



Sustainable Development Goals and Pulse Production in India: A Structural, Ecological and Political–Economic Reassessment

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Abstract

The integration of agricultural sustainability with socio-economic transformation remains central to the global development discourse. In India, pulse production occupies a critical intersection between food security, ecological resilience, and rural livelihoods. This article presents a structural ecological and political–economic reassessment of pulse production in relation to the United Nations Sustainable Development Goals (SDGs). By situating India's pulse economy within the broader framework of global sustainability commitments, the paper critically examines production patterns, institutional arrangements, trade policies, environmental constraints, and distributional outcomes. Drawing on secondary data, policy documents, and contemporary research, the study evaluates the contribution of pulse cultivation toward SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 15 (Life on Land). The analysis reveals that pulses provide ecological services through nitrogen fixation, low water requirements, and soil restoration, yet structural constraints—including price volatility, market distortions, fragmented landholdings, and policy biases favoring cereals—limit their transformative potential. The paper argues for a political–economic reorientation that integrates agroecological principles, equitable market reforms, and institutional innovation. The findings contribute to ongoing debates on sustainable agriculture, emphasizing pulses as strategic crops for achieving inclusive and ecologically balanced development in India.

Keywords: Sustainable Development Goals, pulse production, agroecology, political economy, food security, India

1. Introduction

The adoption of the Sustainable Development Goals (SDGs) by the United Nations in 2015 marked a paradigm shift in global development policy. Unlike the Millennium Development Goals, the SDGs incorporate ecological sustainability, economic growth, and social equity into a unified framework. For agrarian economies such as India, agriculture serves as a foundational sector influencing poverty reduction, employment generation, food security, and environmental sustainability. Pulse production holds a distinct position within Indian agriculture. Pulses—including chickpea (gram), pigeon pea (arhar), lentil (masur), black gram (urad), and green gram (moong)—are primary sources of protein for a largely vegetarian population. India is the world's largest producer and consumer of pulses, yet productivity levels remain relatively low compared to global standards. Despite occupying about 20–22 percent of total cropped area under food grains, pulses contribute disproportionately to nutritional security and ecological balance. This article undertakes a structural ecological and political–economic reassessment of pulse production in India within the SDG framework. The objective is to evaluate whether current production patterns and policy frameworks align with sustainable development commitments and to propose reforms grounded in agroecology and distributive justice.

2. Conceptual Framework

2.1 Sustainable Development Goals and Agriculture

The 17 SDGs adopted by the United Nations provide an integrated blueprint for sustainable development by 2030. Among these, SDG 1 (No Poverty), SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 15 (Life on Land) are closely linked with agriculture. SDG 2 explicitly emphasizes sustainable food production systems and resilient agricultural practices. For India, where nearly half the workforce depends directly or indirectly on agriculture, progress toward these goals is inseparable from agrarian transformation.

2.2 Structural Ecological Perspective

The structural ecological approach examines how agricultural systems interact with ecological processes at macro and micro levels. Pulses contribute to:

- Biological nitrogen fixation
- Soil fertility restoration
- Reduced dependence on synthetic fertilizers
- Lower water intensity compared to rice and wheat

Thus, pulses are integral to ecological sustainability in rain-fed and semi-arid regions.

2.3 Political–Economic Perspective

A political–economic analysis focuses on state policies, market structures, trade regimes, and power relations influencing agricultural outcomes. In India, policy bias historically favored cereals under the Green Revolution strategy, marginalizing pulses in terms of irrigation, research investment, and procurement support.

3. Overview of Pulse Production in India

India accounts for roughly one-fourth of global pulse production. Major pulse-producing states include Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka, and Andhra Pradesh. Production has increased significantly in recent years due to improved varieties, price incentives, and government initiatives such as the National Food Security Mission (NFSM-Pulses). However, productivity remains constrained by:

- Rain-fed cultivation (over 80 percent area)
- Limited irrigation
- Small and fragmented landholdings
- Price volatility
- Post-harvest losses

The structural imbalance between cereals and pulses persists. While rice and wheat benefit from assured procurement and minimum support prices (MSPs), pulse procurement remains uneven across states.

4. Ecological Significance of Pulses

4.1 Nitrogen Fixation and Soil Health

Pulses host Rhizobium bacteria in root nodules, enabling biological nitrogen fixation. This reduces chemical fertilizer usage and improves soil structure. Studies indicate that pulses can fix 30–200 kg nitrogen per hectare annually, depending on species and conditions.

4.2 Water Use Efficiency

Compared to water-intensive crops such as rice, pulses require significantly less irrigation. In semi-arid zones, pulses adapt well to moisture stress and improve resilience against drought.

4.3 Climate Resilience

Pulse crops contribute to climate adaptation strategies. Their shorter duration and stress tolerance make them suitable for climate-affected regions. Incorporating pulses in crop rotations reduces greenhouse gas emissions linked to fertilizer production.

5. Pulses and SDG 1: Poverty Reduction

Agriculture employs a substantial share of rural households. Pulses are predominantly cultivated by small and marginal farmers. Enhancing productivity and ensuring remunerative prices can directly improve rural incomes. However, structural constraints undermine poverty reduction:

- Inadequate procurement infrastructure

- Limited access to credit
- Price crashes during bumper harvests
- Weak storage facilities

Institutional reforms, including Farmer Producer Organizations (FPOs) and digital market platforms, can strengthen farmers' bargaining power.

6. Pulses and SDG 2: Zero Hunger and Nutritional Security

Protein-energy malnutrition remains a significant challenge in India. Pulses provide affordable plant-based protein, dietary fiber, micronutrients (iron, zinc), and essential amino acids. The Public Distribution System (PDS) has gradually incorporated pulses in some states, yet universal access remains limited. Expanding pulse inclusion in welfare schemes can enhance dietary diversity.

7. Political Economy of Pulse Trade

India frequently imports pulses to stabilize domestic prices. Major exporting countries include Canada, Australia, and Myanmar. Import dependence exposes domestic markets to global price fluctuations. Trade liberalization policies have sometimes depressed domestic farm-gate prices, discouraging production. A calibrated trade strategy balancing domestic production incentives and consumer affordability is essential.

8. Institutional and Policy Framework

8.1 National Food Security Mission (NFSM-Pulses)

Launched to enhance pulse production, NFSM-Pulses promotes improved seeds, cluster demonstrations, and integrated nutrient management.

8.2 Minimum Support Price (MSP)

While MSPs are declared annually, effective procurement mechanisms are uneven. Strengthening procurement and decentralized storage systems can reduce farmer vulnerability.

9. Structural Constraints

1. **Technological Gaps** – Limited mechanization and adoption of improved varieties.
2. **Market Asymmetry** – Dominance of intermediaries.
3. **Land Fragmentation** – Reduced economies of scale.
4. **Climate Variability** – Increased risk exposure.

Addressing these constraints requires coordinated ecological and economic reforms.

10. Agroecological Transition and Sustainable Intensification

Agroecology integrates traditional knowledge with scientific innovation. Pulse-based cropping systems enhance biodiversity and soil regeneration. Policy measures may include:

- Incentivizing crop diversification
- Promoting integrated farming systems
- Expanding micro-irrigation

- Investing in research on climate-resilient varieties

11. Gender and Social Dimensions

Women contribute significantly to pulse cultivation and post-harvest processing. Empowering women farmers through land rights, credit access, and extension services strengthens SDG alignment.

12. Discussion: Structural Reassessment

The current production model reflects historical cereal-centric policies. A structural ecological and political–economic reassessment suggests:

- Rebalancing public investment toward pulses
- Aligning procurement with ecological priorities
- Strengthening rural institutions
- Integrating nutrition-sensitive agriculture policies

Pulses embody a convergence point where ecological sustainability and social justice intersect.

13. Policy Recommendations

1. Expand assured procurement across states.
2. Promote pulse-based crop rotations.
3. Integrate pulses in nutrition programs.
4. Enhance research and seed systems.
5. Implement climate-smart agriculture policies.
6. Support farmer collectives and digital marketing platforms.

14. Conclusion

Pulse production in India offers transformative potential for achieving multiple Sustainable Development Goals. From ecological restoration to nutritional security and poverty alleviation, pulses represent a strategic crop category capable of bridging structural inequities in agriculture. However, realizing this potential requires deliberate political–economic reforms, ecological integration, and institutional strengthening. A structural ecological and political–economic reassessment reveals that pulses must move from the margins of agricultural policy to its core. By aligning production incentives with sustainability objectives, India can leverage its pulse economy as a catalyst for inclusive and environmentally resilient development.

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