



PROSPECTS FOR SUSTAINABLE FARMING IN INDIA: A VISION FOR 2040

Dhivya C^{1*}, Arunkumar R², Jayashree V¹ and Kamali S P¹

¹Research Scholar (Agricultural Extension Education), Tamil Nadu Agricultural University, Coimbatore

²Assistant Professor (Agricultural Extension Education), RVS Agricultural College, Thanjavur

*Corresponding Author Mail ID: dhivya2908@gmail.com

Introduction

India is entering a critical phase in its agricultural journey. With the population expected to touch 1.6 billion by 2040, the country must not only produce more food but do so in a way that safeguards the environment. Rising temperatures, shrinking groundwater, and changing rainfall patterns pose a serious threat to the country's food security. The question is no longer whether we need sustainable farming but whether India can achieve it within the next two decades.

At the same time, consumer demand is shifting toward healthier, chemical-free, and locally produced food. Farmers are also becoming more aware of climate risks and are exploring innovative practices to protect their livelihoods. Technological advancements from drones to precision irrigation are opening new possibilities that were unimaginable a decade ago. These transformations signal that India's food system is standing at a true turning point, where choices made today will shape the nation's agricultural future for decades to come.

Climate Change: The Biggest Threat to Food Security

Climate change is already redefining India's farming landscape. More frequent droughts, severe floods, unseasonal rains, and scorching heatwaves make agriculture increasingly unpredictable. Over 60% of Indian agriculture still depends on monsoon rainfall,

making it vulnerable to even minor climate fluctuations. If no action is taken, India could face significant yield reductions by 2040, especially in major crops like wheat, paddy, pulses, and oilseeds. This highlights the urgent need for climate-smart practices that boost resilience.

Farmers in many regions are already witnessing shifting sowing seasons and changing pest behaviour, further complicating crop management. Water-intensive cropping patterns, once sustainable, are becoming difficult to maintain as groundwater reserves shrink rapidly. These challenges underline the importance of adopting adaptive strategies such as stress-tolerant crop varieties, efficient irrigation methods, and diversified farming systems. Without such interventions, the combined impact of climate extremes could threaten both farmer incomes and national food security.

Technology in Agriculture: Driving the Next Green Revolution

Technological innovations are gradually transforming the way Indian farmers grow food. Tools that were once associated only with advanced countries are now entering Indian farms:

- Drones for pesticide spraying and crop monitoring
- Artificial Intelligence (AI) to forecast pest attacks and guide farm decisions
- Sensors and IoT devices that optimize fertilizer and water use

- Mobile advisory apps, offering customized recommendations

These technologies help reduce waste, lower input costs, and protect the environment. By 2040, large-scale adoption of digital agriculture could form the backbone of sustainable food production in India.

Rebuilding Soil Health: The Move Toward Natural and Regenerative Farming

Years of excessive chemical fertilizer use have weakened soil structure, reduced organic matter, and lowered long-term productivity. Many regions now face stagnant or declining yields.

To reverse this, farmers and states are increasingly embracing:

- Natural Farming techniques (such as ZBNF)
- Organic Farming
- Integrated Nutrient Management
- Crop diversification and intercropping

These practices improve soil fertility, enhance biodiversity and reduce dependency on chemical inputs. By 2040, a significant shift toward regenerative agriculture can help restore soil ecosystems and ensure healthier food production.

Water: The Most Critical Resource for India's Agricultural Future

India uses nearly 85% of its freshwater for agriculture. Yet many regions—like Punjab, Haryana, Maharashtra, and parts of Tamil Nadu—are witnessing alarming groundwater declines.

Sustainable water management will be central to India's agricultural future. Promising solutions include:

- Drip and sprinkler irrigation to reduce wastage

- Smart irrigation systems, guided by sensors
- Rainwater harvesting and farm ponds
- Switching to less water-intensive crops, such as millets

With efficient water use, India can secure both food production and long-term ecological balance by 2040.

Youth, FPOs, and Agri-Entrepreneurship: A New Rural Economy

A major change in the coming decades will be the role of India's youth. Many young people are now entering agriculture through new avenues such as:

- Agri-tech startups
- Drone service businesses
- Food processing units
- E-commerce platforms
- Farmer Producer Organizations (FPOs)

FPOs, in particular, are empowering small and marginal farmers through collective marketing, bulk input purchase, and better price negotiation. By 2040, a strong network of youth-led agri-enterprises can accelerate the shift towards sustainable farming.

Government Policies: Laying the Groundwork for 2040

India has introduced several policies that support sustainable agriculture:

- National Mission for Sustainable Agriculture (NMSA)
- PM-KUSUM scheme for solar pumps and renewable energy
- Digital Agriculture Mission
- Promotion of millets, recognized internationally in 2023
- Support for natural farming and FPOs

Long-term policy consistency and investment in rural infrastructure will help India reach its sustainability goals.

Can India Achieve Sustainable Farming by 2040

Achieving sustainable farming in India by 2040 is challenging but certainly within reach if the right actions are taken today. The country possesses strong scientific expertise, diverse agro-climatic zones, and a rapidly growing base of young innovators who are eager to modernize agriculture. However, large-scale transformation will require coordinated efforts across multiple fronts: farmers adopting climate-smart practices, policymakers ensuring stable long-term support, and researchers developing low-cost, locally adaptable technologies. Strengthening Farmer Producer Organizations, improving market linkages, promoting regenerative farming, and expanding digital tools can collectively accelerate the shift toward sustainability. If these strategies align effectively, India has the potential to not only secure its food future but also emerge as a global leader in sustainable agriculture by 2040.

Conclusion

India's food future is shaped by the choices we make today. With the right blend of technology, resource conservation, and farmer empowerment, the country can create a resilient and eco-friendly agricultural system. The path may be challenging, but a sustainable future by 2040 remains firmly achievable. Continued investment in climate-smart practices, stronger market support, and inclusive policies will play a crucial role. As farmers, researchers, and policymakers work together, India can move towards a food system that safeguards both livelihoods and the environment for generations to come.