack of direct market access.
2. Limited institutional credit forces dependence on informal lenders charging high interest rates.
3. Inadequate storage and processing infrastructure leads to post-harvest losses reducing farmer incomes.

5.Government Initiatives

National Mission for Sustainable Agriculture (NMSA)

1. Launched in 2014-15 under the National Action Plan on Climate Change to address climate change impacts on agriculture.
2. From 2018-19, NMSA became a sub-mission under Green Revolution-Krishonnati Yojana.
3. From 2022-23, it was integrated into Pradhan Mantri Rashtriya Krishi Vikas Yojana to strengthen climate-resilient and sustainable agriculture.

NICRA (National Innovations in Climate Resilient Agriculture)

1. Promotes climate-resilient varieties tolerating drought, flood, heat, and salinity stress.
2. Encourages intercropping, agroforestry, and zero-till sowing reducing environmental impacts while maintaining productivity.

3. Establishes demonstration farms showcasing climate-resilient practices to farmers.

Soil Health Management

1. Soil Health Card Scheme provides farmers with soil nutrient status enabling appropriate fertilizer application reducing overuse.
2. Promotes organic farming, green manuring, and integrated nutrient management improving soil health.

Water Conservation

1. Pradhan Mantri Krishi Sinchayee Yojana promotes "Per Drop More Crop" through micro-irrigation.
2. Focuses on expanding drip and sprinkler irrigation improving water-use efficiency from 30-40% to 70-90%.

6.Way Forward

Promote Agroecology

1. Shift from industrial farming dependent on chemical inputs to eco-friendly practices integrating traditional knowledge with modern science, including crop rotation, intercropping, organic farming, and integrated pest management reducing environmental impacts while maintaining productivity and improving farmer incomes through reduced input costs.

Water-Smart Farming

1. Massively expand micro-irrigation coverage through subsidies, technical support, and farmer training demonstrating water and cost savings, while promoting rainwater harvesting, farm ponds, and aquifer recharge structures augmenting water availability ensuring irrigation security during dry periods particularly in rainfed areas.

Digital Agriculture

1. Use AI, IoT, and drones for precision input management providing real-time soil moisture data, pest surveillance, and weather forecasts enabling informed decision-making, while developing mobile applications connecting farmers with extension services, markets, and credit facilitating knowledge transfer and reducing information asymmetries.

Crop Diversification

1. Encourage pulses, oilseeds, and millets cultivation reducing dependence on water-intensive rice and wheat, while providing procurement support, price incentives, and market linkages for alternative crops making diversification economically viable rather than just environmentally desirable addressing farmer reluctance to shift from assured-procurement crops.

Strengthen Farmer Cooperatives

1. Scale up Farmer Producer Organizations providing collective bargaining power, bulk input purchases, processing facilities, and direct market access improving farmer incomes, while ensuring FPOs receive adequate technical support, credit access, and capacity building enabling them to function effectively beyond initial formation.

Capacity Building

1. Intensify training programs in sustainable practices, climate adaptation techniques, and modern technologies through Krishi Vigyan Kendras, agricultural universities, and extension services, while promoting farmer-to-farmer learning through demonstration plots, field days, and success story sharing overcoming scepticism about new practices through peer influence.

Policy Reforms

1. Rationalize fertilizer subsidies gradually shifting from input subsidies to direct income support decoupling farmer welfare from resource overuse, while reforming power subsidies for agriculture reducing incentives for unsustainable groundwater extraction through volumetric pricing or quotas making farmers conscious of water consumption.

Conclusion

Sustainable agriculture is essential for India's environmental protection, economic growth, and social well-being. The National Mission for Sustainable Agriculture, launched in 2014-15 and integrated into PM-RKVY from 2022-23, promotes climate-resilient practices. NICRA advances climate-resilient varieties, intercropping, agroforestry, and zero-till sowing. India's millet promotion demonstrates global leadership. Challenges include soil health decline from chemical overuse affecting 97.85 million hectares, water stress from excessive groundwater extraction, small landholdings averaging 1.08 hectares hindering mechanization, increasing climate change impacts, and inadequate market and credit access. Solutions require promoting agroecology, water-smart farming through micro-irrigation expansion, digital agriculture using AI and IoT, crop diversification toward pulses and millets, strengthened FPOs, farmer capacity building, and policy reforms rationalizing subsidies ensuring productive, resilient, sustainable agriculture.

Source - <https://opengovasia.com/indias-national-mission-for-sustainable-agriculture-strengthens-climate-resilient-farming/?c=in>