

Ecosystem Integrity and Geographical Indications: A Legal Analysis of GI Protection and Environmental Sustainability in Bihar

Saurabh¹ Prof. Dr. Vani Bhushan²

Abstract

Geographical Indications (GIs) have increasingly emerged as instruments that transcend conventional intellectual property protection by embedding ecological, cultural, and economic values within legal recognition of place-based products. (Geographical Indications of Goods (Registration and Protection) Act, 1999) Recent policy discourse and media attention on India's expanding GI regime highlight the growing relevance of GIs in sustainable development strategies. Bihar, endowed with GI products such as Shahi Litchi, Katarni Rice, Magahi Paan, and Madhubani Paintings, presents a compelling case where ecosystem integrity directly determines product quality, reputation, and market value.

This paper examines the interrelationship between ecosystem protection and Geographical Indications through a legal analysis of the Geographical Indications of Goods (Registration and Protection) Act, 1999, read alongside constitutional principles under Article 21 and the Public Trust Doctrine. (Constitution of India, Art. 21) (M.C. Mehta v. Kamal Nath, 1997) It argues that while the GI framework implicitly relies upon the preservation of local ecology and traditional knowledge systems, it lacks explicit statutory safeguards mandating environmental protection or sustainable production practices.

Against this backdrop, the study situates Bihar's GI regime within contemporary debates on climate change, biodiversity loss, and sustainable agriculture, as reflected in recent governmental initiatives. (Ministry of Commerce and Industry, 2023) It proposes a normative framework that positions GIs as legal mechanisms capable of

harmonising intellectual property protection with ecological sustainability and constitutional environmental obligations.

Keywords: Geographical Indications; Ecosystem Protection; Environmental Sustainability; Public Trust Doctrine; Bihar

Introduction

Geographical Indications (GIs) represent a distinctive form of intellectual property that links the quality, reputation, and characteristics of goods to their geographical origin. Unlike other intellectual property rights that protect individual creativity or innovation, GIs derive their value from collective knowledge, traditional practices, and the ecological conditions of a specific region. (WIPO) In the Indian context, the protection of GIs under the Geographical Indications of Goods (Registration and Protection) Act, 1999 reflects an acknowledgment that certain products owe their uniqueness to the interaction between nature and human skill developed over generations. (Geographical Indications of Goods (Registration and Protection) Act, 1999)

In recent years, the role of GIs has expanded beyond market differentiation and consumer protection to encompass broader concerns of environmental sustainability, cultural preservation, and rural development. Climate change, biodiversity loss, and environmental degradation have increasingly threatened the ecological foundations upon which GI products depend. Consequently, contemporary legal and policy discourse has begun to recognise GIs as potential instruments for ecosystem conservation, capable of incentivising sustainable land use and the

¹Assistant Professor, Patna Law College, Patna University.

²Professor, Patna Law College, Patna University.

preservation of traditional production practices. (Food and Agriculture Organization, 2021)

Bihar offers a compelling case study in this regard. GI-tagged products such as Shahi Litchi, Katarni Rice, Magahi Paan, and Madhubani Paintings are deeply embedded in the State's ecological conditions and cultural heritage. The quality and reputation of these products are directly influenced by soil composition, climatic patterns, water availability, and traditional knowledge systems. Any disruption to these ecological factors not only undermines environmental integrity but also threatens the economic viability and authenticity of the GI products themselves.

Despite this intrinsic link, existing legal frameworks reveal a significant disconnect. While the GI Act implicitly depends on the preservation of local ecosystems, it does not expressly mandate environmental protection or sustainable practices. Conversely, environmental laws in India adopt a largely generic and preventive approach, failing to recognise ecosystems as dynamic systems that sustain culturally rooted, region-specific economic activities such as GI production. This regulatory fragmentation creates a gap where ecosystems critical to GI products are protected only incidentally rather than through a coordinated legal strategy.

Against this backdrop, the present study examines the intersection of GI protection, ecosystem integrity, and constitutional environmental governance, with specific reference to Bihar. By analysing the GI regime alongside Article 21 of the Constitution and the Public Trust Doctrine, the paper seeks to assess whether GIs can be effectively operationalised as legal instruments for ecosystem protection and sustainable development, and how state-level policy interventions may bridge existing legal and institutional gaps. (Constitution of India, art. 21; M.C. Mehta v. Kamal Nath, 1997)

Research Objectives

The present study is undertaken with the following specific objectives:

- To examine the conceptual and legal relationship between ecosystem

integrity and the quality, reputation, and sustainability of Geographical Indication (GI) products, with particular reference to agricultural and cultural goods originating in Bihar.

- To analyse the Geographical Indications of Goods (Registration and Protection) Act, 1999 in order to assess the extent to which it implicitly or explicitly contributes to ecosystem protection and the preservation of traditional knowledge systems associated with GI-producing regions. (Geographical Indications of Goods (Registration and Protection) Act, 1999)
- To evaluate the adequacy of existing environmental laws in India in addressing the ecological needs of GI-producing regions, and to identify gaps arising from the absence of product-specific or region-sensitive ecological safeguards. (Environment (Protection) Act, 1986)
- To situate GI protection within the constitutional framework of Article 21 and the Public Trust Doctrine, and to assess whether GI governance can be aligned with the State's fiduciary duty to protect natural resources. (Constitution of India, art. 21; M.C. Mehta v. Kamal Nath, 1997)
- To develop a normative and policy-oriented framework for Bihar that integrates GI protection with ecosystem conservation, cultural preservation, and sustainable rural development, thereby enhancing the economic value and long-term viability of GI-tagged products.

Research Methodology

This research adopts a doctrinal and analytical legal research methodology, supplemented by a comparative and interdisciplinary approach. The doctrinal method is employed to examine statutory provisions, constitutional principles, judicial precedents, and international instruments relevant to Geographical Indications, environmental protection, and sustainable development. Primary

sources include the Geographical Indications of Goods (Registration and Protection) Act, 1999, constitutional provisions particularly Article 21 and landmark judicial decisions that have shaped environmental jurisprudence and the Public Trust Doctrine in India. (Vellore Citizens' Welfare Forum v. Union of India, 1996)

Secondary sources such as scholarly articles, books, policy papers, government reports, and publications by international organisations are utilised to contextualise the legal analysis and to explore the evolving role of GIs in ecosystem conservation and cultural preservation. An interdisciplinary perspective is adopted to understand the interaction between law, ecology, agriculture, and traditional knowledge systems, particularly in the context of climate change and biodiversity loss. (Food and Agriculture Organization, 2021)

The study also incorporates a region-specific analysis of Bihar, using selected GI products as illustrative case references to demonstrate how ecological conditions directly influence product quality and reputation. While the research does not rely on empirical fieldwork, it critically engages with policy initiatives and comparative experiences from other Indian States to draw normative insights relevant to Bihar.

Finally, the research employs a normative and reform-oriented approach, proposing legal and policy measures aimed at bridging the gap between GI law and environmental regulation. This methodology enables the study to move beyond descriptive analysis and to contribute to scholarly discourse on how Geographical Indications may be operationalised as instruments of ecosystem protection, cultural preservation, and sustainable development.

Conceptual Framework: the Geographical Indication--Ecosystem Nexus

The conceptual foundation of this study rests on the premise that Geographical Indications (GIs) are not merely intellectual property rights protecting names or reputations of goods, but are legal recognitions of an enduring relationship between a product, its geographical origin, and the ecological and cultural systems that sustain it. Unlike

trademarks or patents, which are largely detached from place and environment, GIs derive their legitimacy from the intrinsic link between a product's quality and the natural and human factors of a specific region. (WIPO) This inherent connection positions GIs as potential legal instruments capable of reflecting and reinforcing ecosystem integrity.

At the core of the GI ecosystem nexus lies the concept of *terroir*, which encompasses soil composition, climatic conditions, water availability, biodiversity, and traditional knowledge systems developed over generations. (Food and Agriculture Organization, 2021) These factors collectively determine the distinctiveness, reputation, and market value of GI products. In agricultural GIs particularly, ecological health is not an external variable but a constitutive element of product identity. Any alteration in ecological conditions such as soil degradation, water scarcity, or biodiversity loss directly affects the quality and authenticity of the GI product, thereby weakening the very basis of its legal protection.

From a legal perspective, the Geographical Indications of Goods (Registration and Protection) Act, 1999 implicitly acknowledges this nexus by requiring proof that the quality, reputation, or characteristics of goods are essentially attributable to their geographical origin. (Geographical Indications of Goods (Registration and Protection) Act, 1999) However, the Act conceptualises this relationship in descriptive rather than normative terms. While it recognises ecological and cultural linkages as qualifying criteria for GI protection, it does not impose affirmative obligations to preserve or sustainably manage the ecosystems that sustain such goods. Consequently, ecosystem protection remains an assumed precondition rather than an enforceable objective within the GI regime.

Environmental law, on the other hand, conceptualises ecosystems primarily as environmental assets requiring protection from degradation. Indian environmental statutes adopt a regulatory and preventive approach focused on pollution control, conservation of natural resources, and environmental impact mitigation. (Environment (Protection) Act, 1986) While these laws contribute to ecosystem preservation in a

general sense, they do not recognise ecosystems as dynamic socio-ecological systems that support region-specific economic and cultural activities such as GI production. This results in a conceptual disconnect, wherein ecosystems critical to GI products are protected incidentally rather than as integral components of a place-based production system.

The GI ecosystem nexus, therefore, occupies an intermediary conceptual space between intellectual property law and environmental law. It reflects a hybrid model where legal protection of products is inseparable from the protection of nature and culture. This study conceptualises GIs as potential bridges between these legal domains, capable of internalising environmental values within market-based protection mechanisms. By linking economic incentives to ecological integrity, GIs can encourage sustainable land use, conservation of biodiversity, and preservation of traditional practices without relying solely on coercive environmental regulation.

In the Indian constitutional context, this nexus gains further normative strength through Article 21 and the Public Trust Doctrine, which recognise environmental protection as integral to the right to life and impose a fiduciary duty on the State to safeguard natural resources for present and future generations. (Constitution of India, art. 21; *M.C. Mehta v. Kamal Nath*, 1997) When viewed through this constitutional lens, GI protection is not merely a commercial or intellectual property concern but part of a broader governance framework aimed at sustainable development. The conceptual framework advanced in this paper thus situates Geographical Indications as legal mechanisms that can harmonise intellectual property protection with ecosystem conservation, cultural preservation, and constitutional environmental obligations.

Legal Framework: the Geographical Indications Act, 1999 and Environmental Laws in India

A. Geographical Indications of Goods (Registration and Protection) Act, 1999

The Geographical Indications of Goods (Registration and Protection) Act, 1999

(hereinafter "GI Act") constitutes the primary legal framework governing the protection of Geographical Indications in India. Enacted to fulfil India's obligations under the TRIPS Agreement, the Act seeks to protect the names and reputations of goods whose quality, characteristics, or reputation are essentially attributable to their geographical origin. (Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)) The GI Act adopts a collective rights-based approach, recognising that the value of GI products flows from shared traditional knowledge, region-specific practices, and environmental conditions rather than individual innovation.

Under Section 2(1)(e), a geographical indication is defined as an indication which identifies goods as originating from a specific territory, region, or locality, where a given quality, reputation, or other characteristic of the goods is essentially attributable to its geographical origin. (Geographical Indications of Goods (Registration and Protection) Act, 1999) This statutory definition implicitly acknowledges the role of ecological factors such as soil composition, climate, water availability, and biodiversity in shaping the distinctive attributes of GI products. However, while the Act recognises this intrinsic link, it does not explicitly articulate environmental protection or ecosystem conservation as statutory objectives.

The registration mechanism under the GI Act requires producers to adhere to prescribed standards of production and specifications linked to the geographical region. (Geographical Indications of Goods (Registration and Protection) Act, 1999, §§ 11--17.) Although these requirements indirectly discourage environmentally harmful practices since ecological degradation would undermine the authenticity and registrability of GI products the Act stops short of imposing enforceable obligations relating to sustainable resource use, biodiversity conservation, or climate resilience. Environmental protection thus remains incidental rather than integral to the GI regime.

B. Environmental Laws in India: Scope and Limitations

India's environmental legal framework is primarily designed to prevent ecological harm, regulate pollution, and conserve natural resources through sector-specific statutes. Key legislations include the Environment (Protection) Act, 1986, the Water (Prevention and Control of Pollution) Act, 1974, the Air (Prevention and Control of Pollution) Act, 1981, and the Biological Diversity Act, 2002. (Environment (Protection) Act, 1986) These laws adopt a regulatory and preventive approach, treating ecosystems as entities requiring protection from degradation rather than as dynamic systems sustaining culturally embedded economic activities such as GI production.

While these statutes safeguard natural resources forests, water bodies, soil, biodiversity, and wildlife they do so in a generalised manner, without recognising the distinctive ecological and cultural linkages that give rise to GI products. For instance, the Biological Diversity Act, 2002 seeks to conserve biodiversity and regulate access to biological resources, yet it does not specifically address the role of biodiversity in maintaining the quality and reputation of GI-tagged goods. (Biological Diversity Act, 2002) Similarly, pollution control laws focus on compliance and enforcement but remain disconnected from region-specific sustainability needs of traditional agricultural and artisanal practices.

As a result, ecosystems critical to GI products are protected only incidentally under environmental laws. There is no coordinated legal framework that aligns environmental conservation objectives with the preservation of GI-linked cultural identity, traditional knowledge systems, or region-specific livelihoods.

C. Constitutional Environmental Governance and the Public Trust Doctrine

The constitutional framework further shapes the legal landscape governing environmental protection in India. Article 21 of the Constitution, as interpreted by the Supreme Court, encompasses the right to a clean and healthy environment as an integral component of the right to life. (Subhash Kumar v. State of Bihar, 1991) In addition, the Public Trust Doctrine imposes a fiduciary obligation upon the State to protect natural

resources for the benefit of present and future generations. (M.C. Mehta v. Kamal Nath, 1997)

Despite these constitutional principles, their application to GI governance remains largely unexplored. Neither the GI Act nor environmental statutes explicitly integrate Article 21 obligations or the Public Trust Doctrine into the regulation of GI-producing ecosystems. Consequently, the protection of ecological integrity underlying GI products depends on fragmented legal instruments rather than a cohesive statutory or constitutional strategy.

D. Regulatory Fragmentation and the Need for Integration

The coexistence of the GI Act and environmental laws reveals a structural disconnect. The GI regime relies on ecological integrity for the survival and authenticity of GI products, yet does not mandate environmental safeguards. Environmental laws, conversely, protect ecosystems without recognising their role in sustaining region-specific cultural and economic systems such as GIs. This regulatory fragmentation undermines the potential of GIs to function as instruments of ecosystem conservation and sustainable development.

From a legal perspective, the absence of integration between intellectual property law and environmental governance represents a missed opportunity. By aligning GI protection with environmental regulation and constitutional principles, the legal framework could transform GIs into tools that simultaneously protect cultural heritage, preserve ecosystems, and enhance rural livelihoods particularly in ecologically sensitive and GI-rich States such as Bihar.

Climate Impact Analysis: India with Special Reference to Bihar

Climate change has emerged as a significant stressor affecting agricultural systems, ecosystems, and traditional livelihoods across India. Rising temperatures, erratic rainfall patterns, increased frequency of floods and droughts, and declining biodiversity have directly impacted agro-ecological stability, particularly in regions dependent on climate-sensitive agricultural production. (Intergovernmental Panel on Climate

Change, 2022) These impacts pose serious challenges for Geographical Indication (GI) products, whose quality, reputation, and authenticity are intrinsically linked to specific environmental conditions and traditional practices.

At the national level, India has acknowledged the vulnerability of agriculture and rural livelihoods to climate change through policy instruments such as the National Action Plan on Climate Change (NAPCC) and its subsidiary missions on sustainable agriculture, water, and biodiversity. (Ministry of Environment) However, these frameworks largely adopt a sector-wide approach and do not specifically address the unique vulnerabilities of GI-producing regions, where even minor ecological disruptions can alter product characteristics and undermine GI credibility.

Bihar represents one of the most climate-vulnerable states in India due to its geographical location, riverine ecology, and agrarian economy. The State is frequently affected by floods in the northern regions and drought-like conditions in southern districts, leading to soil erosion, waterlogging, and declining soil fertility. (Government of Bihar) Such environmental stresses have direct implications for Bihar's GI products, including Shahi Litchi, Katarni Rice, and Magahi Paan, all of which depend on precise soil composition, temperature ranges, water quality, and traditional cultivation methods.

For instance, fluctuations in temperature and unseasonal rainfall have been reported to adversely affect the flowering, fruit quality, and shelf life of Shahi Litchi, thereby impacting both domestic and export markets. Similarly, Katarni Rice cultivation is highly sensitive to changes in soil moisture and monsoon patterns, while Magahi Paan requires specific humidity and soil conditions that are increasingly threatened by climatic variability. These disruptions not only affect productivity but also weaken the geographical link that forms the legal foundation of GI protection.

Despite these challenges, the existing legal and policy response remains fragmented. Climate change adaptation strategies are addressed separately under environmental and agricultural policies, while GI governance continues to focus

primarily on registration, branding, and market protection. The absence of an integrated climate--GI framework means that ecosystems critical to GI products are not proactively protected or adapted to changing climatic realities.

From a legal perspective, this gap raises important questions regarding the sustainability of GI protection in the face of climate change. If ecological degradation continues unchecked, the very attributes that justify GI registration may cease to exist, rendering legal protection ineffective. Consequently, climate resilience must be recognised as a core component of GI governance, particularly in climate-sensitive states like Bihar.

This analysis underscores the need to reconceptualise GIs as climate-sensitive legal instruments that require coordinated governance across intellectual property law, environmental regulation, and climate policy. Integrating climate adaptation measures into GI standards, production protocols, and state-level policies can strengthen ecosystem resilience, protect traditional livelihoods, and ensure the long-term viability of GI products in an era of accelerating climate change.

Case Studies of Bihar's Agricultural Geographical Indication Products

Bihar's agricultural Geographical Indication (GI) products provide concrete illustrations of the intrinsic linkage between ecosystem integrity, traditional knowledge, and legal protection. Products such as Shahi Litchi, Katarni Rice, and Magahi Paan derive their distinctive quality, reputation, and market value from highly specific agro-ecological conditions. These case studies demonstrate how environmental degradation and climate variability directly threaten GI authenticity, thereby reinforcing the argument that GI protection is inseparable from ecosystem conservation.

Shahi Litchi of Muzaffarpur

Shahi Litchi, registered as a GI product, is cultivated predominantly in the Muzaffarpur region of Bihar and is internationally recognised for its unique sweetness, aroma, and pulp quality.

These attributes are closely linked to the region's alluvial soil, specific temperature range, humidity levels, and traditional orchard management practices developed over generations. (Geographical Indications Registry) The litchi crop is particularly sensitive to climatic fluctuations, requiring cool winters and moderately warm summers for optimal flowering and fruit development.

Recent climatic disturbances, including erratic rainfall patterns, rising temperatures, and declining groundwater levels, have adversely affected flowering cycles and fruit yield. Such environmental stress not only reduces productivity but also compromises the distinctive characteristics that justify GI recognition. The Shahi Litchi case illustrates how ecosystem degradation---manifested through climate change and unsustainable water use---poses a direct legal and economic threat to GI protection by undermining the geographical link essential under the GI Act.

Katarni Rice

Katarni Rice is a traditional aromatic rice variety cultivated mainly in the Bhagalpur and Banka districts of Bihar. Its characteristic fragrance, grain texture, and taste are products of specific soil composition, micro-climatic conditions, and age-old cultivation practices, including low-input farming and seasonal sowing patterns. (Geographical Indications Registry) Unlike high-yield hybrid varieties, Katarni Rice depends heavily on ecological balance and biodiversity-friendly agricultural methods.

Climate-induced challenges such as irregular monsoons, increased frequency of droughts, and soil nutrient depletion have placed significant pressure on Katarni rice cultivation. The gradual replacement of traditional varieties with climate-resilient but non-GI hybrids further threatens its survival. This case study highlights the vulnerability of GI products to environmental change and underscores the need for legal and policy interventions that actively support sustainable farming practices rather than relying solely on market-based GI protection.

Magahi Paan

Magahi Paan, cultivated primarily in the Magadh region of Bihar, is renowned for its distinctive taste, softness, and medicinal properties. Its quality is intrinsically linked to shaded cultivation systems, soil moisture retention, water purity, and traditional betel vine management techniques. (Geographical Indications Registry) The crop is highly sensitive to changes in humidity, temperature, and water availability, making it particularly vulnerable to climate variability and environmental pollution.

In recent years, declining soil fertility, water contamination, and increasing temperatures have negatively impacted vine health and leaf quality. The absence of targeted environmental safeguards within the GI regime means that protection of Magahi Paan depends largely on general environmental laws and the voluntary adherence of cultivators to traditional practices. This reveals a structural gap in legal governance where the ecological foundations of GI products remain inadequately protected.

Analytical Observations

These agricultural GI case studies from Bihar collectively demonstrate that GI products function as indicators of ecosystem health. Environmental degradation whether through climate change, water stress, or loss of biodiversity directly erodes the legal basis of GI protection by weakening the geographical link mandated under the GI Act. While GI registration secures intellectual property rights, it does not independently guarantee ecological sustainability. Consequently, without complementary environmental regulation and region-specific policy support, GI protection remains fragile and incomplete.

Comparative Analysis: Gi Governance in Bihar Vis-à-Vis Karnataka and Tamil Nadu

Geographical Indications governance in India varies significantly across States, depending upon the degree of institutional support, policy integration, and proactive governmental involvement. While Bihar possesses several agriculturally significant GI products, its governance framework remains comparatively underdeveloped when assessed against States such

as Karnataka and Tamil Nadu, which have adopted targeted and structured interventions to strengthen GI protection, ecosystem sustainability, and market integration.

Bihar: Limited and Fragmented GI Governance

Bihar has secured GI registration for agricultural products such as Shahi Litchi, Katarni Rice, and Magahi Paan under the Geographical Indications of Goods (Registration and Protection) Act, 1999. (Geographical Indications Registry) However, the State's involvement has largely remained confined to facilitating registration, with limited post-registration support. There is an absence of a dedicated GI policy, specialised GI cell, or statutory mechanism linking GI protection with ecosystem conservation, climate resilience, or sustainable agricultural practices. GI producer groups in Bihar primarily rely on traditional knowledge and informal practices, with minimal institutional assistance for quality control, branding, export facilitation, or ecological safeguarding. (Ministry of Commerce and Industry)

Moreover, Bihar's environmental and agricultural policies function independently of GI governance. Ecosystem protection measures under general environmental laws do not specifically recognise GI-producing regions as ecologically sensitive or culturally significant landscapes requiring tailored protection. As a result, the conservation of soil quality, water resources, and biodiversity essential to GI products remains incidental rather than intentional.

Karnataka: Institutionalised and Market-Oriented GI Governance

In contrast, Karnataka has emerged as one of India's most proactive States in GI governance. The State hosts a dedicated **Karnataka State GI Cell**, operating under the Department of Industries and Commerce, which provides technical, legal, and financial assistance for GI registration, enforcement, and promotion. (Department of Industries and Commerce) Agricultural GIs such as **Mysore Silk**, **Coorg Arabica Coffee**, and **Nanjangud Banana** have benefitted from structured producer organisations, standardised

production protocols, and active government-led branding initiatives. (Coffee Board of India)

Karnataka has also integrated GI protection with broader rural development and sustainability objectives. Coffee Board initiatives in GI-notified regions promote shade-grown cultivation, soil conservation, and biodiversity preservation, recognising the ecological foundations of GI quality. (Coffee Board of India) Such measures demonstrate an understanding of ecosystems as dynamic systems sustaining both livelihoods and product reputation.

Tamil Nadu: Policy Integration and Cultural--Ecological Linkages

Tamil Nadu presents another advanced model of GI governance, characterised by strong State involvement and policy coordination. The Government of Tamil Nadu established a **State-level GI Registry Support System**, actively assisting producer groups in registration, capacity-building, and enforcement. (Department of Industries) Agricultural GIs such as **Kancheepuram Silk**, **Erode Turmeric**, and **Palani Panchamirtham** are supported through quality certification schemes, cooperative structures, and targeted export promotion. (Agricultural and Processed Food Products Export Development Authority (APEDA))

Notably, Tamil Nadu has linked GI governance with cultural heritage preservation and sustainable agricultural practices. For instance, turmeric GI initiatives are supported through schemes promoting organic cultivation, water conservation, and soil health, thereby reinforcing the ecological conditions necessary for maintaining GI authenticity. (Government of Tamil Nadu) This integrated approach reflects a governance model that consciously aligns intellectual property protection with ecosystem stewardship.

Comparative Assessment

The comparison reveals a clear governance asymmetry. Bihar's GI regime remains largely registration-centric, lacking post-registration enforcement, ecosystem integration, and market facilitation. Karnataka and Tamil Nadu, by contrast, treat GIs as developmental instruments,

embedding them within institutional frameworks that combine environmental sustainability, rural livelihoods, and economic growth. This divergence underscores the need for Bihar to adopt a structured GI governance framework that recognises ecosystems not merely as environmental assets but as foundational to GI value creation.

Recommendations: a Gi--Ecosystem Governance Framework for Bihar

To address the regulatory gaps identified in the preceding analysis and to operationalise the ecosystem-preserving potential of Geographical Indications (GIs), this paper proposes a **Bihar-specific GI--Ecosystem Governance Framework**. The framework seeks to integrate intellectual property protection with environmental sustainability, cultural preservation, and rural economic development, consistent with constitutional principles and the Public Trust Doctrine.

1. Statutory Integration of GI Protection with Environmental Regulation

The Geographical Indications of Goods (Registration and Protection) Act, 1999 implicitly relies upon ecological integrity but lacks explicit environmental safeguards. Bihar should advocate for, and concurrently adopt at the State level, **supplementary rules or guidelines** requiring GI producer groups to comply with region-specific environmental standards, including soil conservation, water management, and biodiversity protection. Such integration would align GI governance with existing environmental laws, thereby reducing the current fragmentation between intellectual property and environmental regulation. (Geographical Indications of Goods (Registration and Protection) Act, 1999)

2. Region-Specific Sustainability Standards for GI Products

Given the ecological diversity within Bihar, uniform sustainability norms are insufficient. The State should develop **product-specific and region-specific sustainability protocols** for agricultural GI products such as Shahi Litchi, Katarni Rice, and Magahi Paan. These protocols

may include restrictions on chemical inputs, promotion of traditional cultivation techniques, and conservation of agro-biodiversity. Embedding these standards within GI specifications would ensure that ecosystem preservation becomes a core criterion for maintaining GI status rather than a peripheral concern. (Food and Agriculture Organization, 2021)

3. Institutional Strengthening of GI Producer Groups

GI producer associations play a central role in maintaining quality and authenticity, yet many such groups in Bihar lack institutional capacity. The State should establish **dedicated GI support cells** at the district or divisional level to provide technical assistance, environmental guidance, and legal support to GI producers. Strengthening collective governance mechanisms would enhance compliance with sustainability standards while empowering local communities as custodians of both ecological and cultural heritage. (Ministry of Commerce and Industry, 2023)

4. Incentivising Sustainable and Traditional Practices

To encourage compliance with eco-friendly practices, Bihar should introduce **financial and non-financial incentives** for GI producers adopting sustainable methods. These may include subsidies for organic inputs, preferential access to markets, certification support, and branding assistance for environmentally sustainable GI products. Incentive-based governance would shift the regulatory approach from mere compliance to positive reinforcement of sustainable practices. (NITI Aayog, 2022)

5. Market Integration and Responsible Commercialisation

Sustainable GI governance must also address economic viability. Bihar should integrate GI-tagged products into State-supported marketing platforms, export promotion schemes, and public procurement policies, while ensuring that commercialisation does not compromise ecological integrity. Responsible market integration would enhance producer incomes, increase State revenue, and reinforce the economic

rationale for ecosystem conservation. (Export Promotion Council for Agricultural and Processed Food Products (APEDA))

6. Constitutional Anchoring under Article 21 and the Public Trust Doctrine

Finally, the proposed framework must be grounded in constitutional environmental jurisprudence. By recognising ecosystems sustaining GI products as **trust resources**, the State can justify proactive intervention under Article 21 and the Public Trust Doctrine. Such constitutional anchoring would provide normative legitimacy to Bihar's GI--ecosystem governance model and ensure its resilience against policy discontinuities. (Constitution of India, art. 21; M.C. Mehta v. Kamal Nath, 1997)

Conclusion

This study has examined Geographical Indications (GIs) as legal instruments that extend beyond their conventional intellectual property function to embody ecological, cultural, and economic values rooted in specific geographical regions. Through a doctrinal and comparative analysis, the paper has demonstrated that the quality, reputation, and authenticity of agricultural GI products are intrinsically dependent upon the health and integrity of the ecosystems in which they are produced. In the context of Bihar, GI products such as Shahi Litchi, Katarni Rice, and Magahi Paan clearly illustrate how soil composition, climatic conditions, water availability, biodiversity, and traditional knowledge systems together constitute the foundational basis of GI value. (Food and Agriculture Organization, 2021)

The analysis of the Geographical Indications of Goods (Registration and Protection) Act, 1999 reveals that while the statutory framework implicitly relies upon ecological and cultural factors, it does not expressly mandate ecosystem protection or sustainable production practices. Similarly, India's environmental laws though robust in their preventive and regulatory scope treat ecosystems largely as passive environmental assets and fail to recognise their role in sustaining region-specific economic and cultural activities such as GI production. (Geographical Indications of Goods (Registration and Protection) Act, 1999)

This doctrinal disconnect substantiates the regulatory gaps identified under Hypotheses 3 and 4, where ecosystem protection within the GI regime remains indirect, fragmented, and dependent on external legal instruments rather than integrated statutory obligations.

The comparative assessment of GI governance in Bihar vis-à-vis Karnataka and Tamil Nadu further highlights the significance of proactive state intervention. Karnataka and Tamil Nadu have demonstrated that targeted institutional support, producer-centric governance structures, branding initiatives, export facilitation, and integration of GI promotion with agricultural and rural development policies can significantly enhance the economic and cultural value of GI products. (Ministry of Commerce and Industry, 2022) Bihar, by contrast, continues to adopt a relatively passive role, limiting its engagement largely to registration without sustained post-registration governance, ecosystem stewardship, or market integration.

In this context, the paper argues that the Government of Bihar, acting as a trustee of natural resources under the Public Trust Doctrine and guided by the expansive interpretation of the Right to Life under Article 21 of the Constitution, bears a constitutional obligation to protect ecosystems that sustain GI products. (Constitution of India, art. 21; M.C. Mehta v. Kamal Nath, 1997) Operationalising GIs as instruments of ecosystem governance requires a Bihar-specific GI--ecosystem framework that integrates environmental regulation, agricultural policy, traditional knowledge protection, and market development. Such an approach would transform ecosystem conservation and cultural preservation from incidental outcomes into core objectives of GI protection.

Ultimately, the study concludes that Geographical Indications possess significant untapped potential to function as legal tools for sustainable development. When aligned with constitutional principles and supported by targeted state-level governance, GIs can simultaneously conserve ecosystems, preserve cultural heritage, strengthen rural livelihoods, and contribute to state revenue. For Bihar, embracing this integrated model offers a viable pathway to reconcile intellectual property

protection with environmental sustainability and inclusive economic growth.

References

Geographical Indications of Goods (Registration and Protection) Act, 1999.

Constitution of India, art. 21.

M.C. Mehta v. Kamal Nath, (1997) 1 SCC 388.

Ministry of Commerce and Industry, Government of India, GI promotion initiatives (2023--2025).

WIPO, *Geographical Indications: An Introduction* (WIPO Publication).

Food and Agriculture Organization, *Geographical Indications and Sustainability* (FAO Policy Brief, 2021).

Constitution of India, art. 21; *M.C. Mehta v. Kamal Nath*, (1997) 1 SCC 388.

Environment (Protection) Act, 1986; Biological Diversity Act, 2002.

Vellore Citizens' Welfare Forum v. Union of India, (1996) 5 SCC 647.

Geographical Indications of Goods (Registration and Protection) Act, 1999, § 2(1)(e).

Environment (Protection) Act, 1986; Water (Prevention and Control of Pollution) Act, 1974.

Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), arts. 22--24.

Environment (Protection) Act, 1986; Water (Prevention and Control of Pollution) Act, 1974; Air (Prevention and Control of Pollution) Act, 1981; Biological Diversity Act, 2002.

Biological Diversity Act, 2002.

Subhash Kumar v. State of Bihar, (1991) 1 SCC 598.

Intergovernmental Panel on Climate Change, *Sixth Assessment Report: Impacts, Adaptation and Vulnerability* (2022).

Ministry of Environment, Forest and Climate Change, Government of India, *National Action Plan on Climate Change*.

Government of Bihar, *State Action Plan on Climate Change* (Revised Edition).

Geographical Indications Registry, Government of India, *GI Registration Details: Shahi Litchi*.

Geographical Indications Registry, Government of India, *GI Registration Details: Katarni Rice*.

Geographical Indications Registry, Government of India, *GI Registration Details: Magahi Paan*.

Geographical Indications Registry, Government of India, GI registrations relating to Bihar.

Ministry of Commerce and Industry, Government of India, *GI Promotion and Producer Support Initiatives* (Annual Reports).

Department of Industries and Commerce, Government of Karnataka, Karnataka State GI Cell publications.

Coffee Board of India, *GI Protection and Sustainability Practices in Coffee-Growing Regions*.

Department of Industries, Government of Tamil Nadu, State GI Facilitation Measures.

Agricultural and Processed Food Products Export Development Authority (APEDA), GI Export Promotion Reports.

Government of Tamil Nadu, Department of Agriculture, Organic Farming and GI-linked Sustainability Schemes.

Ministry of Commerce and Industry, Government of India, GI Promotion and Capacity-Building Initiatives (2023--2025).

NITI Aayog, *Sustainable Agriculture and Rural Livelihoods* (Policy Paper, 2022).

Export Promotion Council for Agricultural and Processed Food Products (APEDA), GI Export Promotion Guidelines.

Geographical Indications of Goods (Registration and Protection) Act, 1999; Environment (Protection) Act, 1986.

Ministry of Commerce and Industry, Government of India, *GI Promotion and State-Level Best Practices* (Reports on Karnataka and Tamil Nadu, 2022--2024).