



Economics of Seed Certification and Quality Control in India: Issues, Mechanisms, and Way Forward

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Seed is the most fundamental input in agricultural production. The quality of seed directly determines germination rate, crop uniformity, yield potential, and ultimately the farmer's income and food security. Seed certification is the official process by which the quality of seed-including genetic purity, physical purity, germination capacity, and health-is verified and guaranteed to farmers before it reaches the field.

In India, the seed industry has grown significantly over the past five decades, transitioning from a state-dominated supply system to a mixed economy involving public sector agencies, private seed companies, cooperatives, and farmer-producer organizations. Yet, a significant proportion of farmers-especially in rainfed, tribal, and remote regions-continue to use farm-saved, uncertified seed that limits productivity and exposes them to varietal degradation over time.

The economics of seed certification encompasses the costs of running certification infrastructure, the price premium that certified seed commands in the market, the value addition it provides to farmers through yield improvement, and the systemic benefits to the agricultural supply chain. This article examines the concept, institutional framework, economics, key challenges, and policy directions for seed certification and quality control in India.

Concept and Types of Seed Certification

Seed certification is the process of ensuring that seed of notified varieties maintains genetic identity, physical purity, and freedom from disease across successive generations of seed production and distribution. It is administered through statutory seed certification agencies (SCAs) in each state under the Seeds Act, 1966.

Breeder Seed

The primary source of all certified seed, produced directly under the supervision of the plant breeder. It is the highest quality class with maximum genetic purity (100%). Breeder seed is used to produce Foundation Seed.

Foundation Seed

Produced from Breeder Seed under strict field and processing standards. It is the source for producing Certified Seed. Foundation Seed carries a white tag and must meet high standards for genetic purity (typically 99.5-99.9%) and germination.

Certified Seed

The seed class directly sold to farmers for commercial crop production. Produced from Foundation or Certified Seed (one generation). Carries a blue tag and must meet minimum standards for germination (typically 85%), physical purity (98%), and moisture content (8-12%) depending on the crop.

Truthfully Labelled (TL) Seed

Not formally certified but labelled honestly by the producer. This category provides a market-based quality assurance for private sector seed not covered under the official certification system. It is increasingly common for hybrid seeds of vegetable and horticultural crops.

Quality Declared Seed (QDS)

A simplified quality assurance system promoted by the FAO for resource-poor farmers in developing countries, where full certification infrastructure is unavailable. QDS relies on self-declaration by producers with periodic monitoring, reducing cost while maintaining basic standards.

Institutional Framework for Seed Certification in India

India's seed quality control system is governed by a multi-tier institutional architecture:

- Seeds Act, 1966: The principal legislation governing seed quality, certification, and regulation of the seed trade.
- Seeds (Control) Order, 1983: Regulates the sale, storage, and distribution of seed and mandates minimum seed quality standards.
- State Seed Certification Agencies (SCAs): Statutory bodies in each state responsible for field inspection, seed testing, and certification of seed lots.
- Central Seed Testing Laboratory (CSTL): The apex laboratory for seed testing, located in Varanasi; also provides appellate authority for disputed test results.
- State Seed Testing Laboratories (SSTLs): Conduct physical, germination, and health tests on seed lots submitted for certification.
- National Seed Corporation (NSC) and State Farms Corporation of India (SFCD): Public sector seed companies that produce Foundation and Certified Seed for distribution.
- Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA): Regulates variety registration and protects breeders' rights under the PPV&FR Act, 2001.

Benefits of Seed Certification and Quality Control**For Farmers**

- Assured germination percentage reduces the risk of poor plant stand and crop failure.
- Genetic purity ensures the expected agronomic performance and market value of the variety.
- Access to improved, high-yielding, and disease-resistant varieties through the formal seed supply chain.
- Certified seed eligibility for Input subsidies, crop insurance claims, and government procurement schemes.
- Reduced dependence on informal seed markets that may supply mislabelled or adulterated seed.

For Seed Producers and Companies

- Certification provides a quality guarantee that supports a price premium and consumer trust.
- Formal certification enables access to institutional procurement by NSC, NAFED, and state agencies.
- Documentation of seed lots facilitates traceability and brand building in competitive markets.

For the Agricultural Sector and Economy

- Increased crop yields contribute to national food security and agricultural GDP growth.
- Reduced crop variability improves supply chain predictability for processors and exporters.
- Quality seed infrastructure supports India's ambition to become a global seed hub—seed exports crossed ₹7,300 crore in 2023-24.
- Lower crop failure rates reduce demand for agricultural distress relief and insurance.

Challenges in Seed Certification and Quality Control

Despite the established framework, several systemic challenges constrain the effectiveness and reach of seed certification in India:

1. Capacity constraints: Seed Certification Agencies are understaffed and lack modern seed testing equipment, leading to backlogs in field inspections and lab analysis.
2. Fragmented seed sector: A large number of small, unorganised seed dealers and informal seed producers operate outside the certification system, undercutting certified seed prices.
3. Low certified seed replacement rate (SRR): India's national average SRR is around 30-35% against a target of 50%-meaning 65-70% of seed is farm-saved or uncertified.
4. Regulatory gaps: The Seeds Act, 1966 is outdated. The proposed Seeds Bill, 2004 (which was not enacted) aimed to modernise regulation; but reform has stalled for over two decades.
5. Counterfeit and spurious seed: Adulterated or mislabelled seed causes crop failures, farmer distress, and erosion of trust in formal seed supply chains.
6. Weak enforcement in remote areas: Quality monitoring is difficult in tribal belts, hilly terrains, and conflict-affected regions where state presence is limited.
7. Limited coverage of horticultural and vegetable crops: Certification infrastructure is heavily oriented toward major field crops, leaving vegetables, spices, and plantation crops under-served.
8. Farmer awareness deficit: Many small and marginal farmers are unaware of certified seed benefits, tag colours, or how to identify genuine certified seed in the market.

Way Forward and Policy Recommendations

1. Enact a New Seeds Act

The Seeds Act, 1966 must be replaced with comprehensive modern legislation that incorporates mandatory variety registration, stringent anti-counterfeiting provisions, consumer grievance redressal for seed failure, and integration with digital traceability systems.

2. Strengthen Seed Certification Infrastructure

State governments should invest in modernising Seed Testing Laboratories with ISTA-accredited equipment, increase field inspection staff, and automate report generation. A national online portal for real-time seed certification tracking should be established.

3. Increase Seed Replacement Rate (SRR)

The government should scale up Seed Village Programmes, Seed Hubs, and Farmer Producer Organisation (FPO)-based seed production clusters to make certified seed available within 5 km of every village at affordable prices, supported by targeted subsidies for smallholders.

4. Digital Seed Traceability

Each certified seed lot should be assigned a unique QR code traceable from breeder to farmer, integrated with the Unified Farmer Service Interface (UFSI) and PM-KISAN database. This will reduce counterfeit seed and enable rapid recall in case of quality failure.

5. Expand Quality Declared Seed (QDS) System

For crops and regions where full certification is impractical, the Quality Declared Seed system should be formally institutionalized with periodic third-party audits, farmer self-help group participation, and linkage with NABARD's micro-enterprise credit schemes.

6. Special Measures for Marginalised Farmers

Women farmers, small and marginal holders, and SC/ST cultivators should receive priority access to subsidised certified seed through targeted distribution drives, self-help groups and Mahila Kisan Sashaktikaran Pariyojana (MKSP) channels.

7. Awareness and Extension

Krishi Vigyan Kendras (KVKs), agricultural universities, and state extension departments should run awareness campaigns on seed tag colours, germination testing at home, and seed

complaint mechanisms. Mobile-based advisory platforms should include seed quality guidance modules.

Conclusion

Seed certification and quality control form the bedrock of agricultural productivity improvement in India. A certified seed is not merely a biological input-it is a quality guarantee that empowers farmers to invest with confidence in fertilizers, irrigation, and labour, knowing that the seed will perform as expected.

The economic returns to quality seed are well-documented: yield increases of 10-35% for certified over farm-saved seed, higher market prices for produce of uniform quality, and reduced crop failure rates. Yet, systemic challenges-outdated legislation, low SRR counterfeit seed, and weak enforcement-continue to undermine the full realisation of this potential.

The path forward requires a convergence of legal modernisation, institutional investment, digital innovation, and farmer-centric policy design. India's ambition to become a global seed hub by 2030 depends critically on building a seed quality system that farmers can trust-one that is accessible, affordable, and accountable from breeder to field.

Key Takeaway

Quality seed is the highest-return agricultural investment. Formalising and modernising India's seed certification system-through updated legislation, digital traceability, enhanced SRR, and farmer education-is not just a regulatory

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