

# Environment and Agricultural Sustainability in India: Issues and Prospects

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## Abstract

Agriculture has always been central to India's economy and society, providing livelihoods to a majority of the rural population. Over the decades, the sector has moved from traditional subsistence farming to high-input models introduced during the Green Revolution. While this transition increased food production, it has also led to serious environmental challenges such as soil degradation, water scarcity, biodiversity loss, and climate-related risks. These problems are further compounded by socio-economic issues, including the vulnerability of small and marginal farmers, policy imbalances, and inadequate market support for sustainable produce.

To address these challenges, sustainable agricultural practices are increasingly recognized as the way forward. Water-efficient technologies, including drip irrigation and rainwater harvesting, are vital for tackling water scarcity. At the policy level, reforms in subsidies, better pricing mechanisms, and investment in extension services can support farmers in adopting sustainable approaches. India's path towards agricultural sustainability demands collaborative efforts across stakeholders. With growing global commitments and technological innovations, the prospects for a sustainable agricultural future remain strong and achievable.

**Key Words:** Agricultural sustainability, Water-efficient, Subsistence farming, Livelihoods.

## Introduction

Agriculture has always been the backbone of India's economy and culture. For centuries, Indian society has depended on farming not only as a source of food but also as a way of life that shapes traditions, festivals, and livelihoods. Even today, more than half of India's population depends directly or indirectly on

agriculture for survival. Over the past seven decades, the country's agricultural landscape has witnessed major transformations. Traditional subsistence farming, characterized by low input and low output, gradually gave way to



more modern systems after the Green Revolution of the 1960s. The introduction of high-yielding varieties of seeds, chemical fertilizers, pesticides, and large-scale irrigation systems helped India achieve self-sufficiency in food production. Famines that once haunted the nation were replaced by food surpluses in certain crops, especially wheat and rice.

However, this remarkable achievement came at a cost. The very practices that boosted productivity also placed a heavy burden on the natural environment. Excessive use of chemical inputs degraded soils, over-extraction of groundwater created alarming water crises, and monocropping reduced biodiversity. At the same time, socio-economic challenges such as rural poverty, farmer indebtedness, and unequal access to resources became more visible. As the population continues to rise and climate change poses unpredictable threats, the question of sustainability in agriculture has become urgent. India must now strike a balance between ensuring food security and safeguarding the environment for future generations.

This essay explores the issues surrounding environment and agricultural sustainability in India. It examines the environmental challenges, socio-economic dimensions, possible pathways to sustainable farming, and the future prospects that lie

ahead. The aim is to show that agricultural sustainability in India is not merely a technical question but a deeply interconnected issue involving ecology, economy and society.

### **Environmental Challenges in Indian Agriculture**

One of the most serious problems facing Indian agriculture today is soil degradation. In the drive to increase yields, farmers often rely heavily on chemical fertilizers and pesticides. While these inputs boost production in the short run, their long-term impact is damaging. Excessive use of nitrogen and phosphorous leads to soil acidification, nutrient imbalance, and depletion of organic matter. As soil loses its natural fertility, farmers are forced to apply even more chemicals, creating a vicious cycle of dependency. In many regions, especially in Punjab and Haryana, soil health has deteriorated to such an extent that natural productivity has declined, threatening the future of farming itself.

Equally alarming is the loss of biodiversity in Indian agriculture. The Green Revolution encouraged monocropping of wheat and rice at the expense of traditional, diverse crops such as millets, pulses, and oilseeds. Genetic uniformity has made farming systems less resilient to pests, diseases, and climate shocks. India, once known for its rich variety of indigenous seeds, has witnessed the gradual disappearance of many local strains. This not only reduces resilience but also narrows the dietary diversity of the population, weakening nutritional security.

Lastly, the impact of climate change looms large over Indian farming. Erratic weather patterns, delayed monsoons, frequent droughts, and unseasonal rainfall disrupt cropping cycles and reduce yields. Small farmers in rain-fed areas are particularly vulnerable, as they lack irrigation facilities or financial buffers to cope with crop losses. Rising temperatures also threaten the productivity of key crops such as rice, wheat, and maize. In coastal regions, rising sea levels and salinity intrusion endanger fertile lands. Thus, environmental sustainability in agriculture is directly linked with the broader global challenge of climate change.

### **Socio-Economic Dimensions**

Environmental challenges cannot be separated from the socio-economic realities of Indian farmers. Farmer vulnerability remains a pressing issue. The majority of Indian farmers are small and marginal, owning less than two hectares of land. With limited resources, they struggle to invest in modern technologies or withstand environmental shocks. Debt is a common feature of rural life, and crop failures often push farmers into cycles of borrowing. Tragically, this vulnerability has been linked to widespread farmer suicides in several states.

Policy and institutional challenges further complicate matters. Government policies, while well-intentioned, often prioritize short-term productivity over long-term sustainability. Subsidies on fertilizers, electricity, and water, for example, encourage overuse of resources. Similarly, procurement policies favour wheat and rice, leading farmers to stick with these water-intensive crops even in unsuitable regions. Support for organic farming, agroecology, or natural farming remains limited compared to input-intensive models.

The market dynamics of agriculture also play a crucial role. Sustainable and organic produce often fails to fetch fair prices due to lack of awareness and weak consumer demand. Farmers rarely benefit from value addition or direct sales, as middlemen dominate the supply chain. Inadequate infrastructure for storage, processing, and transportation results in post-harvest losses, reducing farm incomes further. Unless markets are restructured to reward sustainability, farmers will find little incentive to change their practices.

### **Pathways to Sustainable Agriculture**

Despite these challenges, numerous pathways exist for making Indian agriculture more sustainable. The adoption of agroecological practices is one such approach. Agroecology emphasizes working with nature rather than against it. Practices such as crop rotation, intercropping, integrated pest management, and the use of organic manures help maintain soil fertility, conserve biodiversity, and reduce chemical dependence. Traditional knowledge, when combined with modern scientific innovations, can create resilient farming systems tailored to local

conditions.

Water efficiency is another key priority. Micro-irrigation technologies like drip and sprinkler systems have the potential to save up to 50 percent of water while increasing yields. Rainwater harvesting, revival of traditional water tanks, and recycling of wastewater can provide additional resources for farming. Equally important is educating farmers about water budgeting and the need to diversify away from water-intensive crops in drought-prone regions.

Policy reforms are essential for encouraging sustainable agriculture. Subsidies can be redesigned to support bio-fertilizers, organic inputs, and eco-friendly technologies instead of chemicals. Minimum Support Prices (MSP) could be extended to pulses, millets, and oilseeds to encourage crop diversification. Sustainability indicators, such as soil health or water-use efficiency, could be integrated into agricultural planning at both state and national levels.

Capacity building and extension services play a vital role in this transition. Farmers must be trained in low-cost, sustainable techniques and made aware of long-term benefits. Extension workers, NGOs, and digital platforms can act as channels for spreading knowledge. Farmer cooperatives and self-help groups can foster peer learning and collective action, reducing the risks of adopting new practices. Finally, strengthening market linkages is crucial. Organic certification, branding, and direct marketing channels can ensure farmers receive fair returns for sustainable produce. Urban consumers are increasingly health-conscious and willing to pay more for eco-friendly products, a trend that can be harnessed to support rural livelihoods. Public procurement for schools and hospitals can also be aligned with sustainable farming, creating steady demand.

#### **Prospects for the Future**

The future of Indian agriculture lies in embracing sustainability as a guiding principle. While the path is challenging, opportunities abound. Consumer demand for organic and natural foods is rising, not only in cities but also in export markets. Government initiatives such as the National Mission

on Sustainable Agriculture (NMSA) and the promotion of millets as “nutri-cereals” show growing recognition of the need for ecological balance.

Technological innovations also offer hope. Precision agriculture—using sensors, drones, and satellite imagery—can help farmers optimize input use and reduce waste. Biotechnology, when applied cautiously, may develop crop varieties resistant to climate stress. Digital platforms are connecting farmers directly to markets, reducing dependence on middlemen.

Equally important is the cultural shift towards valuing environmental stewardship. Farming communities across India are reviving traditional knowledge, experimenting with natural farming, and reconnecting with biodiversity. The international spotlight on climate change and the Sustainable Development Goals (SDGs) further strengthens the case for sustainable agriculture.

#### **Conclusion**

Agriculture in India is at a crossroads. The achievements of the past, while commendable, have exposed serious cracks in the ecological and social fabric of farming. The heavy use of chemicals, reckless water extraction, loss of biodiversity, and growing impact of climate change show that business as usual cannot continue. At the same time, the struggles of small and marginal farmers underline that sustainability is not only an environmental concern but also a social and economic necessity.

A true paradigm shift is required: from maximizing yields at any cost to nurturing balance, resilience, and equity. Policymakers, scientists, farmers, and consumers must work together to build systems that are productive yet sustainable, modern yet rooted in tradition, competitive yet inclusive. By embracing sustainable practices today, India can secure food for its people, livelihoods for its farmers, and health for its environment in the decades to come.

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