I J C R M
International Journal of Contemporary Research In Multidisciplinary

*Research Article*

# Production, Productivity, and Export Potential of Shahi Litchi in Bihar: Opportunities and Challenges

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**DOI:** https://doi.org/10.5281/zenodo.16739227

## Abstract

Bihar, especially the Muzaffarpur district, is recognized as the heartland of litchi cultivation in India. Among its varieties, the Shahi Litchi stands out due to its early maturity, distinctive flavor, and rich aroma. In 2018, it was granted the Geographical Indication (GI) tag, placing it among India's premium horticultural products. Despite accounting for nearly 40% of the nation's litchi production, the state faces a paradox: while the fruit is widely loved and in demand, its export volume remains low. This research paper critically examines the trends in the area under cultivation, production, and productivity of Shahi Litchi, highlighting key infrastructural and policy challenges. It also evaluates the export potential of this fruit and suggests ways to integrate Bihar's litchi economy with global markets. Primary data from field surveys and secondary data from authentic sources such as the Department of Horticulture (Govt. of Bihar), National Horticulture Board, APEDA, and the National Research Centre on Litchi (NRCL) are used to support the analysis.

## Manuscript Information

- **ISSN No:** 2583-7397
- **Received:** 16-06-2025
- **Accepted:** 27-07-2025
- **Published:** 04-08-2025
- **IJCRM:**4(4); 2025: 406-413
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- **Plagiarism Checked:** Yes
- **Peer Review Process:** Yes

## How to Cite this Article

Kumar S, Hassan I. Production, Productivity, and Export Potential of Shahi Litchi in Bihar: Opportunities and Challenges. Int J Contemp Res Multidiscip. 2025;4(4):406-413.

**Access this Article Online**

www.multiarticlesjournal.com

**KEYWORDS:** National Research Centre on Litchi (NRCL), National Horticulture Board, agricultural diversity, crop advisories


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## 1. INTRODUCTION

India, with its rich agricultural diversity, stands as a global leader in the cultivation of numerous horticultural crops. Among them, the litchi (Litchi chinensis) occupies a unique place due to its delicate flavor, vibrant appearance, and significant socio-economic value. This subtropical fruit, originally believed to have been domesticated in Southern China nearly two millennia ago, has seamlessly adapted to the humid climate of Northern India. Today, India is the second-largest producer of litchi in the world, trailing only China, with Bihar emerging as the most prominent hub of litchi cultivation in the country.

Bihar's dominance in the litchi sector is attributed largely to the Shahi Litchi — a premium cultivar that has become synonymous with the fertile plains of Muzaffarpur district. The name "Shahi," meaning royal, aptly reflects the fruit's distinguished characteristics: bright pink-red skin, translucent pulp, small seed, high juice content, and a unique sweet fragrance. Cultivated predominantly in Muzaffarpur and adjoining districts like Vaishali, Samastipur, Sitamarhi, and East Champaran, Shahi Litchi has carved out a niche both in domestic markets and, increasingly, in global circles.

The strategic significance of Shahi Litchi was formally acknowledged in 2018 when it was awarded the coveted Geographical Indication (GI) tag by the Government of India. The GI recognition not only safeguards the authenticity of the product but also enhances its potential for branding and international trade. This milestone has generated new interest among policymakers, farmers, exporters, and researchers in unlocking the economic potential of this delicacy.

Despite such recognition, the sector remains beset with several constraints. While Bihar contributes close to 40–45% of India's total litchi production, its share in litchi export remains marginal. Most of the production is consumed domestically, with a significant chunk sold in raw form at local markets or transported to metro cities like Delhi, Kolkata, and Mumbai. Only a minuscule portion makes it to international markets, owing to a lack of processing units, cold chain infrastructure, and export-grade certification facilities. As a result, the vast potential of Shahi Litchi in boosting rural incomes, promoting agro-based industries, and enhancing India's soft power through food diplomacy remains untapped.

The horticultural economy of Bihar is highly dependent on the seasonal success of such high-value crops. With an average of 8.2 metric tonnes per hectare productivity (as per NRCL and Department of Horticulture data), Shahi Litchi orchards provide seasonal employment to thousands of farm families, labourers, and fruit contractors. During the months of May and June, litchi harvesting transforms the local economy — markets become vibrant, transport services are in high demand, and ancillary services such as packaging, grading, and loading flourish temporarily. However, this seasonal boom also highlights a critical vulnerability: the absence of robust post-harvest systems, value chain linkages, and organized market platforms.

Moreover, climatic variability is increasingly becoming a threat to stable litchi production. Shahi Litchi requires a specific temperature and moisture regime during its flowering and fruit-setting stages, typically between February and April. A sudden rise in temperature, unseasonal rainfall, or hailstorms can significantly affect fruit quality and yield. The 2021 and 2023 harvest seasons witnessed substantial damage due to weather anomalies, reinforcing the urgency of adopting climate-resilient practices and predictive weather-based crop advisories.

Another under-addressed issue is the dominance of informal and traditional marketing structures in the litchi trade. Most growers, particularly small and marginal farmers, depend on pre-harvest contractors who purchase the entire orchard output well in advance — often at prices much below the market value. These middlemen, while providing immediate liquidity and risk mitigation to the farmers, also capture a disproportionate share of the value, leaving the primary producer with minimal profit. In the absence of minimum support prices (MSP), price stabilization funds, or organized cooperatives, farmers are left vulnerable to market fluctuations and exploitative practices.

This research paper seeks to delve into these interconnected issues by conducting a thorough investigation into the production, productivity, and export potential of Shahi Litchi in Bihar. It utilizes a mix of primary data (drawn from surveys and field interactions with litchi farmers in Muzaffarpur district) and secondary data sourced from reliable institutional databases including the Department of Horticulture, Government of Bihar, National Horticulture Board (NHB), National Research Centre on Litchi (NRCL), and Agricultural and Processed Food Products Export Development Authority (APEDA).

The core objectives of this study are to:

- Trace historical trends in the area, yield, and volume of Shahi Litchi production.
- Examine the structural, climatic, and market-related challenges faced by litchi growers in Bihar.
- Evaluate the existing policy framework, including government schemes and institutional support mechanisms.
- Assess the potential of Shahi Litchi in domestic and international markets, especially in light of the GI tag.
- Propose actionable recommendations to enhance production efficiency, reduce post-harvest losses, and strengthen the export ecosystem

### 2. Area, Production, and Productivity Trends:

Over the past decade, Bihar has maintained its position as India's leading litchi-producing state, with a significant portion of its cultivation dedicated to the high-value Shahi Litchi variety. The litchi sector, particularly in Muzaffarpur and adjoining districts such as Vaishali, Samastipur, Sitamarhi, East Champaran, and Darbhanga, has become a pillar of the region's horticultural economy. Despite environmental challenges and infrastructural limitations, both the area under litchi cultivation and the gross production volume have registered consistent growth in recent years.

Based on the official statistics from the Department of Horticulture, Government of Bihar, and the National Research Centre on Litchi (NRCL), Muzaffarpur, the following table


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illustrates the trend in area, production, and productivity of litchi in Bihar over a five-year period:

| Year | Area under Cultivation (ha) | Total Production (MT) | Productivity (MT/ha) |
|---|---|---|---|
| 2018 | 32,000 | 260,000 | 8.10 |
| 2019 | 32,500 | 265,000 | 8.15 |
| 2020 | 33,000 | 270,000 | 8.20 |
| 2021 | 33,500 | 275,000 | 8.21 |
| 2022 | 34,000 | 280,000 | 8.24 |

***Source*:** Department of Horticulture, Bihar; NRCL Annual Reports (2018–2022) [16]

The data shows a cumulative increase of 2,000 hectares in the area under litchi cultivation and a net production increase of 20,000 metric tonnes (MT) over five years. However, the productivity rate — measured in metric tonnes per hectare — has seen only a modest rise from 8.10 MT/ha in 2018 to 8.24 MT/ha in 2022. This limited growth in productivity highlights underlying issues in orchard management, soil health, and technology adoption.

Several critical factors explain why productivity has not improved in proportion to the expansion in cultivated area:

1. **Aging Orchards:** A large number of litchi trees, particularly in traditional orchards of Muzaffarpur, are more than 25–30 years old. These older trees, while once highly productive, now exhibit declining yields due to physiological fatigue, poor pruning, and insufficient nutrient support. Rejuvenation programs, though proposed, are yet to be implemented at scale.
2. **Lack of Scientific Cultivation Practices:** According to NRCL field studies, over 70% of litchi farmers continue to follow traditional practices, with little exposure to modern horticultural techniques such as canopy management, soil testing, organic mulching, and integrated pest management (IPM). This limits the crop's potential yield and quality.
3. **Inadequate Irrigation Infrastructure:** Despite litchi's sensitivity to water stress, a majority of the orchards in Bihar rely solely on rainfall or traditional shallow wells. Adoption of drip irrigation and micro-sprinklers, which can improve water use efficiency and fruit size, remains extremely limited.
4. **Climatic Fluctuations:** Litchi production is highly susceptible to weather anomalies. The critical flowering and fruit-setting stages fall between February and April, a period increasingly affected by heatwaves, hailstorms, and unseasonal rainfall. The 2021 season, for instance, recorded yield losses of 5–7% in several blocks due to sudden temperature surges.
5. **Soil Nutrient Imbalance:** Long-term cultivation without proper soil amendments has led to declining micronutrient availability in many orchards. NRCL has highlighted boron and zinc deficiency as a significant concern affecting fruit development and shelf life.
6. **Limited Extension Services:** Bihar's agricultural extension system is understaffed and under-resourced. As a result, awareness about Good Agricultural Practices (GAP), training modules, and government schemes does not reach the grassroots effectively.

In contrast to the marginal productivity gains in Bihar, states like Punjab and Uttarakhand have achieved productivity levels exceeding 10 MT/ha through structured interventions such as high-density plantation models, research-farmer linkages, and packhouse-linked market access. This comparison underscores the need for Bihar to pivot from horizontal expansion (area increase) to vertical improvement (productivity enhancement) by focusing on quality planting materials, orchard rejuvenation, and technology adoption.

In summary, while the consistent growth in cultivation area reflects a strong market demand and farmer interest, Bihar's litchi sector must now shift focus toward improving per hectare yield and fruit quality. A strategic blend of scientific interventions, institutional support, and farmer engagement can significantly boost productivity, reduce pre-harvest losses, and improve farm income in the Shahi Litchi economy

## 3. Challenges in Production and Quality Maintenance:

The cultivation of Shahi Litchi in Bihar, despite being recognized for its premium quality and commanding a Geographical Indication (GI) tag, faces a multitude of production-related and quality maintenance challenges. These issues, rooted in biological, environmental, and institutional factors, have a cumulative effect on productivity, fruit quality, and market competitiveness. A comprehensive understanding of these challenges is essential to guide effective policy and technical interventions.

### Aging Orchards and Declining Productivity

One of the foremost problems identified in the litchi belt of Bihar is the widespread aging of orchards. According to a study by Chaudhary and Ramachandran (2022) [7], nearly 40% of the litchi orchards in Muzaffarpur district are over two decades old, resulting in reduced yield and increased susceptibility to diseases. Older trees are less responsive to fertilization, pruning, and pest management interventions, thereby contributing to stagnation in productivity, which has remained around 8.2 MT/ha for several years (Department of Horticulture, Bihar, 2022) [1, 8].

Litchi growers in Bihar are increasingly troubled by pest infestations and plant diseases that directly impact fruit quality. The litchi mite (Aceria litchii), for instance, causes severe skin blemishes, while the fruit borer (Conopomorpha sinensis) results in internal fruit damage. Janmejay *et al*. (2022) [11] reported that pest-related losses can account for up to 25% of yield in unmanaged orchards. Additionally, fungal pathogens like anthracnose (Colletotrichum gloeosporioides) and sooty mold contribute to defoliation and poor fruit set, particularly in humid post-rainfall conditions. Despite the availability of Integrated Pest Management (IPM) protocols, adoption remains limited due to lack of field-level extension.


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**Climatic Vulnerability**

Litchi is a climate-sensitive fruit, and its successful cultivation depends heavily on synchronized temperature and moisture conditions. The flowering and fruit-setting phase between February and April is particularly vulnerable. NRCL (2021) notes that an increase in pre-monsoon temperatures, combined with erratic rainfall, disrupts pollination and accelerates fruit cracking and drop. For example, in 2021, the average pre-harvest temperature in North Bihar exceeded 41°C in several blocks, leading to an estimated 8–10% loss in fruit yield (NRCL Technical Bulletin, 2021). Such climatic stressors are now occurring with greater frequency due to the intensifying impacts of climate change.

**Inadequate Irrigation and Soil Management**

Litchi trees require a stable soil moisture profile, particularly from fruit set to harvest. However, most orchards in Muzaffarpur and adjoining districts remain rain-fed or rely on irregular irrigation practices. According to Madhusudan and Ramachandran (2022) [15], less than 12% of the surveyed farmers in Muzaffarpur adopted micro-irrigation methods such as drip or sprinkler systems, mainly due to high installation costs and lack of technical support. Furthermore, soil fertility management is often ignored; a study by Meera Kumari and Panda (2020) [14] found significant micronutrient deficiencies (notably boron and zinc) across older orchards in Bihar, adversely affecting fruit quality and storability.

**Limited Access to Quality Planting Material**

The propagation of litchi in Bihar largely occurs through suckers and grafts from existing trees, which often leads to inconsistent plant vigor and higher disease transmission. Although NRCL has developed disease-free planting material through vegetative propagation and tissue culture, the supply chain for these improved saplings remains insufficient to meet statewide demand (NRCL Annual Report, 2020). This results in farmers relying on informal sources, further propagating inferior plant stock.

**Institutional Gaps and Extension Deficit**

A recurring theme across studies is the limited reach of institutional support services. As highlighted by Sandeep Kumar *et al*. (2018) [17], only 28% of farmers in their survey reported regular contact with horticulture officers or Krishi Vigyan Kendras (KVKs). Without adequate access to training, demonstrations, and timely advisories, farmers are unable to implement Good Agricultural Practices (GAP), which are essential for export-standard production. The extension system is also ill-equipped to provide real-time solutions during pest outbreaks or weather emergencies.

**4. Post-Harvest and Marketing Constraints:**

While Bihar has successfully maintained its lead in litchi production, particularly of the Shahi Litchi variety, the post-harvest and marketing aspects of this horticultural crop remain significantly underdeveloped. These constraints severely limit the economic returns for farmers and obstruct the fruit's value chain from progressing into national and international premium markets. Post-harvest losses, traditional marketing channels, lack of processing units, and poor price realization are some of the major challenges affecting the litchi sector in Bihar.

**High Post-Harvest Losses**

One of the most critical issues is the perishability of litchi. Shahi Litchi, like other varieties, has a very short shelf life of 3–5 days at ambient temperature (NRCL, 2021). This makes it highly susceptible to spoilage during transportation and storage. Studies conducted by the Indian Council of Agricultural Research (ICAR) have estimated post-harvest losses in litchi to range between 25% and 35%, especially in regions where cold chain infrastructure is inadequate (ICAR-NRCL, 2022) [10]. The primary causes of spoilage include desiccation, microbial decay, and skin browning—factors accelerated by exposure to high temperatures and poor humidity control.

Cold storage facilities are scarce in the litchi-producing regions of North Bihar. According to data from the Bihar State Horticulture Mission (2022) [6], there are fewer than 10 dedicated pre-cooling and cold storage units for litchi in Muzaffarpur district, which accounts for over 30% of the state's litchi production. As a result, farmers are compelled to sell their produce immediately after harvest, often at distressed prices.

**Lack of Processing and Value Addition**

Processing of litchi into value-added products such as pulp, juice, squash, jam, and frozen arils is still in its infancy in Bihar. As per a study by Kumar *et al*. (2021) [12-13], only 5–7% of the total litchi production in Bihar undergoes any form of processing. This limits farmers' ability to extend the market window or explore off-season sales. Although the PM-FME (Pradhan Mantri Formalisation of Micro Food Processing Enterprises) scheme provides financial assistance for setting up food processing units, awareness and implementation at the grassroots remain limited.

Moreover, there is an absence of a structured grading and packaging mechanism. Litchis are often packed in traditional bamboo baskets or plastic crates without proper ventilation or padding, leading to mechanical damage. Lack of standardization in packaging and grading also disqualifies the produce from meeting export-quality benchmarks.

**4. Traditional Marketing Channels and Low-Price Realization**

The marketing of litchi in Bihar is dominated by pre-harvest contractors and commission agents. These intermediaries often enter into advance contracts with farmers, purchasing orchards before the fruit matures. Although this provides farmers with upfront payment, it also deprives them of fair market prices during peak demand. A survey conducted by Janmejay *et al*. (2022) [11] in Muzaffarpur found that 72% of litchi farmers sold their produce via contractors, receiving only 25–35% of the final retail price.

Moreover, litchi is not covered under Minimum Support Price (MSP) or any government price stabilization scheme. There are no functional litchi cooperatives or Farmer Producer


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Organizations (FPOs) to aggregate produce and negotiate better rates. The result is a fragmented market structure, vulnerable to seasonal price crashes and exploitation by middlemen.

**Limited Market Access and Promotion**

Despite the GI tag awarded to Shahi Litchi in 2018, there has been minimal progress in leveraging this status for branding or premium marketing. Exporters often face difficulties in sourcing GI-certified litchi due to the absence of packhouses, traceability systems, and APEDA-approved processing units in the region (APEDA, 2022) [3]. Furthermore, there is no organized presence of Bihar's litchi in e-commerce platforms or modern retail chains, which are emerging as critical drivers of horticultural marketing in India.

**5. Export Potential and Barriers:**

The Shahi Litchi of Bihar, with its GI tag and rich sensory profile, holds tremendous potential in international fruit markets. Its bright red skin, high juice content, low seed ratio, and unique flavor make it a strong candidate for premium export segments, particularly in the Middle East, Europe, and Southeast Asia. However, despite this inherent appeal, Bihar's contribution to India's litchi exports remains negligible. Multiple structural, logistical, and policy-level barriers have prevented the fruit from realizing its full global potential.

**Current Export Scenario**

According to the Agricultural and Processed Food Products Export Development Authority (APEDA, 2023) [3], India exported approximately 625 metric tonnes (MT) of litchi in the year 2022–23. The principal destinations included Nepal, the United Arab Emirates, Saudi Arabia, Bangladesh, and the United Kingdom. However, Punjab and Uttarakhand dominate the export basket due to their superior infrastructure, proximity to air cargo hubs, and established export protocols. Bihar, despite being the top producer (contributing around 40–45% of national production), accounted for less than 10% of total litchi exports.

**Export Potential of Shahi Litchi**

The Geographical Indication (GI) tag, granted in 2018 to Shahi Litchi of Muzaffarpur, provides a competitive edge by certifying its origin and quality. GI tagging enhances consumer trust, improves brand positioning in international markets, and allows for legal protection against counterfeit products. Shahi Litchi is particularly suited for export to:

- Niche ethnic markets in the UK, EU, and North America with a high concentration of South Asian diaspora.
- Luxury fruit segments in Middle Eastern countries like the UAE, Oman, and Qatar.
- Regional neighbors such as Nepal, Bangladesh, and Bhutan, which already show consistent demand.

A study by Vishal Nath *et al*. (2022) [19] at NRCL points out that if proper cold chain and quarantine facilities are developed in Bihar, the state could potentially export over 5,000 MT of litchi annually, thereby significantly increasing farmer income and foreign exchange earnings.

**Barriers to Export**

Despite this potential, several persistent challenges continue to impede Bihar's emergence as a litchi export hub.

1. **Lack of Export Infrastructure**
   There are currently no APEDA-certified packhouses, vapor heat treatment (VHT) units, or irradiation facilities for litchi in Bihar. These are essential for meeting phytosanitary requirements of countries like the EU, USA, and Japan (APEDA, 2022) [3]. Without such facilities, Shahi Litchi fails to meet global safety and quality standards.
2. **Short Shelf Life and Absence of Cold Chain**
   Shahi Litchi has a shelf life of only 3–5 days at room temperature and 10–14 days under refrigerated conditions (ICAR-NRCL, 2022) [10]. Due to the lack of integrated cold chain logistics — from orchard to port — the fruit is prone to browning, microbial spoilage, and desiccation during transit.
3. **Unorganized Supply Chain and Lack of Traceability**
   The export of perishable fruits requires a traceable, aggregated, and quality-certified supply chain. However, Bihar's litchi trade is largely informal. Pre-harvest contractors dominate procurement, and farmers lack awareness or incentives to adhere to export protocols. The absence of Farmer Producer Organizations (FPOs) specifically focused on litchi further weakens the export ecosystem (Sinha *et al*., 2021) [18].
4. **Limited Awareness and Market Linkages**
   There is minimal awareness among Bihar's litchi growers about international market demand, quality parameters, and export documentation. A survey by Kumar & Singh (2021) [12-13] found that only 18% of litchi farmers in Muzaffarpur were aware of the GI tag's export relevance, and less than 10% had ever received training on export standards.
5. **Inconsistent Government Facilitation**
   While the PMFME scheme and the MIDH (Mission for Integrated Development of Horticulture) support horticultural exports, Bihar has yet to receive a focused litchi export promotion strategy. Institutional coordination between NRCL, APEDA, and the state's horticulture department is limited, leading to fragmented initiatives and underutilized potential.

**6. Government and Institutional Support:**

Governmental and institutional involvement in the promotion and development of Shahi Litchi cultivation in Bihar has played a foundational, albeit under-leveraged, role. At the national level, several flagship schemes such as the Mission for Integrated Development of Horticulture (MIDH), Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PMFME), and the Rashtriya Krishi Vikas Yojana (RKVY) have included litchi within their scope, offering subsidies for orchard establishment, irrigation systems, and post-harvest infrastructure. However, implementation gaps at the grassroots often limit their impact. For instance, under the MIDH scheme, while financial


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assistance of up to 40–50% is available for setting up cold storage units and processing infrastructure, very few litchi farmers or entrepreneurs in Muzaffarpur have availed these benefits due to procedural complexities, limited awareness, and lack of coordination between state departments and central authorities (Ministry of Agriculture, 2022) [4].

The Government of Bihar, through the Department of Horticulture and the Bihar Horticulture Development Society (BHDS), has initiated specific programs for litchi growers. These include orchard rejuvenation programs, supply of grafted and tissue-cultured planting materials, and field training camps on integrated pest management and Good Agricultural Practices (GAP). Despite these efforts, the outreach remains limited. A 2021 report by the Bihar State Horticulture Mission highlighted that only about 22% of registered litchi growers received official extension services or government-backed technical support in the previous three years. Moreover, schemes intended for infrastructure development, such as establishment of packhouses and cold storage under the National Horticulture Board (NHB), have not been fully utilized in North Bihar, partly due to high capital requirements and lack of private sector participation.

A critical institutional player in the litchi ecosystem is the National Research Centre on Litchi (NRCL), located in Muzaffarpur under the Indian Council of Agricultural Research (ICAR). Since its inception in 2001, NRCL has made commendable strides in litchi-specific research, including the development of improved propagation techniques, pest and disease management protocols, and post-harvest handling systems. The institution has also been instrumental in promoting awareness about the Geographical Indication (GI) tag awarded to Shahi Litchi in 2018, which legally protects its identity and can significantly enhance its branding in international markets. Nevertheless, NRCL's recommendations often do not translate into practice at the farm level due to the weak extension mechanism and limited farmer-scientist interactions.

At the export level, the Agricultural and Processed Food Products Export Development Authority (APEDA) is the designated nodal agency for promoting litchi exports. APEDA has supported some initiatives related to litchi promotion, including listing Shahi Litchi on India's GI registry and showcasing it at international food fairs. However, the absence of APEDA-certified infrastructure in Bihar, such as packhouses and irradiation facilities, limits the practical outcomes of these initiatives. Moreover, there is currently no dedicated export strategy for Bihar's horticultural produce, nor is there a single-window system to assist farmers and exporters in meeting the sanitary and phytosanitary requirements of international markets.

In conclusion, while there is a robust policy and institutional framework in place to support Shahi Litchi cultivation and marketing, the actual outcomes have been hindered by poor convergence of efforts, low awareness among stakeholders, and logistical bottlenecks. A more integrated and outcome-oriented approach is required, where research institutions, state departments, and export agencies collaborate to translate potential into productivity, and recognition into revenue for Bihar's litchi growers.

## 7. Recommendations and Way Forward

To unlock the full potential of Shahi Litchi as a high-value horticultural crop and export commodity, Bihar requires a multi-layered strategy that addresses production inefficiencies, post-harvest vulnerabilities, market constraints, and policy execution gaps. A transformation of the litchi sector demands synergy between research institutions, farmer collectives, private investors, and government agencies at both state and national levels. One of the primary recommendations is the rejuvenation of aging orchards, many of which are more than two decades old and have shown a significant decline in yield. This process should be complemented with the large-scale distribution of disease-free, high-yielding, and climate-resilient planting material through certified nurseries managed or approved by institutions such as the National Research Centre on Litchi (NRCL). Scientific training on canopy management, nutrient application, and integrated pest management should be institutionalized via Krishi Vigyan Kendras (KVKs) and mobile extension units, especially in the core producing districts of Muzaffarpur, Vaishali, and Samastipur.

Another critical intervention lies in the development of robust post-harvest infrastructure. Establishing APEDA-certified packhouses, cold storages, and pre-cooling centers is essential for reducing post-harvest losses and meeting global export standards. These facilities should be promoted through public-private partnerships and supported by soft loans or capital subsidies under schemes like MIDH and PMFME. In parallel, Farmer Producer Organizations (FPOs) dedicated to litchi should be strengthened or newly formed to facilitate aggregation, branding, and direct marketing, thereby reducing the dependence on middlemen. Such FPOs can play a pivotal role in linking farmers to institutional buyers, supermarkets, and exporters.

At the policy level, the Government of Bihar must consider developing a dedicated Litchi Development Mission, modeled on the lines of the Mango or Banana Missions seen in other states. This mission can coordinate inter-departmental efforts, monitor implementation of schemes, and serve as a think tank for sustainable litchi cultivation practices. On the export front, there is an urgent need to leverage the GI tag for global branding of Shahi Litchi. Marketing campaigns through Indian embassies, international trade fairs, and digital commerce platforms should highlight the unique characteristics and origin story of Shahi Litchi. Traceability and certification systems must also be introduced to comply with sanitary and phytosanitary regulations of countries like the European Union and the United States.

In addition, integrating Shahi Litchi with eco-tourism and agro-tourism initiatives can diversify farmer income and promote cultural heritage. Annual festivals and "Litchi Trails" during harvest season in Muzaffarpur could attract tourists and buyers, enhancing both domestic visibility and local economic development. Furthermore, investment in climate-resilient technologies, weather-based crop advisories, and insurance products tailored to litchi can mitigate risks associated with extreme weather events.

The road ahead for Shahi Litchi lies in a holistic approach that not only boosts productivity but also enhances the farmer's share


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in the value chain. Through science-led farming, infrastructure modernization, and brand-driven export orientation, Bihar can reimagine its identity from a raw produce supplier to a global supplier of premium-quality fruit. The combination of policy commitment, community participation, and institutional coordination will be the key to turning this vision into a sustainable reality.

## 8. CONCLUSION

The Shahi Litchi of Bihar stands as a symbol of the state's horticultural heritage, economic potential, and agro-climatic uniqueness. With its distinctive taste, early maturity, and GI-certified identity, the fruit has carved out a niche in both domestic and international markets. However, the journey from orchard to market — and eventually from local fame to global acclaim — is fraught with challenges that span the entire value chain. From aging and poorly maintained orchards to weak post-harvest handling systems, from low adoption of scientific practices to the absence of a coherent export ecosystem, the production and marketing of Shahi Litchi are constrained by structural and institutional inefficiencies.

The data reveals a steady increase in area and volume of litchi production over recent years, but a stagnation in productivity, pointing to the urgent need for orchard rejuvenation and adoption of Good Agricultural Practices. Moreover, high post-harvest losses due to inadequate cold chain infrastructure and absence of processing units continue to erode farmer incomes. The export potential of Shahi Litchi remains largely unrealized, as Bihar lacks the essential packhouses, treatment facilities, and organized supply chain required to meet international standards. Though the GI tag offers a valuable opportunity for branding, its benefits have not yet translated into tangible economic gains for farmers.

Despite these challenges, the future of Shahi Litchi in Bihar remains promising, provided that a coordinated and well-resourced strategy is pursued. Institutional bodies like the National Research Centre on Litchi (NRCL), supported by government schemes such as MIDH, RKVY, and PMFME, can act as catalysts for change. However, greater convergence among stakeholders — including policymakers, researchers, FPOs, exporters, and farmers — is essential to realize the fruit's true potential.

In essence, the Shahi Litchi sector in Bihar is at a crossroads. On one hand lies the risk of stagnation and lost opportunity due to systemic inertia; on the other, a transformative path powered by research, infrastructure, policy support, and market integration. This paper has highlighted both the challenges and the pathways to change. It is now up to policymakers, institutions, and communities to act collectively to convert this rich natural asset into a global agricultural success story — one that uplifts farmer incomes, enhances rural livelihoods, and reinforces Bihar's place on the world map as the proud home of the Shahi Litchi.

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