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A Holistic Approach to Food Safety and Traceability for Consumer Protection in India

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ABSTRACT

India is the second-largest food producer in the world, yet its participation in global food trade remains limited due to persistent challenges related to food safety, quality assurance and traceability. Rapid urbanization, expansion of processed and ready-to-eat foods and increasing consumer reliance on packaged products have heightened concerns over food safety and transparency. This article examines India's food safety system through a holistic perspective, emphasizing the role of traceability in strengthening consumer protection and market credibility. Drawing on existing literature, policy reviews and empirical evidence, the study highlights key issues such as food adulteration, misleading labelling practices, poor hygiene standards, low consumer understanding of nutrition information and limited adoption of traceability systems, particularly in domestic supply chains. Although India has established a comprehensive regulatory framework under the Food Safety and Standards Act, 2006 and developed digital, export-oriented traceability platforms such as GrapeNet and TraceNet, their application remains largely confined to export commodities. The article underscores the potential of digital technologies, including QR codes, barcoding and blockchain to enhance transparency, facilitate rapid food recalls and build consumer trust. It concludes that strengthening enforcement, simplifying labelling regulations, expanding digital traceability to domestic markets, improving infrastructure and promoting consumer awareness are essential for ensuring food safety, protecting consumers and enhancing India's competitiveness in global food markets.

***Keywords*:** *Food safety, Traceability, Consumer protection, Food labelling*

Introduction

India ranks as the second-largest producer of food globally, yet its share in international food trade is less than 2.5 per cent. Despite substantial production of processed fruits, vegetables, cereals and animal products, India captures only around one per cent of the corresponding global market segments. Low yields, fragmented supply chains and quality issues at the primary production level continue to hinder India's export performance. At the same time, importing nations increasingly impose stringent standards related to safety, hygiene and traceability. Domestically, rising urbanization, growth of packaged foods and increased consumer dependence on ready-to-eat products have intensified the need for stringent food safety standards. Food safety has therefore emerged as a critical policy and industry focus. The complexity of India's food systems, from smallholder-dominated agriculture to rapidly expanding food processing and e-commerce sectors, demands a holistic approach to ensure safe and transparent food flows. The complexity of modern supply chains makes it critical to ensure safety and transparency at every stage. This article examines India's food safety regulatory environment and highlights the role of traceability as a key tool for consumer protection.

India's Food Safety Challenge

Producing food is only the first step. Ensuring that food is safe, nutritious and trustworthy is a much bigger challenge. Across India's food supply chain, several issues continue to weaken consumer confidence such as:

- **Adulteration** in products like milk, spices, oils and packaged foods
- **Confusing or incomplete labels** on food packets
- **Improper hygiene practices** in small restaurants and food stalls
- **Poor awareness** among consumers about reading food labels

- **Limited traceability**, making it difficult to track where food comes from
- **High post-harvest losses** and waste due to weak storage and handling systems

These issues collectively reduce the credibility of Indian food products and increase the risk of food-borne incidents.

Decoding Our Food Labels: Are We Really Informed?

Food labels should empower consumers. However, research indicates that India still has a long way to go.

- Sudershan *et al.* (2013) found that while 90 per cent of consumers reported reading food labels, most focused solely on manufacturing and expiry dates. Only one-third examined ingredients or nutritional facts.
- Elizabeth *et al.* (2015) reported that only 52 per cent of packaged foods met FSSAI nutrient labelling requirements, and only 27 per cent complied with Codex criteria.
- Snehasree *et al.* (2013) observed that adolescents found nutrition information on labels complex to understand.
- Studies from 2021 indicated that while awareness is increasing, comprehension remains low.
- Misleading claims like "sugar-free," "whole grain," "zero cholesterol" and "real fruit juice" often hide more than they reveal. Without strict rules and better awareness, consumers cannot make informed choices.

Why Traceability Matters More Than Ever

Traceability refers to the ability to track food products through production, processing and distribution stages. It is vital for food recalls, authentication of safety claims and building consumer trust. India has faced multiple export rejections such as EU bans on mangoes, US recalls of tuna, Russian restrictions on bovine meat and 2024 bans in Singapore and Hong Kong on certain spices, illustrating the consequences of weak traceability and monitoring.

A study by Eram *et al.* (2022) surveying 30 food enterprises revealed that 96.88 per cent used barcodes only for pricing, not origin traceability. Only 17 per cent understood traceability systems. Major constraints included lack of knowledge, high capital costs, poor infrastructure and limited skilled manpower.

Anjani *et al.* (2024) demonstrated that food safety awareness positively influences demand for hygienically produced milk. Education, access to information, gender, and age significantly shape awareness. The authors emphasize the need for credible certification and labelling systems.

Regulatory Framework for Food Safety

The Food Safety and Standards Authority of India (FSSAI), established under the Food Safety and Standards Act (FSSA), 2006, is the apex body responsible for regulating food safety in the country. Its mandate includes setting science-based standards, regulating production and distribution, overseeing food laboratories, contributing to international food standards and promoting consumer awareness. FSSAI issues three levels of licenses based on annual turnover, scale of operations and commodity category.

- **Registration:** For micro enterprises with turnover below ₹12 lakh per annum.
- **State License:** For businesses with turnover between ₹12 lakh and ₹20 crore.
- **Central License** for large enterprises (turnover > ₹20 crore), exporters and businesses operating across states.
- Sector-specific thresholds also determine the type of license; for example, dairy units above 2500 MT/day require central licensing, whereas hotels of 3-star and above need state licenses.

Standards and Certifications

- **Compulsory Standards** include mandatory national legislation governing food quality, safety, hygiene and labelling.
- **Voluntary Certifications** like **AGMARK**, **ISI** and **organic certifications** complement regulatory norms and enhance product credibility.
- **Codex Alimentarius-** India has been a Codex member since 1964. Codex standards covering pesticide residues, additives, hygiene codes and contaminants serve as global benchmarks and guide harmonization of India's food regulations with international norms.

Initiatives Toward Strengthening Food Safety

Supply-Side Initiatives

- Mandatory certified food safety supervisor in food establishments
- Training and capacity-building programs
- Benchmarking and certification schemes

Demand-Side Initiatives

- Anti-adulteration campaigns
- Front-of-pack nutrition labelling policies
- Eat Right India movement
- Promotion of healthy food choices

Sustainability Initiatives

- Reduction of food waste
- Greener supply chain practices
- Encouraging organic and residue-free production

India's Digital Tools for Food Tracking: Emerging technologies supporting traceability include:

- Barcoding and QR coding
- RFID tracking
- Blockchain-based data sharing
- IT-enabled monitoring platforms

India's export-oriented traceability systems include:

- **GrapeNet:** Tracks the export of grapes from farms to packing facilities.
- **AnarNet:** Monitors pomegranate exports.
- **HortiNet:** Covers a wide range of fruits and vegetables.
- **TraceNet:** Facilitates traceability for organic products under the National Programme for Organic Production.
- **Peanut.Net:** Ensures aflatoxin compliance in groundnut exports.

These platforms are designed to create transparent, verifiable digital records of production, testing and export processes. However, their use remains limited to export-focused commodities and domestic supply chains continue to lack structured traceability mechanisms.

Policy Recommendations

1. **Strengthened Enforcement:** Enhanced inspections, regular audits and penalties for non-compliance.
2. **Improved Labelling Framework:** Clearer, simplified labels and strict regulation of misleading claims.
3. **Digital Traceability Expansion:** Adoption of QR codes, barcodes and blockchain beyond export commodities.
4. **Capacity Building for Food Businesses:** Training on hygiene, documentation and digital systems.
5. **Consumer Education:** Awareness campaigns on nutrition labelling and safe food practices.
6. **Infrastructure Development:** Upgrading testing laboratories, cold-chain facilities and monitoring tools.
7. **Integration of Domestic and Export Systems:** Uniform safety standards across both markets.

Conclusion

India has made considerable progress in establishing regulatory structures and IT-based systems for food safety and traceability. Initiatives by FSSAI, APEDA and EIC reflect the growing emphasis on safe food handling, monitoring and export compliance. However, significant gaps persist in industry compliance, consumer understanding and the application of traceability in domestic supply chains. A holistic approach combining stronger enforcement, digital traceability, capacity building, transparent labelling and consumer education is essential for protecting consumers and enhancing India's competitiveness in the global food market. Strengthening these systems will also enable rapid responses to food-borne incidents and ensure safer, more accountable food supply chains across the country.

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