An Integrated Strategic Framework for Enhancing Efficiency and Resilience in the Organic Food Products Value Chain

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Abstract. India holds tremendous potential to emerge as a global leader in cost-competitive organic food production rooted in its indigenous agro ecological wisdom. However, considerable challenges constrain development of efficient value chains connecting organic farmers to growing consumer demand. Strategic interventions informed by evidence and alignment across public policy, private investment and farmer participation are essential to unlock the sector's full transformative promise. This review synthesizes academic research on the Indian organic food sector to identify key considerations for strengthening and enhancing the efficiency and resilience in the value chain. This paper addresses this need by analysing the existing challenges, identifying critical gaps, and proposing an integrated, stakeholder-driven framework to strengthen and optimise the organic food value chain. The concluding section integrates all the related elements into a proposed framework for enhancing and optimizing the organic value chain in the Indian context.

Keywords: VCA, Organic Food, Demand Dynamics**.**

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1. Introduction

India's organic food industry has grown quickly in recent years due to rising consumer health consciousness, growing knowledge of the negative effects of conventional agriculture, and growing export potential. According to global market reports, the organic food industry is projected to continue expanding at a significant rate, driven by both domestic consumption and international trade opportunities. In India, the sector holds immense potential due to its agrarian base, diverse crop varieties, and favourable climatic conditions for organic cultivation. But significant challenges remain in developing a robust organic value chain encompassing production, processing, distribution and retail. It requires analysis of diverse aspects including consumer attitudes and preferences, supply chain capabilities, policy interventions, food quality and safety standards, and sustainability impacts to formulate an effective framework to enhance and optimize the organic food system.

Key issues such as lack of standardised certification processes, inadequate supply chain infrastructure, limited farmer awareness, weak market linkages, and price volatility hinder the sector's ability to scale sustainably. Moreover, organic farmers often face difficulties in reaching high-value markets due to gaps in storage, transportation, and quality assurance.

The optimization of the organic food value chain is not merely an operational concern—it is a strategic necessity. A well-coordinated and technology-driven value chain can enhance transparency, reduce wastage, improve quality assurance, and ensure fair value distribution across stakeholders. Emerging technologies such as block chain, Internet of Things (IoT), and Artificial Intelligence (AI) offer promising avenues for improving traceability, forecasting demand, and streamlining logistics in organic supply chains.

Given the growing domestic demand, export potential, and environmental benefits of organic agriculture, there is an urgent need for a comprehensive framework that strengthens each link in the value chain while fostering collaboration among farmers, certification agencies, distributors, retailers, and policymakers. Such a framework can ensure that the organic food sector not only meets the needs of health-conscious consumers but also contributes meaningfully to sustainable rural development and ecological preservation.

2. Research Design

2.1 Need of the Study

The growing global demand for organic food products is driven by rising health consciousness, environmental sustainability concerns, and a preference for chemical-free agricultural practices. However, despite the market potential, the organic food sector faces significant challenges in India and globally. The value chain—from production and certification to processing, distribution, and retail—often remains fragmented and inefficient, resulting in higher costs, reduced competitiveness, and limited consumer access.

This study is necessary to develop an integrated framework that addresses these bottlenecks, leverages technology, and creates synergies among stakeholders—farmers, processors, distributors, retailers, and policymakers. A robust and optimised value chain can ensure that the organic food sector not only meets

growing domestic demand but also positions itself strongly in international markets, thereby contributing to rural development, public health, and environmental sustainability.

While numerous studies have examined organic farming practices, consumer perceptions, and market trends, limited research exists on developing a comprehensive and integrated framework to optimise the entire value chain of organic food products. Most existing literature focuses on isolated aspects—such as production methods, certification systems, or marketing strategies—without addressing the interlinkages and dependencies among these components.

2.2 Objective

The primary objective of this study is to provide a framework to strengthen and optimise the value chain of organic food products in India with emphasis on demand dynamics, sustainability, quality& safety, supply chain and policies and regulations through a systematic analysis of literature review.

2.3 Sources and Methods

The sources used in this study are secondary including publications in Elsevier, Inderscience, Emerald, Google Scholar, Taylor & Francis, and other online databases. In addition to this, a comprehensive review was conducted of working papers, discussion papers, and reports published by key regulatory institutions, including the Organic Trade Association (OTA), National Centre of Organic Farming (NCOF) under Ministry of Agriculture, National Programme for Organic Production (NPOP), FSSAI and other certification institutions. In addition, relevant literature on value chain of organic food including scholarly books and academic texts, was, examined to provide a robust theoretical foundation. The review has been done by using measures such as context of the research, objective, and research methodology including findings.

This review synthesizes academic research on the Indian organic food sector to identify key considerations for strengthening the value chain. The sources analysed comprise scholarly articles published in peer-reviewed journals, conference papers, project reports, and statistical data from government agencies and industry organizations. The review is structured around the following themes that emerged as salient factors in the literature: (I) consumer demand dynamics, (II) supply chain development, (III) policy and regulatory environment, (IV) food quality and safety, and (V) sustainability impacts. For each theme, the current status is assessed, challenges and opportunities highlighted, and potential interventions discussed based on evidence from the literature. The concluding section integrates these elements into a proposed framework for enhancing and optimizing the organic value chain in the Indian context.

I. Consumer Demand Dynamics

India’s organic food market has witnessed rapid growth from a relatively small base, yet per capita consumption remains well below global averages. Between 2014 and 2019, sales increased at an annual rate exceeding 15%, reaching INR 63.9 billion (Organic Trade Association, 2020). The Organic Trade Association’s 2025 Organic Market Report reveals strong momentum for the organic sector, with consumer demand fueling growth across

categories and organic outpacing the overall marketplace for the first time since 2020. The Indian organic food market is experiencing substantial growth, with a market size of USD 1,796.29 million in 2024, and a projected reach of USD 3,217.11 million by 2031, exhibiting a compound annual growth rate (CAGR) of 10.2%. This growth is fueled by increasing health awareness, a focus on wellness, and rising disposable incomes. While India is a net exporter of organic products, the domestic market is also expanding rapidly. Demand is primarily concentrated in metropolitan areas among affluent and educated consumers, though awareness of health and food safety is driving adoption in smaller towns as well (Kumar & Ali, 2019). Nevertheless, organic products still represent only a marginal portion of total food sales, suggesting considerable potential for future expansion.

Gaining insights into the attitudes, perceptions, and preferences that drive consumer behaviour is essential for promoting the adoption of organic food products. An empirical survey of 300 consumers in the Delhi-NCR region revealed that health benefits and food safety are the primary factors motivating consumers to pay premium prices, supplemented by considerations such as environmental sustainability, support for local farmers, and superior product quality (Mishra & Singh, 2016). Confidence in genuine certification and organic labeling helps address information gaps common in credence goods and has a positive impact on purchase intentions (Mishra & Sharma, 2014). Consumers are generally aware of organic food products, with existing users willing to pay a price premium of 6–10% for them. In contrast, non-users are only inclined to purchase organic options if they are priced similarly to conventional products. Key factors influencing organic food purchases include product availability and price, followed by environmental concerns and overall attitudes toward organic food. (Thaker & Jain, 2024). Additionally, viability and sustainability of the Indian organic food retail industry depend on the efficient management of the supply chain(Ezhilvani, 2023).

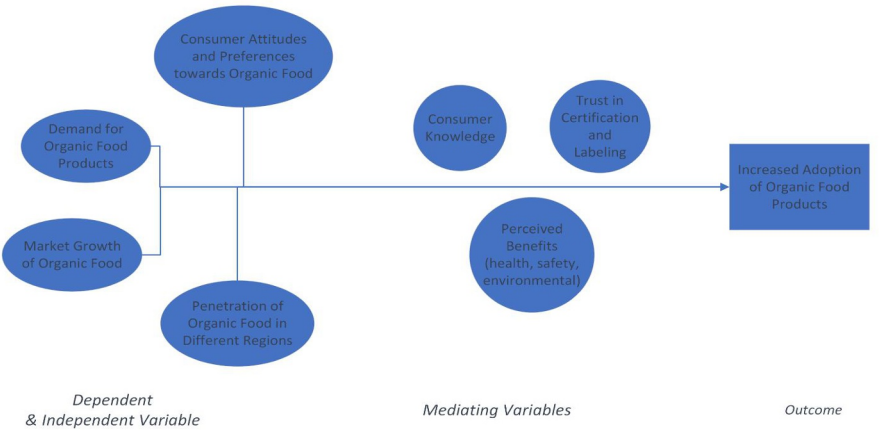

Fig. 1 Consumer Demand Dynamics

Doubt about quality claims, lack of availability, high prices and uneven awareness curb wider acceptance of organic foods (Patil 2020). Low accessibility outside major retail chains limits purchase opportunities, though farmers markets and specialty stores are bridging gaps in distribution (Bilal and Lal 2019). Targeted promotional strategies highlighting health, nutrition and ethical benefits are needed to convert positive consumer

attitudes into buying behaviour (Khan and Tuteja 2022). Engaging consumers through social media to shape preferences early and create advocacy is another demand lever (Chakrabarti 2010). Health Benefits, Income, Status-quo, Education and availability are found to be the drives of organic food products (Kalra & Dixit, 2020).

This Study indicates that growing Indian consumer segments view organic as a premium, aspirational product category aligned with health priorities and ethical values as shown in Fig. 1. Addressing concerns around authenticity, affordability and accessibility while raising awareness of personal and societal benefits can unlock significant latent demand.

II. Supply Chain Development

Connecting organic farmers to markets requires coordinated supply chain development encompassing production, aggregation, processing, storage, and transportation and retail functions as shown in Fig. 2. Capacity building is needed across the value chain to improve traceability, reduce spoilage and transaction costs, and ensure stable supply for market growth (Kharat and Zaware 2020).

Indian smallholder agriculture with fragmented landholdings poses challenges for consolidation and scale. Farmer collectives through cooperatives or contract farming arrangements can facilitate market linkages, input supplies, certification and technology access for small producers (Reddy 2018). Developing local enterprise clusters integrating forward linkages in storage, transport, processing and marketing is another model to enhance competitiveness (Singh and George 2019).

Cool chain infrastructure from farm gate to retail is crucial for perishable organic products but underdeveloped currently, leading to high wastage. Organized retail penetration for organic fare is still minimal outside major cities, with mom-and-pop kirana stores dominating distribution (Shetty et al. 2013). Scaling e-commerce and modern trade channels can expand availability beyond niche outlets, as long as transparent labelling and segregation practices are maintained (Vembu et al. 2013). Through the integration of blockchain technology within a well-designed system architecture, the proposed model delivers greater transparency, stronger traceability, and more efficient certification processes. It emphasizes key elements such as user-friendly interfaces, smart contracts, consensus mechanisms, IoT integration, and governance structures, demonstrating the practical application of blockchain in enhancing transparency and traceability across the entire food supply chain(Riouall & Rabhi,2024).By utilizing CNN-based regression models, the proposed system enables precise demand forecasting, reduces food wastage, optimizes resource utilization, and facilitates data-driven decisions in pricing and inventory management. This advanced forecasting method contributes to creating a more sustainable and efficient food supply chain in India (Rao, Sukumar et.al 2025)

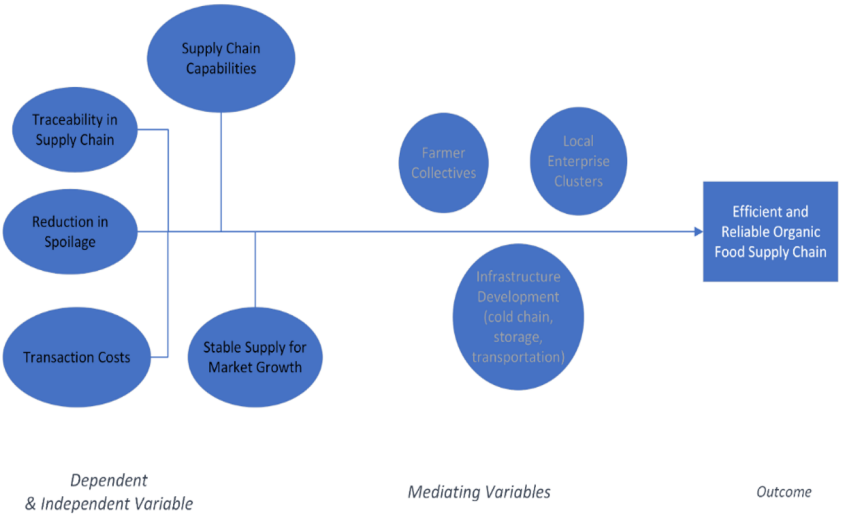

Fig. 2 Supply Chain Development

The supply chain requires significant investment across infrastructure; skills and technologies to deliver scale, minimize wastage and retain nutritional quality. Strategic government initiatives like National Program for Organic Production can catalyse development by subsidizing certification costs and promoting cluster formation (Sharma 2013). Partnerships between producers, processors and retailers will be pivotal to upgrade production to global standards while ensuring fair returns to farmers.

III. Policy and Regulatory Environment

Due to the credence nature of organic products, regulatory frameworks and standards are pivotal in influencing the sector's performance. At the production level, accredited third-party certification is critical for ensuring quality and fostering consumer trust. In India, the National Programme for Organic Production (NPOP) establishes the institutional structure for setting standards and implementing inspection systems (Bansal, 2018). Nonetheless, the high costs of certification pose a significant challenge for smallholder farmers, while complex documentation requirements discourage participation (Mukherjee et al., 2018). Simplifying and subsidizing the certification process could strengthen supply-side capacity and encourage broader adoption.

An agglomeration of government agencies regulates trade, exports and imports of organic foods, while individual states also have policies resulting in fragmentation (Chandrashekar 2010). A centralized nodal agency for oversight, reducing red tape and facilitating accreditation has been proposed to aid development (Kledal et al. 2010). Rationalizing taxes and import duties on organic inputs can make adoption more attractive for farmers relative to conventional agriculture.

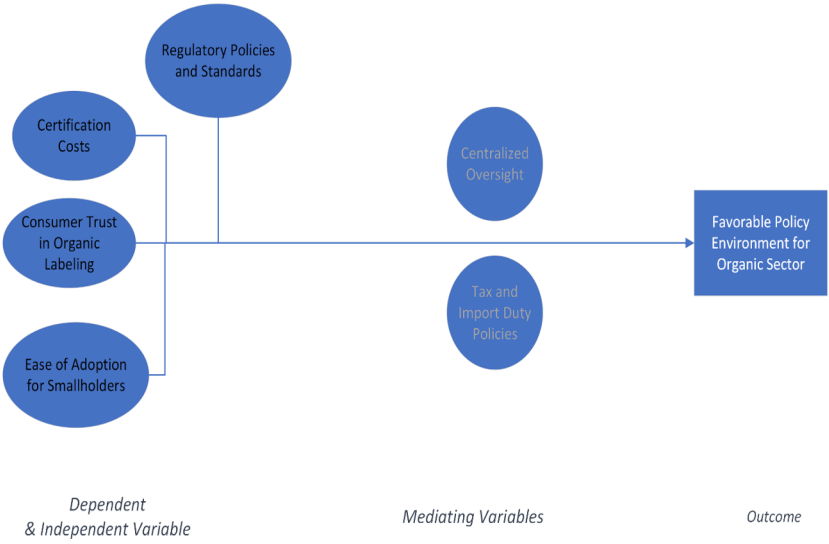

Fig.3 Policy and Regulatory Environment

At the consumer end, mandatory organic certification and labelling builds credibility and informs purchase decisions (Vembu et al. 2013). The proliferation of competing labels with varying criteria can confuse customers and allow green washing, highlighting the need for consumer education and awareness campaigns on standards (Ranjan et al. 2019). Critics argue that centralized regulations privileging export-oriented monocultures undermine alternative food networks serving local community needs (Kledal and Sulitang 2007).

Regulatory policies must balance competing objectives of food safety, farmer welfare and consumer trust with sector promotion. A favourable, transparent and streamlined policy environment will be critical for stimulating robust organic value chains Additionally, certification requirements such as use of "India Logo" is significant in building consumer trust, fostering market growth, and facilitating export opportunities for Indian organic products(Yadav et.al, 2024). The conceptual model of policy and regulatory environment is shown in Fig. 3.

IV. Food Quality and Safety

A key driver for organic food demand is perceived superiority in nutritional composition and safety relative to conventionally grown alternatives. However, scientific evidence presents a complex picture. Systematic reviews find organic fruits and vegetables contain substantially lower pesticide residues, but limited differences in key micronutrients based on current research (Rempelos et al. 2021; Smith-Spangler et al. 2012).

Meta-analyses identify significantly higher levels of antioxidants and polyphenols in organic foods which may confer health benefits, though long-term human trials are lacking (Barański et al. 2014; Średnicka-Tober et al. 2016). Organic animal products exhibit more favorable fatty acid composition (Średnicka-Tober et al. 2016). But effects are variable across studies and impacted by myriad agronomic and environmental factors (Lairon

2010). Controlled field experiments represent a crucial avenue for future research, as they allow for the isolation and measurement of the specific impacts attributable to organic farming methods.

Contamination risks also require assessment as no universal production system guarantees absolute food safety (Magkos et al. 2006). Concerns around pathogens, heavy metal accumulation and mycotoxin contamination apply to both conventional and organic farming (Rembiałkowska 2007). Good agricultural practices with robust quality management systems are essential to manage risks across diverse contexts (FAO and WHO 2008).

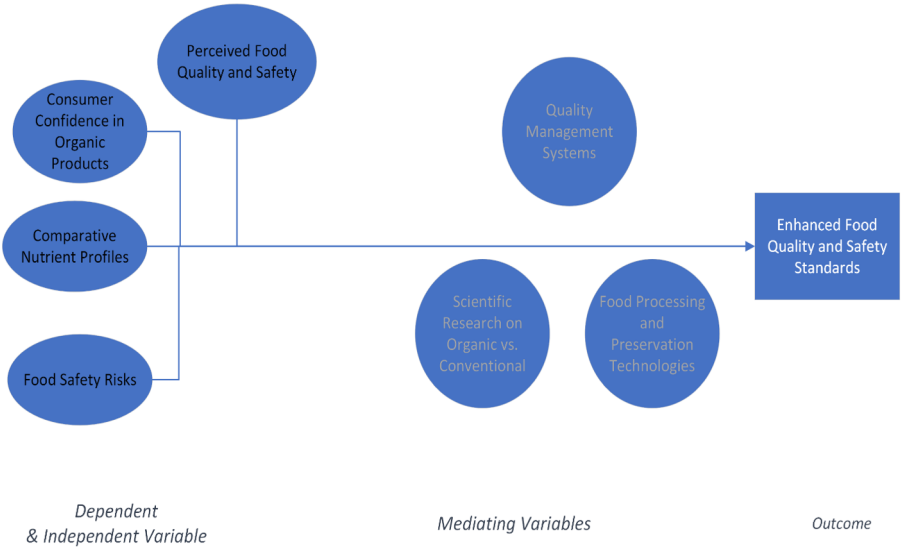

Fig. 1 Food Quality and Safety

On-going innovation in organic food processing and preservation technologies can help retain nutritional quality and sensory attributes while ensuring safety and shelf-life (Röös and Törslett 2017). Environmentally sustainable packaging solutions are also pertinent to uphold integrity along supply chains (Marsh and Bugusu 2007). Evidence-based food safety and quality standards should guide sector development to deliver wholesome, nutritious products. The assessment of food quality and safety is depicted in Fig. 4.

V. Sustainability Impacts

A core premise for organic agriculture is enhancing ecosystem services and environmental sustainability vis-à-vis input-intensive conventional farming. Meta-analyses indicate organic production has large benefits for biodiversity, soil quality, water purity and other ecological parameters compared to conventional methods (Lechenet et al. 2017; Tuomisto et al. 2012). But context-specific variables including prior land use and baseline biodiversity influence relative outcomes (Hole et al. 2005).

Yield comparisons are complex, with organic farms exhibiting lower average output for many crops but also greater stability under extreme weather events, fewer crop failures and climate resilience advantages (Reganold

and Wachter 2016). Productivity depends on complementary practices in crop rotations, integrated pest management and efficient water use suited to local conditions (Seufert et al. 2012). Thoughtful system design and not just input restrictions are required to raise yields (Reeve et al. 2016). using websites and social media forums to disseminate green marketing information and reaching out to consumers using creative and interesting content, can further the cause of green marketing (Madduri & Niveditha, 2025).

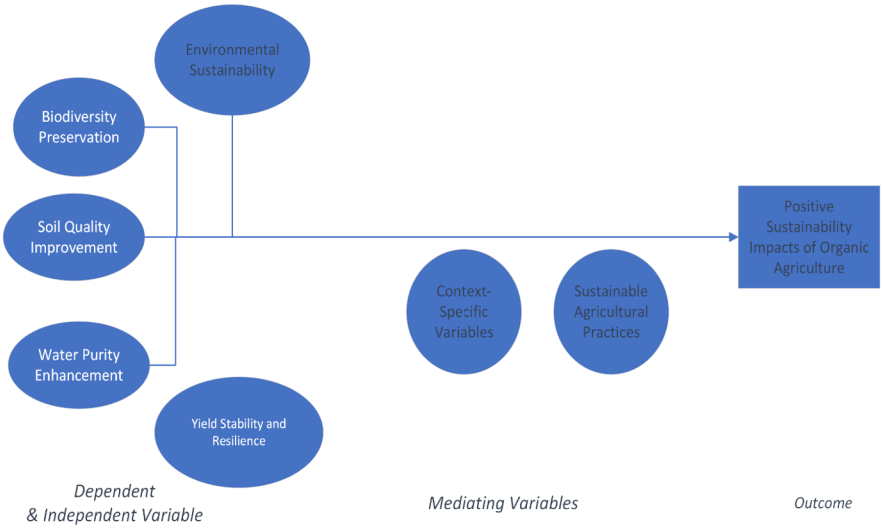

Fig. 5 Sustainability Impacts

Transition costs, profitability and livelihood impacts are critical in evaluating large-scale adoption among smallholders. Modelling Indian scenarios indicates organic production is more profitable for farmers due to lower input costs, but public support is essential during conversion (Panneerselvam et al. 2012). More empirical research is warranted on the relative costs, yields and returns across contexts to guide policies that enhance livelihoods while maintaining environmental sustainability. The relationship for the same is highlighted in Fig. 5.

3. Proposed Framework to Enhance and Optimize the Organic Value Chain

Synthesizing key aspects from the literature is shown in Fig. 6, the following priority areas are recommended as part of a comprehensive framework to strengthen the Indian organic food system:

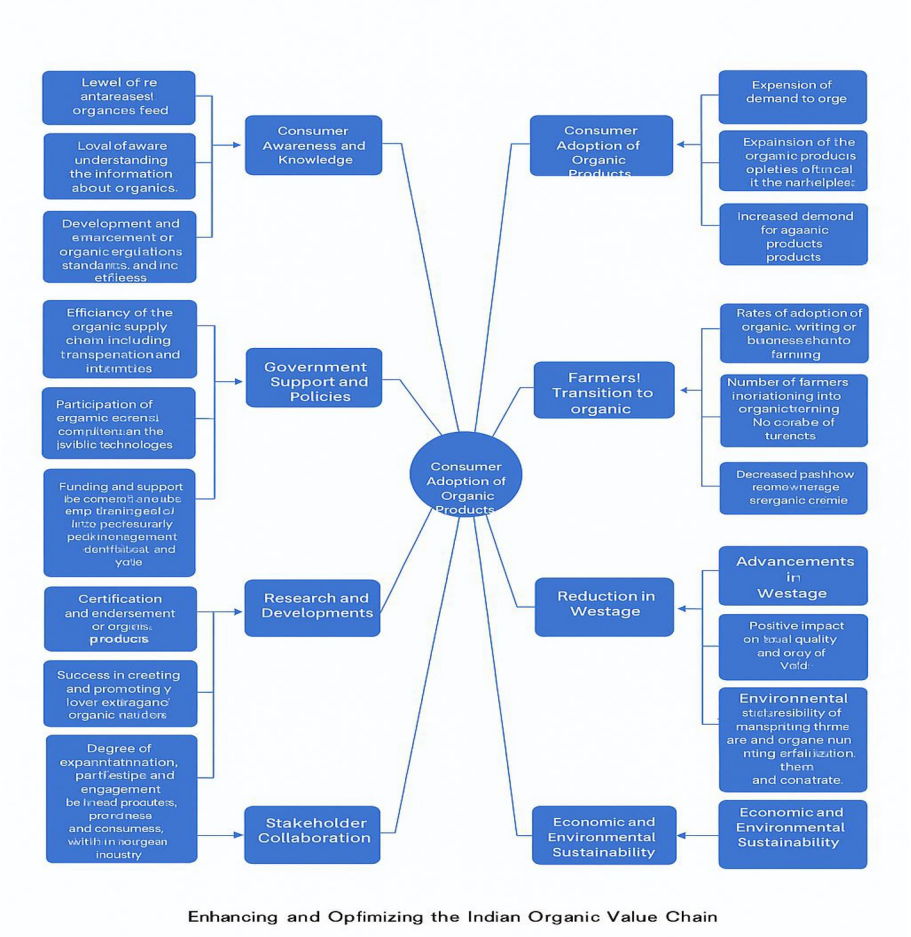

Fig. 6 Proposed Framework

The growth and optimization of India's organic value chain require a holistic approach that integrates consumer awareness, government support, supply chain efficiency, research, local branding, and stakeholder collaboration. By strengthening each of these pillars, the sector can achieve higher consumer trust, increased adoption of organic products, improved farmer participation, reduced wastage, and sustainable economic growth. These efforts not only enhance food quality and safety but also contribute to environmental preservation, biodiversity, and long-term viability for smallholder farmers, ensuring that India's organic sector thrives in both domestic and global markets.

4. Conclusion

With its deep-rooted indigenous agro-ecological knowledge, India has great potential to become a global leader in the production of organic food that is both affordable and sustainable. However, considerable challenges constrain development of efficient value chains connecting organic farmers to growing consumer demand. Strategic interventions informed by evidence and alignment across public policy, private investment and farmer participation are essential to unlock the sector's full transformative promise. This literature review has aimed to compile knowledge from academic studies on critical leverage points to strengthen organic value networks in relation to consumer attitudes, supply chain capabilities, regulatory environment, food quality and sustainability. The proposed framework provides broad directions for enhancing and optimizing the organic food system in India to achieve scale, integrity and impact. Further interdisciplinary research incorporating voices of diverse stakeholders can enrich understanding and guide inclusive, context-specific solutions. India stands at a pivotal juncture to integrate organic food production with nutrition security, ecological sustainability and rural development priorities.

References

1. Magkos, F., Arvaniti, F., Zampelas, A.: Putting the safety of organic food into perspective. Nutr. Res. Rev. 16(2), 211–222 (2006). https://doi.org/10.1079/nrr200361
2. Kledal, P.R., Sulitang, T.: The organization of organic vegetable supply chains in China – flexible property rights and different regimes of smallholder inclusion. In: 106th EAAE Seminar, Montpellier, France, pp. 7916 (2007). European Association of Agricultural Economists
3. Kledal, P. et al.: Organic food and farming in Kenya. In: Willer, H., Kilcher, L. (eds.) The World of Organic Agriculture – Statistics and Emerging Trends. IFOAM, Bonn (2010)
4. Lairon, D.: Nutritional quality and safety of organic food. In: Lichtfouse, E. (ed.) Sustainable Agriculture, vol. 2, pp. 99–110. Springer, Dordrecht (2011). https://doi.org/10.1007/978-94-007-0394-0_7
5. Chandrashekar, H.M.: Changing scenario of organic farming in India: an overview. Int. NGOJ 5(2), 34–39 (2010)
6. Panneerselvam, S.: Food retail and retail supply chain in India – literature review. Int. J. Res. IT Manag. Eng. 2(3), 80–100 (2012)
7. Sharma, N., Sharma, S., Kumar, S., Joshi, R.: Dissipation and harvest time residue of 2, 4-D in soil and wheat crop. Indian J. Weed Sci. 45(1), 68–70 (2013)
8. Reganold, J.P., Wachter, J.M.: Organic agriculture in the twenty-first century. Nat. Plants 2, 15221 (2016). https://doi.org/10.1038/nplants.2015.221
9. Singh, V.K.: Soil physical properties, yield trends and economics after five years of conservation agriculture based rice–maize system in north-western India. Soil Tillage Res. 155, 133–148 (2016)
10. Yadav, O.P., Prasanna, B.M., Yadava, P., Jat, S.L., Kumar, D., Dhillon, B.S., Solanki, I.S., Sandhu, J.S.: Doubling maize (Zea mays) production of India by 2025 – challenges and opportunities. Indian J. Agric. Sci. 86(4) (2016). https://doi.org/10.56093/ijas.v86i4.57427
11. Średnicka-Tober, D. et al.: Composition differences between organic and conventional meat: a systematic literature review and meta-analysis. Br. J. Nutr. 115(6), 994–1011 (2016). https://doi.org/10.1017/S0007114515005073
12. Lechenet, M. et al.: Reducing pesticide use while preserving crop productivity and profitability on arable farms. Nat. Plants 3, 17008 (2017). https://doi.org/10.1038/nplants.2017.8
13. Ranjan, P. et al.: Analysis of pearl millet market structure and value chain in India. J. Agribus. Dev. Emerg. Econ. 8(2), 406–424 (2018). https://doi.org/10.1108/JADEE-02-2016-0007
14. Prokopy, L.S., Y.J.: Understanding barriers and opportunities for adoption of conservation practices on rented farmland. Land Use Policy 80, 214–223 (2019). https://doi.org/10.1016/j.landusepol.2018.09.039
15. Sharma, P., Gummagolmath, K.C.: Reforming guar industry in India: issues and strategies (n.d.)

16. Kumar, A., Singh, H., Kumar, S., Mittal, S.: Value chains of agricultural commodities and their role in food security and poverty alleviation – synthesis (n.d.)
17. Shalendra, Gummagolmath, K.C., Sharma, P., Patil, S.: Role of pulses in the food and nutritional security in India (n.d.)
18. Kumar, S.C.A.V., Prasad, C.S.: Social innovations in organic foods in rainfed India: the case of Dharani FaM Coop Ltd. In: Bassi, A., Kato, M. (eds.) Cooperatives and Social Innovation, pp. 165–182. Springer, Singapore (2020). https://doi.org/10.1007/978-981-15-8880-8_12
19. Cohen, A.J.: Negotiating the value chain: a study of surplus and distribution in Indian markets for food. Law Soc. Inq. 45(2), 460–492 (2020). https://doi.org/10.1017/lsi.2019.49
20. Kalra, S. et al.: Impact of consumer perception on demand of organic food products in India. Int. J. Sci. Technol. Res. 9(2), 2277–8616 (2020)
21. Priyadarshi, R., Routroy, S., Kant, G.: Analyzing the post-harvest supply chain enablers of vertical integration for rural employability and marketability. J. Bus. Ind. Mark. 37(3), 529–548 (2021). https://doi.org/10.1108/JBIM-04-2020-0182
22. Rempelos, L. et al.: Integrated soil and crop management in organic agriculture: a logical framework to ensure food quality and human health? Agronomy 11(12), 2494 (2021). https://doi.org/10.3390/agronomy11122494
23. Khan, I., Tuteja, R.: Healthy food through health care segment in the emerging market of India: a two-decade review of the attitude of organic food consumers. Acta Univ. Bohem. Merid. 25(2), 91–98 (2022)
24. Ezhilvani, C.M.: Investigating the supply chain dynamics of the organic food retail market in India – with case studies. Int. J. Sci. Dev. Res. 8(5), 2455–2631 (2023)
25. Bisheko, M.J., G., R.: A study on farmers' perceptions about the scope of the Kisan Suvidha app in improving agricultural sustainability. In: Proc. 2023 Conf. Inf. Commun. Technol. Soc. (ICTAS), pp. 1–6 (2023)
26. Thaker, D.K., Jain, D.: Insight on organic food products in India. Int. J. Res. Anal. Rev. 6(1) (2019/2024)
27. Rao, K.M. et al.: Enhancing food supply chain efficiency using AI-based demand forecasting. Int. J. Eng. Res. Sci. Technol. 21(3(1)), 565–574 (2025). https://doi.org/10.62643/ijerst.v21.n3(1).pp565-574
28. Organic Trade Association: https://ota.com/ (accessed 2025)
29. National Centre for Organic and Natural Farming: https://nconf.dac.gov.in/ (accessed 2025)
30. Agricultural and Processed Food Products Export Development Authority (APEDA): https://apeda.gov.in/national-programme-for-organic-production-npop (accessed 2025)