



Preserving Life and Heritage: The Role of Geographical Indications (GI) in Biodiversity Conservation with Special Reference to Endangered Species

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Authors' contributions

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ABSTRACT

Geographical Indications (GIs) have increasingly considered the protection and promotion of the products of different regions by giving them a specific geographical origination. Besides being economically relevant, GIs has an important role in the conservation of biodiversity by ensuring sustainable biological resource use, protection of traditional knowledge, and promotion of eco-friendly practices. GIs not only maintain the resilience of species through the conservation of their genetic diversity, which links with that ecosystem and thereby automatically will provide improved environmental resilience, but also offer legal protection to products peculiar to regions. In respect to this, GIs provide for the scientific community a framework that will align conservation effort with

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economic incentives, fostering ecological sustainability and cultural heritage protection. This study investigates the contributions of GIs to biodiversity conservation against the background of species loss through some possible ways through which the particular features associated with GIs can enhance sustainability. It analyses more closely the intersection of GIs with conservation aims and case studies in which GI protection results in positive impacts on the maintenance of biodiversity. The mechanisms through which GIs increase economic value and cultural significance for products from habitats of species at risk of extinction underline their dual role in promoting local heritage in line with conservation objectives. Now, the results indicate that GIs can be one of the most powerful tools in aligning economic incentives with ecological stewardship and integrating traditional knowledge into modern strategies of conservation. It draws to a close by making policy recommendations for the use of GIs in wider conservation policy impacts, arriving at a synergistic approach capable of securing cultural heritage together with biodiversity.

Keywords: Geographical indication; endangered species; biodiversity; conservation.

1. INTRODUCTION

In this era of accelerating environmental deterioration and globalization, biodiversity preservation is essential to both ecological integrity and cultural heritage. Geographical Indications (GIs) are a unique tool that integrates the protection of natural resources with the development of local economies and cultures, which has made them well-known among strategies used to protect endangered species. Products with features or a certain reputation that are recognized for their specific origin are labelled with a geographical indication (GI). They serve as markers of quality as well as traditional knowledge and customs that have been passed down through the ages [1]. This research explores the intricate function that GIs play in safeguarding endangered species, emphasizing their significance in preserving life and heritage. The shocking rate of species extinction is mostly the result of anthropogenic problems such as pollution, excessive resource extraction, climate change, and habitat degradation. 'The International Union for Conservation of Nature (IUCN)' states that two thirds of the species that have been studied are in danger of going extinct. This dilemma raises ecological concerns as well as the threat to cultural identities associated with these animals. Many indigenous communities rely on the local flora and wildlife for their customs, spiritual beliefs, and means of livelihood [2].

Geographical indications can be quite significant in this case since they encourage environmentally friendly behaviours that benefit both the surrounding population and the local animals [3]. It promotes sustainable practices because products made from traditional knowledge and local biodiversity will have market

value. In this way, it can aid in the conservation of threatened species, as communities would be motivated to maintain habitats and species which are an integral part of their GI products.

2. CONCEPTUAL FRAMEWORK

The geographical indications are an area of intellectual property with a varied historical tradition rooted in protecting the distinctiveness of regional products. Born in the wine and spirits sector, the concept of geographical indications later found more official ground through international trade agreements, in particular, with the Agreement on Trade-Related Aspects of Intellectual Property Rights operated by the World Trade Organization. Across time and space, the GIs have quickly moved beyond wines and spirits to cover a large number of agricultural and non-agricultural commodities, in addition to famous products like Parmigiano-Reggiano cheese of Italy and Darjeeling tea of India. The very essence of GIs is their associating a product's origin with particular qualities, reputation, and characteristics. The link does not just protect against misappropriation or imitation but also promotes local economic development and preserves cultural heritage. GIs not only protect the interests of the local producers but also take care of the collective cultural identity and traditions that are attached to that region [4]. At the same time, the urgent need to address the conservation of endangered species has become a global priority, requiring innovative approaches to protect biodiversity. Although the economic and cultural advantages of GIs are widely acknowledged, their role in biodiversity conservation is less understood, revealing a gap in both academic research and practical application [5]. But through the GI protection of different products, many

endangered species related to those products are also being conserved.

3. IMPACT OF GEOGRAPHICAL INDICATIONS (GI) ON ENDANGERED SPECIES

Geographical Indications (GIs) are symbols associated with products that originate from a specific geographic area and are recognized for their distinctive qualities or reputation linked to that origin. While GIs often serve to protect traditional and artisanal products, their influence on endangered species can be substantial, with potential positive and negative consequences.

3.1. Positive Impacts of Geographical Indications on Endangered Species

3.1.1. Conservation of traditional practices

GIs can help maintain traditional practices that are highly associated with the sustainable management of natural resources. For example, some GI products have their source materials originating from something that was traditionally made or made using a process that traditionally helped in maintaining the species in its natural life [6]. Through the creation of a traditional product market, the GI can save the day for those species that are under pressure since they uphold sustainable harvesting habits. For example, GI protection can incentivize the use of alternative, non-invasive materials instead of those from endangered species [7].

3.1.2. Economic incentives for conservation

GI protection may translate into economic benefits accruable to the local communities, which in itself could be incentive enough for enhanced conservation efforts. For instance, if the economic value of GI products continues increasing, it is likely that local communities will become interested in protecting their natural environment, including habitats for threatened species. Revenues from GI products could be reinvested in conservation programs. For instance, revenues accrued from GI products in biodiversity hotspots could be channelled towards conservation [8].

3.1.3. Promotion of sustainable practices

GIs can encourage sustainable land management practices, which benefit endangered species. The case of the GI of Roquefort cheese from France promotes an ancient model of pastoral farming, which assisted

in the maintenance of the local grassland ecosystem that provides habitat for many native species, including some that are endangered [9].

3.1.4. Legal framework and enforcement

The GIs can also be used to set a legal framework for prevention against the theft and exploitation of products associated with endangered species. In giving legal protection to certain products, the GIs will ensure only value-added and sustainably manufactured products of the authorized manufacturers can have the GI label. Therefore, such illicit trade and exploitation of animals that are endangered may completely reduce.

3.1.5. Sensitization and education

Many times, maintaining and acquiring GI status means generating public awareness about the importance of the product and its relation to the local ecosystem. This may raise awareness among citizens at large in supporting the conversation work. For example, some educational campaigns linked with GIs can involve information on the preservation of endangered species and how sustainable practices contribute to ensuring that such species do survive.

3.2. Negative impacts of geographical indications on endangered species

3.2.1. Increased demand and exploitation

The inflated market value for GI goods can create demand for raw materials used to produce them, overexploiting the endangered species. If the GI product is based on a threatened plant or animal, then this higher value may exacerbate the threat of overharvesting [10]. It does not guarantee that the GI status assures any sustainability in harvesting, and endangered species are depleted. For example, GI products, such as Peruvian maca, have been so commercially successful that overharvesting has resulted—a highly jeopardizing situation to the sustainability of the plant and to the species dependent on its habitat [11].

3.2.2. Habitat disruption

The development of areas dedicated to Geographic Indication (GI) production can have significant environmental impacts, including

habitat loss and biodiversity threats. Converting natural ecosystems into agricultural or production areas for GI crops may lead to the destruction of habitats crucial for endangered species [12]. Besides, cultivation of certain GI crops occasionally introduces some invasive species, which may outcompete and finally threaten the survival of some native species. It has been reported that in the Mediterranean, due to the recent cultivation of some olive varieties under GI status, there had been the proliferation of invasive species at the cost of local biodiversity [13].

4. LEGAL FRAMEWORK AND POLICIES PROTECTING GI

4.1. International Legal Frameworks

4.1.1. "TRIPS agreement (1994)"

Geographical indications (GIs) are protected by minimal requirements set forth by the 'World Trade Organization (WTO)' under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). Specifically addressing GIs, Articles 22–24 of the TRIPS Agreement require member nations to enact legislation to guard GIs against unfair competition and to prevent GI misuse. By guaranteeing the preservation of goods acknowledged for their specific place of origin and related attributes, these clauses support both cultural legacy and economic value. In order to preserve the integrity and good name of goods protected by Geographic Indications (GIs), member nations must offer legal recourse against the use of GIs in misleading or deceptive ways [14].

4.1.2. "Convention on biological diversity (CBD, 1992)"

In addition to promoting sustainable development, 'the Convention on Biological Diversity (CBD)' aims to protect biodiversity. A key component of conservation and the sustainable use of biodiversity is the preservation, respect, and upkeep of traditional knowledge, as stated in CBD Article 8(j). The GIs framework can incorporate this traditional knowledge, which is frequently associated with certain locations and customs. The CBD supports the sustainable use of biological resources and the livelihoods of indigenous and local populations by safeguarding traditional knowledge through Geographical Indications (GIs). By fusing cultural legacy with

environmental sustainability, the relationship between GIs and traditional knowledge under the CBD promotes a comprehensive strategy for biodiversity protection [15].

4.2. National Legal Frameworks for Geographical Indications (GIs)

4.2.1. "Geographical indications of goods (Registration and Protection) Act, 1999 (India)"

In India, GIs are protected and registered under the powerful legal framework of 'the Geographical Indications of Goods (Registration and Protection) Act, 1999'. By limiting who is permitted to use the GI label—those who have registered—this statute safeguards traditional knowledge and encourages sustainable practices. By prohibiting unlawful usage and guaranteeing that the legitimate producers receive financial advantages, the Act contributes to the preservation of the distinctive identity and legacy of local products. By making GI goods more marketable, it also hopes to support local economies and rural. The Act aids in the preservation of cultural heritage by promoting sustainable resource management and biodiversity conservation through the protection of traditional ways and practices [16].

4.2.2. "European Union Regulation (EU) No 1151/2012"

The protection of geographical indications (GIs) and traditional specialties inside the EU, including India is governed by 'Regulation (EU) No 1151/2012'. The purpose of this Regulation is to protect the names of food and agricultural products while preserving and promoting their distinctive characteristics that are associated with their place of origin. It offers a framework for the registration of Protected Geographical Indications (PGIs) and Protected Designations of Origin (PDOs), which safeguard the names of goods that have a particular reputation, quality, or other attributes that can be linked to their place of origin Jackson, 2018, as cited in Harris,[17]. In doing so, the rule upholds consumer protection, encourages rural development, and highlights the area products' cultural and economic significance. Additionally, it aids in preventing the abuse and spoofing of registered identities, guaranteeing that customers will obtain genuine goods of the highest calibre [18].

5. CHALLENGES AND LIMITATIONS IN USING GI IN CONSERVING BIODIVERSITY

Over the past few years, protection and promotion of traditional and artisanal products under Geographical Indications have become very attractive. GIs act as an instrument of authenticity by linking the special qualities of the product to its geographical origin. While GIs offer an interesting avenue for cultural heritage preservation and economic development, their application in the context of endangered species is very controversial [12]. Such application of GIs on biodiversity conservation raises critical questions of sustainability, ethics, and possible spill over effects. The GIs' dual role in promoting economic interests and safeguarding natural resources is at times sure to create conflicting outcomes, especially when the species in question are under threat.

5.1. Lack of Awareness and Understanding

There is usually considerable unawareness among both producers and consumers about the significance and advantages of Geographical Indications. Many local producers may remain unaware of the possible economic and conservation benefits that GIs can entail, while consumers hardly recognize the authenticity and value of GI-labelled products. This can lead to unawareness and hence underutilization, thereby reducing the effectiveness of GIs in biodiversity conservation and sustainable uses. Absence of proper understanding means that GIs remain potential tools for supporting in situ conservation efforts and enhancing local economies [19].

5.2. Enforcement Issues

Effective protection of GIs is rather challenging, especially among the developing nations with limited resources and having a weak legal framework. Common problems to many include counterfeiting and misuse of GI labels, which have the latent capability to undermine the integrity of GIs. Weak enforcement could allow counterfeiting and misuse of GI labels to become so widespread as to render them little value with increasing distrust by consumers. The loss in confidence may hurt the real producers and not really help in conservation, like those linked by GIs [20].

5.3. Global Recognition and Harmonization

The standards and procedures for GI protection have no global recognition and harmonization. There are different methods in which countries recognize GIs and various protecting methods, thus leading to these various processes not being consistent. These disparities make the protection and recognition of GIs across borders complex, hence creating barriers to international trade. In addition, the inconsistent standards can also bring about differences and hamper collaborative conservation efforts globally [21].

5.4. Economic Viability

GI status is attained through lengthy, heavyweight administrative procedures that can be prohibitively expensive for small producers and communities. The application may be long and costly, requiring legal and technical expertise. High costs and cumbersome procedures will likely deter small producers from seeking GI status and, hence, reduce the scope of, and benefits from, GIs. This economic barrier could deny an important tool to many communities seeking to use GIs as a means of supporting sustainable practices and conservation [22].

5.5. Balancing Commercial Interests and Biodiversity

Conflicts may arise between commercial exploitation and conservation goals. Although GIs can enhance the market value of products, this poses the danger of over-commercialization, which might eventually result in unsustainability. The trap into which conservation efforts are placed by over-commercialization seems to capture these producer-purveyors of GIs in a way that no matter how sustainable they strive to become, it will always tax their minds with the possibility of instant profits afforded by over-commercialization. This would include natural resource exploitation, a blow to the very species and habitats they intend to protect through the GIs of their products [23].

5.6. Climate Change

The geographical characteristics that give special features to GI products will be seriously affected by climate change. Climatic conditions, such as temperature changes and precipitation, are likely to bear an impact on the natural environment of a

GI region. Climate change may be a threat to sustainability and validity, and hence both economic and conservation outcomes of GIs. Further, in their changing environmental conditions, the quality and uniqueness of the GI products may diminish, negatively affecting their market value and the effectiveness of GIs in conservation [24].

5.7. Administrative Challenges

GI management and regulation require proper administrative systems and stakeholders involved to be coordinated effectively. Ineffective bureaucracy or lack of well-spelled-out procedures defeats the implementation and application of protections for geographical indications. Procedures related to the registration and enforcement of GIs are prolonged due to inefficiency in administration. This may lower the effectiveness of GIs in their objective of promoting conservation and sustainable development, frustrating producers and consumers alike [25].

5.8. Inclusion of Indigenous and Local Communities

It implies that indigenous and local communities' rights, knowledge, and participation are recognized within the GI framework. These often have traditional knowledge and practices that can significantly contribute to conservation. With the exclusion of indigenous and local communities, many activities might be lost. It might further manifest in the form of conflict and resistance to GI initiatives aimed at conservation and preservation of culture [26].

5.9. Market Access

GI products will encounter a number of market access constraints, which include tariffs, non-tariff barriers, and infrastructure shortages. These challenges might prevent producers from accessing wider markets and getting the maximum benefits related to GI status. The low market accessibility will lower economic incentives for producers to maintain sustainability. If these high-end markets are inaccessible, then the possibilities for GIs to support conservation and enhance local economies remain very low [27].

5.10. Monitoring and Evaluation

There needs to be an effecting system for monitoring and evaluating the impact of GIs on

conservation and sustainable development. However, these systems either get in place or are underdone. If the conditions for monitoring and evaluation are not provided, then the success of the conservation efforts from the GI cannot be determined, hence changes cannot be affected, which will result in missed chances for the improvements of their performance and reduced effectiveness of the GIs in achieving the goals of conservation and sustainability they could be meant to achieve. The phase of the monitoring process is the key step if GIs are to realize their full potential for biodiversity preservation and supporting local economies [28].

6. CASE STUDIES

6.1. Changthangi Goat (India)

Kashmir Pashmina has already been registered under the Geographical Indications of Goods Act in India. GI Tagging is evidence not only to the wool but also for the traditional craftsmanship that goes into its production. These unique handloom products, originating from Jammu and Kashmir, are in much demand not just within the country but in the international market, too. Kashmir Pashmina has the distinction of being the first craft to get registered with a GI tag. While in Persian, "pashm" means wool, in Kashmir, it is used for the raw, unspun wool of the Changthangi goats only. GI designation to Pashmina Wool has been highly instrumental not only in the preservation of the local culture of Kashmir but also in the conservation of the endangered species of Changthangi goats [29].

6.2. Muga Silk (Muga Polu) (India)

The Geographical Indication status will play a very important role in protection and conservation of the Muga silkworm, which is an endemic species in Assam, India. Granting Geographical Indication status to the Moga silk means that the distinguishing characteristics and traditional methods used to produce it are legally recognized and protected. This not only paves the way for cultural heritage and living of local communities that are engaged in the process of Muga production but also safeguards environmental conditions that are a must for the survival of Muga silkworm. Tagged as the king of silks for its natural golden-yellowish texture and yellow-golden brightness, Muga silk is one of the first Geographical Indication registered products of Assam. Wild and multivoltine, Muga silk is

produced by the caterpillar *Antheraea assama*. The caterpillar mostly depends on 'Som' and 'Soalu' plants as its primary hosts. The Muga silk worm exhibits superlative organismal characteristics harboring innumerable heritable traits in all the stages of its life cycle. Morphological traits like body color, shell weight, and cocoon weight had been in traditional use for identification of strains. Because of this life form of the insect, along with the ecological conditions, distribution of the host plants, and the co-existence of the diverse species, this could have found very well its way to the original home of *Antheraea*—Assam. Therefore, GI has a special status in the conservation of this species [30].

6.3. Darjeeling Tea (India)

The Darjeeling Tea GI has played a crucial role in preserving the unique biodiversity of the Darjeeling region, a high-altitude area in India known for its rich flora and fauna. The GI designation has encouraged sustainable tea cultivation practices that not only enhance the quality of the tea but also safeguard the delicate ecological balance of the region. By promoting environmentally friendly farming techniques and restricting the use of harmful chemicals, the GI ensures that traditional tea gardens are managed in a way that protects the habitat of several endangered species [31]. Additionally, the cultivation practices associated with Darjeeling Tea help to maintain the health of the soil and prevent erosion, which is vital for the conservation of the region's diverse plant and animal life. As a result, the GI has become an important tool in both conserving the natural heritage of Darjeeling and supporting the livelihoods of local communities through sustainable agriculture.

6.4. Civet (Indonesia)

GI status is very important for civet conservation, providing an economic incentive through protection. In this regard, the GI tag can increase value to civet coffee by linking its distinct qualities with a particular geographic origin, a move toward more sustainable methods of coffee production. This added value encourages farmers and producers to take measures that protect the civet's natural habitats and good health rather than continue exploiting them. GI status thus increases the global market attractiveness of civet coffee but also reinforces its conservation by aligning economic benefits

with environmental and welfare conservation [32].

6.5. Argan Oil (Morocco)

The Geographical Indication (GI) status of Argan Oil has significantly contributed to the conservation of Argan trees, which are essential for the ecological stability of southwestern Morocco. These trees play a crucial role in providing habitat for endangered species such as the "*Barbary macaque*" and support soil conservation and water retention, combating desertification in the region. The GI designation promotes sustainable harvesting practices and traditional oil extraction methods, ensuring that the environmental impact of production is minimized. By preserving the Argan forests and promoting responsible agricultural practices, the GI benefits both the local ecosystem and the communities who rely on Argan oil for their livelihoods, fostering a balance between economic development and environmental stewardship [33].

6.6. Vicuna (South America)

The Geographical Indication of vicuña wool is a key element in the status of the Vicuna species in the Andean regions of South America. It links wool to a specific geographic area and traditional practice, ensuring sustainable harvesting and protection from encroachment or misuse of the vicuña's habitat. This GI certification ensures the wool is sustainably and ethically sourced, discouraging poaching and thereby maintaining vicuña populations. The GI tag enhances the value of the wool of the vicuña and, in turn, acts as an economic incentive toward the protection of the local community and the maintenance of the ecological balance. These deeds justify GI status for vicuña wool not just in terms of the survival of the species but also according to the principles of sustainable development and being environmentally conscious [34].

6.7. Basmati Rice (India and Pakistan)

The Geographical Indication (GI) status of Basmati Rice has been instrumental in preserving traditional farming practices that are vital for the conservation of rice paddies in India and Pakistan. [35]. These paddies serve as critical habitats for a variety of bird species and aquatic life, including endangered species like the "*Indian spot-billed duck*". By enhancing the economic value of Basmati rice through its GI

designation, there is a strong incentive for farmers to maintain these traditional cultivation methods that support biodiversity. The GI status not only ensures the authenticity and quality of the rice but also encourages sustainable agricultural practices that protect the ecological balance of these vital wetlands, thus benefiting both the environment and the local agricultural communities [25].

6.8. Maguey Mezcalero (Mexico)

Protecting the agave species necessary for mezcal manufacturing in Mexico has been greatly aided by “Maguey Mezcalero’s” Geographical Indication (GI) status. These endangered bat species, which are essential to pollination, are supported by these agave plants, which are also essential to the local ecosystem and the process of making traditional mezcal. Because of the GI designation, sustainable harvesting methods and agave replanting are encouraged, helping to maintain the region's rich biodiversity as well as the traditional methods of producing mezcal [36]. The GI works to preserve the cultural and environmental qualities linked with Mezcal, which benefits the surrounding communities as well as the ecosystem, by encouraging the proper production and conservation of these plants.

6.9. Tequila (Mexico)

Since blue agave plants are vital to Mexico's tequila manufacturing as well as the natural ecosystems they support, their Geographical Indication (GI) status plays a major role in their conservation. The General Industrial Zone (GI) classification safeguards Tequila against overexploitation and ensures its long-term viability by controlling its cultivation and production. Through the preservation of traditional farming landscapes, which are essential to keeping ecological balance, this conservation effort also benefits the surrounding area. The GI helps protect Agave ecosystems and traditional farming practices, which benefits the environment and the local communities that produce tequila. It also improves the quality and market value of tequila [37].

6.10. Kona Coffee (Hawaii, USA)

The preservation of natural Hawaiian forest ecosystems, which are vital habitats for a number of endangered species, has benefited

greatly from Kona Coffee's Geographical Indication (GI) status. Through highlighting the distinct characteristics of Kona Coffee, the GI certification promotes environmentally conscious, sustainable methods of coffee farming. These methods support biodiversity preservation, erosion control, and soil health preservation in the coffee-growing regions. In addition to increasing the market value of Kona Coffee, the GI works to safeguard Hawaii's abundant natural heritage and makes sure that the sustainable management of this well-known crop benefits the local community and the environment [38].

6.11. Parmigiano Reggiano (Italy)

A major factor in preserving the traditional grazing grounds and wildlife of the Po River Valley in Italy is Parmigiano Reggiano's Geographical Indication (GI) designation. The GI certification promotes environmentally friendly dairy farming methods that maintain the health of pasturelands and the various ecosystems they support by guaranteeing that Parmigiano Reggiano is produced in accordance with certain regional requirements. Through the preservation of local wildlife and plant species, this strategy upholds the ecological equilibrium of the area. Aside than boosting Parmigiano Reggiano's quality and reputation, the GI stands for the continued dedication to protecting traditional farming landscapes and encouraging ecologically friendly farming practices [39].

6.12. Awa bancha tea (Japan)

One of the main factors keeping Japan's Tokushima region's distinctive biodiversity intact is Awa Bancha Tea's Geographical Indication (GI) designation. The GI certification supports environmentally friendly farming techniques that preserve the native flora and fauna by acknowledging the traditional tea cultivation methods connected with Awa Bancha. In addition to preserving the ecological equilibrium of the area, these traditional agricultural practices also contribute to the preservation of cultural legacy. Producers are encouraged to maintain these environmentally responsible practices while protecting the area's rich cultural and natural history, since the GI raises the market value of Awa Bancha Tea [40].

7. SUGGESTIVE RECOMMENDATIONS

The suggestion here will be to include broadening the scope of GI protections to cover

more endangered species and ecosystems directly linked to agricultural practices in order to improve the efficacy of Geographical Indications (GIs) in conservation and sustainability. Products can be protected for their special traits as well as their contribution to the preservation of ecosystems by including stricter environmental requirements into the GI registration process. Furthermore, GI standards harmonization and best practice sharing can be achieved through international cooperation, which can help get past obstacles to market access and enforcement. Producers and consumers will comprehend and value the conservation benefits of GIs more if education and awareness efforts are funded. To ensure that conservation goals are efficiently reached while preserving economic benefits for local communities, it will be helpful to support research and monitoring systems that assess the impact of GIs on biodiversity.

7.1. Legal Recognition of GIs in Conservation Laws

To legally acknowledge and encourage the significance of Geographical Indications (GIs) in biodiversity conservation, amend current conservation legislation. This can involve ensuring that products with the GI mark help to preserve endangered species and their habitats by linking GI registration with conservation standards. By encouraging sustainable practices that support conservation objectives, such legal regulations would strengthen the connection between environmental management and cultural heritage.

7.2. Integration into National Biodiversity Strategies

Geographical Indications (GIs) can be promoted and protected, and this can be done by incorporating them into 'National Biodiversity Strategies and Action Plans (NBSAPs)'. By doing this, GIs are made into a crucial component of the larger objectives of conserving biodiversity and ensuring the sustainable use of natural resources. This method guarantees that the legal recognition and strategic utilization of the conservation benefits of Geographically Inaccessible (GI) areas safeguard endangered species and their habitats [41].

7.3. Support for Research and Development

Provide specialized funds to study how GIs and biodiversity conservation interact. Research on

novel uses of GIs to save endangered species and advance sustainable farming and production methods may be aided by this support. Promoting research allows policymakers to find innovative approaches and instruments that use GIs for conservation, improving scientific knowledge and useful application.

7.4. International Collaboration

Encourage cross-border cooperation to exchange best practices and create worldwide guidelines for the application of GIs in conservation initiatives. To communicate information and coordinate conservation efforts, this may entail establishing alliances between nations, international organizations, and non-governmental organizations (NGOs). Together, we can establish global frameworks and norms for the sustainable use of GIs in biodiversity conservation, which would benefit communities and ecosystems everywhere.

7.5. Financial Incentives and Subsidies

Governments have the potential to be extremely important by offering producers who implement sustainable practices under GIs financial incentives, such as grants, subsidies, or tax exemptions. Producers that maintain customary practices that support threatened species and their environments may be incentivized to do so by these incentives. Governments may facilitate producers' efforts to preserve and improve biodiversity by providing financial assistance for conservation-friendly practices [42].

7.6. Environmental Certification for GIs

It is imperative to establish distinct environmental certification criteria for Geographical Indications (GIs) in order to guarantee that their manufacturing processes support the preservation of threatened and endangered species. Criteria for sustainable harvesting, minimizing environmental consequences, and protecting habitats should all be part of these guidelines [40]. Environmental certification can ensure that items designated as Geographically Inaccessible (GI) are manufactured in a way that promotes biodiversity by establishing strict requirements. This strategy not only aids in the preservation of threatened species but also encourages environmentally friendly behaviours.

7.7. Third-Party Audits and Compliance Checks

To preserve the validity of GIs and their environmental advantages, regular third-party audits and compliance checks are necessary. These audits ought to confirm that GI products follow the prescribed environmental guidelines. Independent audits guarantee accountability and transparency in the certification process by offering an objective evaluation of compliance [42]. Third-party audits strengthen the commitment of GI producers to conservation goals by continuously upholding these standards and fostering trust among stakeholders and consumers. This check-and-balance mechanism guarantees that the manufacturing of GI goods actually aids in the preservation of endangered species and the sustainability of the environment.

8. CONCLUSION

The protection of Biodiversity, especially the endangered species is a very complex problem, necessitating a holistic strategy where legal, cultural, environmental, and economic tactics complement each other. Geographical Indications presents an exciting new approach to endangered species conservation. Traditionally used to safeguard the economic value of goods from specific regions and their cultural heritage, GI can, therefore, be of pivotal importance in the conservation of biodiversity. It can relate the existence of endangered species to the economic well-being of nearby communities, hence fostering conservation and ensuring that natural resources are used sustainably. In the present research, case examples and studies outline how GI can be used in the conservation of threatened species. GI has the capability to incentivize communities to save and manage in a sustainable way by providing a distinct market identity to products originating from endangered species or ecosystems. This strengthens the responsibility of local communities in terms of guardianship over biodiversity and enhances their sense of pride and ownership of their resources, apart from making available direct help toward the protection of species.

Moreover, GI can be a useful tool in supporting farming and harvesting that is less harmful to threatened species by promoting sustainable methods. Such restrictions can avoid overexploitation and ensure that use will not seriously threaten species survival through conditions for production and harvesting of

products under Geographic Indications. This is particularly the case in regions where customs are closely related to the environment and continuation of such customs would be vital for survival of certain species. Despite the potential benefits, GI in endangered species conservation is not free of problems. In fact, because legal regimes that govern GI are often very complex, and vary quite a lot between countries, applying and enforcing protections under GI consistently proves to be quite a challenge.

It might also be that either there is overuse because of commercialization of GI goods or that local communities do not share equitably in the benefits. Indeed, considerable reflection on their design and implementation is necessary to ensure GI protections genuinely contribute to the conservation of imperilled species without other adverse, unintended consequences.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Lockie S, Carpenter D. Agriculture, biodiversity and markets: Livelihoods and agroecology in comparative perspective. Routledge; 2009.
2. Arfini F, Cozzi E, Mancini MC, Ferrer-Perez H, Gil JM. Are geographical indication products fostering public goods? Some Evidence from Europe. Sustainability. 2019;11(1), Article 1.
3. Gangjee DS. Geographical Indications and Cultural Heritage (SSRN Scholarly Paper 2187768); 2012.

- Available:<https://papers.ssrn.com/abstract=2187768>
4. Tennakoon CS. The role of geographical indications in promoting sustainable development: Intellectual property rights as a tool for economic and cultural preservation. 2024;9(2). Available:<https://doi.org/10.36713/epra2016>
 5. Bramley C. A review of the socio-economic impact of geographical indications: Considerations for the developing world. The WIPO Worldwide Symposium on Geographical Indications, Lima, Peru; 2011.
 6. CIPR Final report. Traditional Knowledge and Geographical Indications; 2002. Available:http://www.iprcommission.org/graphic/documents/final_report.htm
 7. Pant R. Protecting and promoting traditional knowledge in India: What role for geographical indications?; 2015. Available:<https://www.iied.org/16576iied>
 8. Milano MZ, Cazella AA. Environmental effects of geographical indications and their influential factors: A review of the empirical evidence. *Current Research in Environmental Sustainability*. 2021;3: 100096. Available:<https://doi.org/10.1016/j.crsust.2021.100096>
 9. Quetier F, Marty P, Lepart J. Farmers' management strategies and land use in an agropastoral landscape: Roquefort cheese production rules as a driver of change. *Agricultural Systems*. 2005;84:171–193. Available:<https://doi.org/10.1016/j.agsy.2004.05.005>
 10. Echols MA. Geographical indications for foods, trips and the Doha development agenda. *Journal of African Law*. 2003;47(2):199–220. Available:<https://doi.org/10.1017/S0021855303002092>
 11. Sautier D, Biénabe E, Cerdan C. Geographical indications in developing countries. *Labels of Origin for Food: Local Development, Global Recognition*. 2011; 138–153. Available:<https://doi.org/10.1079/9781845933524.0138>
 12. Larson Guerra J. Geographical indications, In situ conservation and traditional knowledge. *International Centre for Trade and Sustainable Development*; 2011. Available:https://doi.org/10.7215/IP_PB_20110211
 13. Bowen S, Zapata AV. Geographical indications, terroir, and socioeconomic and ecological sustainability: The case of tequila. *Journal of Rural Studies*. 2009;25 (1):108–119. Available:<https://doi.org/10.1016/j.jrurstud.2008.07.003>
 14. Beresford L. Geographical indications: The current landscape. *Fordham Intellectual Property, Media and Entertainment Law Journal*. 2006;17:979.
 15. Giovannucci D, Josling TE, Kerr WA, O'Connor B, Yeung MT. Guide to geographical indications: Linking products and their origins (Summary). *SSRN Electronic Journal*; 2009. Available:<https://doi.org/10.2139/ssrn.1736713>
 16. Quiñones Ruiz XF, Forster H, Penker M, Belletti G, Marescotti A, Scaramuzzi S, Broscha K, Braitto M, Altenbuchner C. How are food Geographical Indications evolving? – An analysis of EU GI amendments. *British Food Journal*. 2018; 120(8):1876–1887. Available:<https://doi.org/10.1108/BFJ-02-2018-0087>
 17. Harris NS, Johnson AS, Huang YA. 2018. *MMWR Morb Mortal Wkly Rep*. 2019;68:1117-23.
 18. Tashiro A, Uchiyama Y, Kohsaka R. Impact of geographical indication schemes on traditional knowledge in changing agricultural landscapes: An empirical analysis from Japan. *Journal of Rural Studies*. 2019;68:46–53. Available:<https://doi.org/10.1016/j.jrurstud.2019.03.014>
 19. Das K. Socioeconomic Implications of Protecting Geographical Indications in India (SSRN Scholarly Paper 1587352); 2009. Available:<https://doi.org/10.2139/ssrn.1587352>
 20. WIPO. The economics of intellectual property. *Suggestions for Further Research in Developing Countries and Countries with Economies in Transition*; 2009. Available:<https://doi.org/10.34667/tind.28197>
 21. Lamarque P, Lambin EF. The effectiveness of market-based instruments to foster the conservation of extensive land use: The case of Geographical Indications in the French Alps. *Land Use Policy*. 2015;42:706–717.

- Available:<https://doi.org/10.1016/j.landusepol.2014.10.009>
22. Chilla T, Fink B, Balling R, Reitmeier S, Schober K. The EU food label 'protected geographical indication': Economic implications and their spatial dimension. *Sustainability*. 2020;12(14), Article 14. Available:<https://doi.org/10.3390/su1214503>
 23. Hoang G, Le HTT, Nguyen AH, Dao QMT. The impact of geographical indications on sustainable rural development: A case study of the Vietnamese Cao Phong orange. *Sustainability*. 2020a;12(11). Article 11. Available:<https://doi.org/10.3390/su12114711>
 24. Frankel S. The mismatch of geographical indications and innovative traditional knowledge. *Prometheus*. 2011;29:253–267. Available:<https://doi.org/10.1080/08109028.2011.629872>
 25. Kimura J, Rigolot C. The potential of geographical indications (GI) to enhance sustainable development goals (SDGs) in Japan: Overview and Insights from Japan GI Mishima Potato. *Sustainability*. 2021a; 13(2). Article 2. Available:<https://doi.org/10.3390/su13020961>
 26. Evans GE, Blakeney M. The protection of geographical indications after Doha: Quo Vadis? *Journal of International Economic Law*. 2006a;9(3):575–614. Available:<https://doi.org/10.1093/jiel/jgl016>
 27. Rangnekar D. The socio-economics of geographical indications: A review of empirical evidence from Europe. *International Centre for Trade and Sustainable Development*; 2004. Available:https://doi.org/10.7215/IP_IP_20040501B
 28. Josling T. The war on terroir: Geographical indications as a transatlantic trade conflict. *Journal of Agricultural Economics*. 2006a; 57(3):337–363. Available:<https://doi.org/10.1111/j.1477-9552.2006.00075.x>
 29. Sharma K, Kour N. Geographical indications: Indian Sceanario with special reference to kashmir pashmina. II(II); 2022.
 30. Saikia DPR. Title: An overview on geographical indication with reference to Muga silk under state of Assam. 2024;9 (3).
 31. Panizzon M, Cottier T. Traditional Knowledge and Geographical Indications: Foundations, Interests and Negotiating Positions (SSRN Scholarly Paper 1090861); 2006. Available:<https://doi.org/10.2139/ssrn.1090861>
 32. Lewis-Whelan B, Ardiansyah A, Roberts PD, Nijman V, Damianou E, Morcatty TQ, Birot H, Imron MA, Nekaris KAI. Welfare and management of civets in Civet coffee tourism plantations. *Journal of Applied Animal Welfare Science*. 2024;27(3):561–574. Available:<https://doi.org/10.1080/10888705.2023.2270414>
 33. Kimura J, Rigolot C. The potential of geographical indications (gi) to enhance sustainable development goals (SDGs) in Japan: Overview and Insights from Japan GI Mishima Potato. *Sustainability*. 2021b;13(2). Article 2. Available:<https://doi.org/10.3390/su13020961>
 34. Bonacic C, Gimpel J. Sustainable Use of the Vicuña: A Critical Analysis and the MACS Project. 2003;345–354. Available:https://doi.org/10.1007/978-1-4615-0375-0_24
 35. Evans GE, Blakeney M. The Protection of Geographical Indications after Doha: Quo Vadis? *Journal of International Economic Law*. 2006b;9(3):575–614. Available:<https://doi.org/10.1093/jiel/jgl016>
 36. Josling T. The war on terroir: Geographical indications as a transatlantic trade conflict. *Journal of Agricultural Economics*. 2006b;57(3):337–363. Available:<https://doi.org/10.1111/j.1477-9552.2006.00075.x>
 37. Curzi D, Huysmans M. The Impact of Protecting EU geographical indications in trade agreements. *American Journal of Agricultural Economics*. 2022;104(1):364–384. Available:<https://doi.org/10.1111/ajae.12226>
 38. Hoang G, Le HTT, Nguyen AH, Dao QMT. The impact of geographical indications on sustainable rural development: A case study of the Vietnamese Cao Phong orange. *Sustainability*. 2020b;12(11). Article 11. Available:<https://doi.org/10.3390/su12114711>
 39. Gocci A, Luetge C. The synergy of tradition and innovation leading to sustainable

- geographical indication products: A literature review. *Journal of Management and Sustainability*. 2020;10:152.
40. Blakeney M. Protection of traditional knowledge by geographical indications. *International Journal of Intellectual Property Management*. 2009;3(4):357–374. Available:<https://doi.org/10.1504/IJIPM.2009.026912>
41. Belletti G, Marescotti A, Sanz-Cañada J, Vakoufaris H. Linking protection of geographical indications to the environment: Evidence from the European Union olive-oil sector. *Land Use Policy*. 2015;48:94–106. Available:<https://doi.org/10.1016/j.landusepol.2015.05.003>
42. Conneely R, Mahon M. Protected geographical indications: Institutional roles in food systems governance and rural development. *Geoforum*. 2015;60:14–21. Available:<https://doi.org/10.1016/j.geoforum.2015.01.004>

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