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Geographical Indications and biodiversity: An overview of regulatory challenges and critical perspectives

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Abstract

Geographical Indications (GIs) link cultural identity and biodiversity conservation by embedding local resources and practices into regulated product specifications. This paper examines GIs' potential to protect heritage breeds and plant varieties, especially under the new EU Regulation (EU) 2024/1143. By valorising "terroir," GIs can incentivize farmers to maintain traditional resources, thus helping counter genetic erosion and industrial standardization. Collective governance structures, such as producer groups, can foster shared knowledge and equitable decision-making, ensuring that cultural continuity aligns with ecological goals. However, several challenges persist: rigid specifications may stifle innovation, administrative procedures can deter smaller producers, and power imbalances can limit inclusive participation. The recent legal reforms—emphasizing sustainability, transparency, and digitization—bolster the GI system's capacity to incorporate biodiversity-friendly practices. In conclusion, while GIs are no panacea, their place-based, collective orientation positions them as promising tools for coupling economic viability with environmental stewardship.

Keywords*: Geographical indications, Biodiversity, Producer Groups, Sustainability, Market rules, Territory.*

1. Introduction

The modern agri-food sector is witnessing an ever-growing consumer preference for products that exhibit distinctive local characteristics, strong cultural identities, and verifiable ecological credentials (Borsellino *et al*., 2020). Geographical Indications (GIs) have emerged as a central tool in this space, especially within the European Union (EU), where they serve both as intellectual property rights and quality assurance mechanisms. Products recognized under GIs are said to embody the "*terroir*" of a region—an intricate interplay of soil, climate, local knowledge, and other socio-ecological factors (Canfora, 2024). This link between place and product exerts a powerful influence on consumer perceptions of authenticity, tradition, and quality. Given the multifaceted value that GIs represent—cultural, economic, ecological—they have attracted scholarly attention and policy reforms that aim to strengthen their sustainability potential.

Within this debate, a critical issue emerges regarding the relationship between GIs and bio-

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diversity conservation (Leone, 2021; Leone and Cristallo, 2023). Many rural landscapes in Europe and around the world face the pressing challenge of maintaining traditional practices and local genetic resources in the face of pressures from industrial agriculture, climate change, and market homogenization (Gocci and Luetge, 2020). Genetic erosion—whether of animal breeds or plant varieties—threatens long-term food security, ecosystem resilience, and cultural diversity (Leone, 2021). The protective and codifying framework of GIs offers an effective policy tool for reversing or mitigating these trends. By granting protected status to products derived from local breeds and varieties, GIs not only reward farmers and communities economically but also preserve genetic diversity by keeping native resources in use. As such, the synergy between GIs and biodiversity stands at the heart of many policy and academic conversations (FAO, 2018). When producers cultivate a traditional tomato ecotype or rear an indigenous sheep breed under a GI scheme, they contribute to the perpetuation of genetic lineages that might otherwise be lost. This dynamic underscores the notion that GIs can be a collective intellectual property model that fosters socio-economic development while sustaining local ecosystems (Di Lauro, 2020).

This paper investigates how GIs operate as a catalyst for the protection of both plant and animal biodiversity. The text begins by describing the conceptual underpinnings of GIs, focusing on their historical, cultural, and economic significance. Building on that foundation, it delineates how GIs evolved into legally recognized rights within the EU, culminating in Regulation (EU) 2024/1143. This recent legal framework, which consolidates and updates older regulations, is pivotal in clarifying the role of GIs in promoting sustainability goals. Subsequent sections examine the practical ways in which GIs foster biodiversity conservation, with specific attention to the role of local producer groups, traditional knowledge systems, and collective governance. The argument extends to address potential challenges and criticisms of the GI framework, including administrative burdens, risks of standardization, and power asymmetries that can emerge among stakeholders. The discussion also articulates how the updated provisions in Regulation (EU) 2024/1143 shave expanded or refined GI rules to align more effectively with sustainability imperatives.

The latter sections of the paper analyse future perspectives, including the need for adaptability in product specifications, deeper integration of animal welfare measures, and the continued embedding of biodiversity criteria in GI governance. In line with this forward-looking approach, the paper offers recommendations for policymakers, producer groups, and researchers, highlighting the importance of synergy among all these actors to fully harness the biodiversity benefits of GIs. The core proposition advanced here is that GIs, if managed collectively and dynamically, can produce substantial gains for local ecosystems, cultural heritage, and rural livelihoods. By blending market recognition, intellectual property protection, and environmental stewardship, Geographical Indications emerge as a paradigmatic model for how sustainable agriculture can be reconciled with socio-economic viability. It is therefore necessary to verify the regulatory contents of the relationship between GIs and biodiversity in order to understand the limitations and prospects of this regulatory instrument.

2. Conceptual background: linking Geographical Indications to biodiversity conservation

Geographical Indications rest upon the idea that certain products are intimately bound to specific geographical areas, where local environmental and cultural factors give those products unique characteristics or a distinctive reputation (Albisinni, 2020). Over the last century, numerous legal instruments have recognized the legitimacy of protecting these products through a specialized intellectual property right, ensuring that only those who adhere to codified geographical and production standards can use the registered name. This notion of origin-based product identity is not merely theoretical; it shapes consumer expectations and fosters rural development by creating an economic premium around intangible cultural assets (Bolognini, 2019).

Biodiversity, as broadly defined, encompass-

es variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems, as well as the ecological complexes of which they are part. Agricultural biodiversity, in particular, covers the variety and variability of plants, animals, and microorganisms used in farming (FAO, 2019). Traditional farming communities around the world have shaped agricultural biodiversity by domesticating and selectively breeding an immense range of species and varieties. This millennia-long process has led to a wealth of local landraces and animal breeds, each uniquely adapted to particular environmental constraints and cultural preferences.

The intersection between GIs and biodiversity arises from how GIs codify and valorise the production of locally distinctive goods, often those that rely on particular genetic resources (Leone and Cristallo, 2023). Because GIs stress the specificity of place, they frequently hinge upon the use of heritage varieties or traditional breeds. This trait-based approach, when institutionalized in product specifications, can motivate local actors to continue cultivating or rearing genetic resources that might lack the productivity or uniformity valued by industrial supply chains (Nirosha and Mansingh, 2025). Consequently, GIs can foster the on-farm or *in situ* conservation of genetic resources, ensuring that local biodiversity is maintained through actual use rather than relegated to gene banks or small-scale hobbyist farming. The existence of a stable or expanding market for GI-labelled products can reinforce these conservation efforts, creating a price premium tied to the uniqueness conferred by local biodiversity (Crescenzi *et al*., 2022). In essence, GIs can transform biodiversity from a vulnerable common good into an economically viable asset.

However, the relationship between GIs and biodiversity is not entirely straightforward. Critics have argued that formalising production methods into rigid product specifications could freeze certain practices at the expense of the ongoing evolution of local knowledge (Quiñones Ruiz, 2018). Others note that the commercial success of a GI does not automatically guarantee that biodiversity aspects are meaningfully conserved (Leone, 2021); producers could capitalise on the recognised name without fully committing to conserving the ancestral resources at the heart of that name's reputation. However, as normative frameworks such as Regulation (EU) 2024/1143 make explicit reference to sustainability and biodiversity, the potential synergy is becoming increasingly apparent. This synergy is based on a collective awareness of how local genetic resources confer distinctive qualities, and how these qualities, once codified and marketed, can create a mutually beneficial feedback loop between conservation and economic value.

3. Historical and legal evolution of Geographical Indications

GIs trace their origins to early European systems of local name protection that arose from ad hoc efforts to defend the authenticity of regional specialties. In the eighteenth century, merchants in certain regions clashed over the naming of wine and cheese, as producers sought legal recourse to combat appropriation of their local reputations. By the twentieth century, public authorities had begun establishing formal legal frameworks, with France taking a pioneering role through codified "appellations d'origine" for wine. Over time, international agreements such as the 1883 Paris Convention for the Protection of Industrial Property and, later, the 1994 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) offered broader recognition for place-based product names. Within the European Union, the first structured GI legislation was introduced in 1992 under Council Regulation (EEC) No 2081/92, which marked a major step toward harmonizing geographical designation rules for agricultural products and foodstuffs (Canfora, 2024). This milestone opened the door to successive reforms and expansions (Trapè, 2019), eventually leading to more specialized legislation, including Regulation (EU) No 1151/2012 for foodstuffs, Regulation (EU) No 1308/2013 for wine, and Regulation (EU) 2019/787 for spirits. These instruments formalized the designations "Protected Designation of Origin" (PDO), "Protected Geographical Indication" (PGI), and "Traditional Speciality Guaranteed" (TSG). Under these systems, producers seeking to register a product

must show the specific qualities, production processes, and geographic link in a disciplinary or product specification. Once registered, the name is protected across the EU, preventing non-conforming producers—whether inside or outside the region—from using it. In the early 2000s, as consumers became more aware of ethical and environmental aspects of agriculture, GIs were increasingly recognized as tools for rural development and ecological stewardship (Flinzberger *et al*., 2022). Although various amendments to existing EU frameworks acknowledged environmental considerations, they were largely optional rather than mandatory. In practice, many GI consortia did embrace biodiversity and sustainability goals (Vandecandelaere *et al*., 2021), though the lack of a uniform approach sometimes limited the full potential of GIs in conservation strategies. Against this backdrop, Regulation (EU) 2024/1143 stands out as a landmark measure. By consolidating legal rules for wines, spirits, and agricultural products, it has clarified the responsibilities of producer groups and improved mechanisms to prevent unfair evocation or mislabelling. Beyond its organizational reforms, the new regulation positions GIs as essential components of cultural heritage and sustainable development, offering a clearer legal basis for integrating biodiversity objectives into everyday GI management, notably concerning the protection of local animal breeds.

4. Overview of Regulation (EU) 2024/1143

Regulation (EU) 2024/1143 brings together several strands of previous EU legislation and introduces specific measures aimed at ensuring that GIs keep pace with broader sustainability targets, including those spelled out in the European Green Deal and the Farm to Fork Strategy. The first clear innovation in this regulation is the unification of distinct GI frameworks for wine, spirits, and foodstuffs within one legislative instrument. Such consolidation eliminates duplicative clauses and contradictions that previously existed across separate legal texts and thereby facilitates more consistent enforcement at the Member State level.

A second key feature is its explicit recognition of sustainability—environmental, social, and economic—as a pillar of GI protection. The text not only encourages producer groups to document and adopt sustainability measures in their product specifications but also allows for modifications to existing specifications to integrate new environmental or biodiversity-related criteria (Cristallo, 2025). In this sense, the regulation provides a legal foundation for dynamic, adaptive management of GIs, wherein product rules can evolve to reflect the latest scientific findings or policy goals. In particular, for biodiversity, the regulation allows for the inclusion of explicit conservation targets (e.g., mandated inclusion of certain heritage crops, restrictions on chemical inputs, or guidelines for preserving local ecosystems) within the specification. Moreover, this regulatory framework can be complemented by voluntary tools that encourage stakeholders to go beyond the minimum requirements, fostering innovation and sustainability in product development and environmental conservation. Such measures can either be proposed by producer groups themselves or encouraged by the competent national authorities who oversee GI registration.

Another innovation is the use of digital tools to promote transparency. Regulation (EU) 2024/1143 promotes digitisation in line with the process of innovation in agri-food systems (Ferrari, 2024). Digitalisation can make information on local breeds, seed saving practices and organic standards easily accessible. By sharing real-time data with the public, researchers and market actors, this approach not only increases accountability but also builds consumer trust, especially when sustainability claims are at stake (Geppert *et al*., 2024).

The new regulation also expands the legal scope of protection against evocation and misuse. Although earlier regulations provided protection in principle, the updating of certain enforcement provisions and the move toward an EU-wide digital registry are expected to strengthen the capacity of authorities to clamp down on GI infringements. From a biodiversity standpoint, this heightened enforcement is valuable because preserving the link between a product and its authentic place of origin likewise preserves the breed or plant variety at the heart of

that product. If imitation products could proliferate, local producers would have less incentive to maintain the genealogical purity or distinctive attributes that define an authentic GI.

Finally, Regulation (EU) 2024/1143 represents a more explicit alignment with the EU's external trade policy, given the GI chapters included in many free trade agreements (Ribeiro de Almeida, 2024). This alignment further cements the global significance of GIs as an instrument for climate resiliency, biodiversity, and local economic development. Many consumer markets worldwide place premium value on EU-labelled products, not only for taste or cultural prestige but also for perceived sustainability and authenticity. The new regulation leverages this recognition and attempts to embed biodiversity protection more firmly in the entire GI "value proposition," thus creating a synergy that encourages local producers and traders to keep local resources intact.

5. Geographical Indications as a tool for biodiversity conservation

Although GIs are sometimes dismissed as niche marketing, a growing body of evidence reveals that they can be transformative in shaping land use and preserving local ecosystems. Farmers who cultivate or raise protected local resources typically embed them in complex cultural and ecological contexts, gleaned from centuries of traditional knowledge (Ferrari, 2019). This interplay of genes, environment, and culture constitutes the "*terroir*" that modern GI frameworks strive to protect. Because terroir-based production is inseparable from local biodiversity—soil microbes, pollinators, forage species, or local livestock breeds—strong GI protection often yields wide-ranging ecological benefits (Leone and Cristallo, 2023).

One avenue through which GIs encourage conservation lies in their economic logic. A GI product frequently garners a higher market price because it is marketed as premium and distinctive (Cei *et al.*, 2018). This premium can offset the potentially higher costs of rearing niche breeds, cultivating heirloom varieties, or adopting traditional but labour-intensive methods. Without a GI framework, farmers might struggle to compete with large-scale producers who rely on standardized, high-yield breeds or varieties. By contrast, when a GI invests cultural and economic value in local resources, it transforms them into an asset. Farmers thus have a market incentive to maintain the complexity of local genetic resources, which are essential to preserve the product's distinctiveness and the authenticity expected by consumers. Over time, the synergy between local identity and consumer recognition can nurture a virtuous circle of conservation.

Conservation is further reinforced by the communal aspect of GIs. Unlike patents or trademarks owned by single entities, GIs typically involve a collective right managed by producer groups or consortia. These groups collectively devise, monitor, and enforce the production rules contained in the product specification (Genovese, 2023). The collective nature of GIs fosters knowledge sharing, with older farmers passing along the intricacies of sowing, breeding, or processing to younger generations. In many regions, such collaboration is invaluable for preserving intangible cultural heritage alongside biological resources. Because the GI system ties a product's identity to a specific region, it fosters strong local ties and a sense of stewardship among producers, who understand that neglecting or eroding the local resource base could undermine the product's reputation and thus threaten their livelihood (Guerra, 2010).

An example of how GIs support biodiversity in practice could be seen in the many cheese-producing regions in Europe. Often, the cheese's unique aroma and texture derive from a combination of local forage species, indigenous livestock breeds, and artisanal cheesemaking traditions. The product specification might specify that cows must graze on biodiverse alpine pastures for a certain period each year, or that certain feed components be locally produced. These provisions ensure that the multi-species grasslands—important habitats for pollinators and wild flora—remain actively managed rather than abandoned or converted to monocultures (Lambert-Derkimba *et al*., 2010). In this way, the GI effectively merges economic profitability with ecological stewardship, reaffirming the presence of local biodiversity.

Moreover, GIs are also a valuable tool for the active conservation of biodiversity. Article 46 of the Regulation allows for a protected geographical indication to be granted to products whose unique qualities, reputation or specific characteristics are closely linked to their place of origin. This may include the recognition of a specific plant variety or animal breed. In essence, the GI system both celebrates local cultural and economic heritage and encourages the conservation of indigenous genetic resources, giving producers a clear incentive to nurture and maintain these unique biological treasures (Leone and Cristallo, 2023).

Nonetheless, the direct impact of GIs on biodiversity can vary. Some GIs might emphasize historical or cultural practices without necessarily prioritizing ecological considerations; in such cases, biodiversity preservation might still occur incidentally but not always to the same extent. This is where the evolving regulatory environment, exemplified by Regulation (EU) 2024/1143, becomes crucial. By explicitly endorsing sustainability as a key component of GI protection, EU authorities and national competent bodies encourage producer groups to adopt more robust biodiversity measures and to evaluate them systematically. This regulatory scaffolding pushes GIs beyond narrow marketing niches, cultivating in them a more inclusive approach in line with agroecological principles.

6. The role of producer groups and collective management

One of the main features of GIs is the principle of collective organisation. As the literature consistently underscores, GIs are not typically owned by a single individual but function as a shared resource overseen by a group or consortium representing all eligible producers within a defined geographical area (Di Lauro, 2020). These consortia possess a range of powers that extend beyond registering or defending the GI, including the coordination of production protocols, compliance measures, and joint promotional strategies. The communal dimension of such an arrangement is especially significant for biodiversity, since it allows for a territory-based approach rather than leaving each farm to operate in isolation.

Producer groups[1] can strengthen the management of local biodiversity by establishing internal rules related to seed sourcing, animal breeding programs, and rotational grazing or integrated pest management practices. Although Regulation (EU) 2024/1143 does not explicitly require these consortia to negotiate with public authorities, it fosters an environment in which collaboration with regional or national institutions can prove beneficial for biodiversity goals (Rizzuto, 2024). In particular, Article 7 of the regulation enables producer groups to introduce specific sustainability measures either by integrating them into the product specification or by adopting other private-law instruments such as marks or certifications (Di Lauro, 2024). The text clarifies that such measures may focus on environmental, social, or economic objectives, thus granting groups the possibility to embed biodiversity-friendly criteria in their disciplinary. By codifying these points—whether they pertain to local breeds or minimal chemical inputs—the consortium can ensure that a GI's identity remains linked to the preservation of unique ecological resources. This collective dimension is pivotal for biodiversity because it allows a shared, territory-based strategy rather than leaving each farm isolated.

A further innovation in Regulation (EU) 2024/1143 concerns the extension of stakeholder participation in producer groups, with the type of stakeholders being defined by reference to Article 157 of Regulation (EU) No 1308/2013. According to the regulation, Member States may allow operators and representatives of economic activities connected to one or more phases of the GI supply chain, along with other interested stakeholders, to become part of the group—so long as they hold a specific interest in the prod-

[1] The new regulation distinguishes between ordinary producer groups and recognized producer groups, granting the latter broader powers and enabling them to extend sustainability norms to all producers even if these norms are not incorporated into the product specification.

uct. The regulation explicitly states that these additional members do not exercise control over the group of producers. This mechanism brings an expanded array of perspectives—possibly including processors, retailers, or even NGOs—into the same organizational setting as primary producers, thereby creating a more inclusive governance model. In the context of biodiversity, such diversity of membership can prove invaluable. Smaller-scale producers may find like-minded partners among other stakeholders who value ecological assets, while larger or more commercially oriented actors can gain insights into the benefits of preserving local genetic resources.

Collective management also extends to how the GI's disciplinary is updated over time. In some cases, older GIs might have been written at a time when biodiversity concerns were less salient. Under the impetus of Regulation (EU) 2024/1143, these groups can propose amendments that integrate biodiversity requirements—perhaps specifying that local animal breeds must compose a certain share of the herd, or that a specific range of local cereals, vegetables, or pulses must be used. These updates can be grounded in ongoing scientific research. Producer groups sometimes collaborate with universities, extension agencies, or conservation NGOs to better understand the ecological footprint of their production and to identify the native resources that need protection (Nirosha and Mansingh, 2025).

The ability of a GI consortium to adopt and enforce biodiversity measures is not automatic. In certain contexts, the group may be dominated by large or industrial producers who have less interest in investing in genetic conservation. However, the widely recognized notion in GI legislation that these consortia represent the general interest of the local economy can create internal checks and balances. Smaller-scale, ecologically minded producers can play a vocal role, and local governments or consumer advocacy groups might also pressure the consortium to embrace higher sustainability standards. Enforcement then becomes a matter of local prestige and market credibility: if a GI fails to meet its stated biodiversity or environmental claims, its reputation could be severely damaged.

7. Plant biodiversity, traditional knowledge, and Geographical Indications

A large part of agricultural biodiversity revolves around plant diversity. Over generations, smallholder farmers have cultivated a vast array of landraces, each carrying distinctive genetic traits suited to local conditions. Large-scale industrial agriculture has often displaced these landraces in favour of a handful of high-yield or disease-resistant varieties—an understandable strategy for food security but one that narrows the genetic base (Dasgupta, 2021). This homogenization can undermine the resilience of farming systems in the face of climate change and evolving pest pressures. GIs, by tying a product's authenticity to a particular local variety, provide a constructive counterpoint to the standardization trend.

Traditional knowledge systems also occupy a vital role within GI frameworks (Arfini and Bellassen, 2019). Such knowledge often includes sowing and harvesting calendars attuned to microclimatic conditions, as well as specialized processing or storage methods that maintain the organoleptic qualities of heritage crops. In many cases, this knowledge is transmitted orally from generation to generation; formal recognition under a GI can help record it systematically within product specifications. Regulation (EU) 2024/1143 encourages acknowledging local knowledge as a legitimate basis for conferring a product's specificity, thus reinforcing the intangible cultural heritage that accompanies biodiversity. For instance, the regulation clarifies that a GI can incorporate historical references and ethnobotanical evidence to strengthen the argument for a unique link to the territory (Albisinni, 2024; Costantino, 2024). When integrated into a legally protected disciplinary, such knowledge is less likely to be lost or eclipsed by globalizing forces.

An illustrative example might be found in orchard-based GIs, where fruit varieties developed through centuries of local breeding show adaptation to regional pests or climate conditions. If the product specification requires these specific varieties, and if producers see a financial return through GI marketing, the orchard becomes an active repository of genetic diversity. Farmers

can further refine these varieties, selecting for taste, resistance, or yield without losing the link to local heritage. In doing so, they perpetuate a micro-evolutionary process that keeps agriculture adaptive. In many southern European regions, GI-labelled fresh fruits or nuts have spurred orchard revitalization projects, reversing a decades-long trend of orchard abandonment (Arfini and Bellassen, 2019). The reintroduction or preservation of pollinator habitats often goes hand in hand with orchard upkeep, highlighting the interconnectedness of local knowledge, plant diversity, and farmland biodiversity.

8. Animal biodiversity and GIs: legal and practical perspectives

The conservation of animal biodiversity within GI systems has attracted particular interest in the last two decades, especially regarding livestock species with distinctive genetic traits. Traditional breeds often show resilience to local climatic extremes or disease pressures, making them an invaluable resource for climate adaptation. Nonetheless, these breeds may exhibit relatively low productivity in industrial contexts, prompting farmers to replace them with high-performance hybrids. GIs can counteract this trend by embedding breed-specific requirements in the product specification, so that only animals of a named local breed can be used to produce the GI-labelled product. Doing so ensures economic viability for these animals and fosters ongoing breeding programs that maintain or even enhance genetic diversity.

Literature argues that the GI framework can effectively protect farm animal biodiversity by recognizing the breed as intrinsic to the product's identity (Leone and Cristallo, 2023). According to this analysis, the explicit mention of breed characteristics within a GI specification allows for robust legal protection against products made with other breeds. This fosters an environment in which local breed associations collaborate with GI consortia to monitor parentage and manage herd books. Regulation (EU) 2024/1143 reinforces such measures, stressing the need for well-documented links between breed, region, and product. Producer groups are also encouraged to detail how the rearing conditions—outdoor grazing, minimal antibiotic usage, local feed—support the distinctiveness of these animals and, by extension, the final product. These explicit references to animal welfare become another pillar of sustainability, since healthy, well-adapted local animals often align with lower input farming systems that support a broader range of farmland biodiversity.

Although these measures are promising, several challenges persist. Certification and monitoring can be complex, especially if breeders are geographically dispersed or if local record-keeping systems are underdeveloped (Canfora, 2015). The cost of verifying breed lineage, controlling inbreeding, and ensuring compliance with product specifications can be significant. Nonetheless, the communal nature of GIs often helps mitigate such expenses. Producer groups can pool resources to hire accredited certifying bodies, invest in modern genetic testing, or negotiate with local governments for financial assistance. Over the long term, the premium that GI products fetch in the market often repays these collective investments.

Another dimension concerns the interplay between GI rules and broader animal-welfare regulations. While some Member States have advanced legislation requiring certain welfare standards, others have weaker frameworks. The new regulation clarifies that GI product specifications should not run contrary to general EU animal welfare standards, and it encourages further integration of welfare criteria in the specifications. Because GI-labelled products are often associated with higher quality, public expectations of humane animal husbandry are also high. This synergy between animal welfare and biodiversity is particularly evident in free-range or pasture-based systems (Lambert-Derkimba *et al*., 2010). If local herds can graze diverse grasslands, the region's overall biological diversity may be enriched through the maintenance of semi-natural habitats, which also serve as a refuge for wild species of plants and insects. The interplay of local knowledge, breed specifics, and GI collective rules thus weaves a tightly knit strategy for sustaining rural ecosystems.

9. Challenges and criticisms

Although GIs hold significant promise for safeguarding biodiversity, this system is not without its complexities and critiques. One persistent issue is the possibility of standardization, ironically arising from the requirement to specify methods and inputs in considerable detail (Gocci and Leutge, 2020). Critics argue that rigid GI specifications can freeze local knowledge and exclude other legitimate variations of production. For instance, producers in adjacent micro-zones might use equally traditional but slightly different techniques that, under a narrow specification, become invalidated. This dynamic could narrow the range of local diversity rather than expand it, though it is also worth noting that many consortia make provisions for small local variations within the recognized region.

A related concern surfaces around the administrative demands of GI registration and oversight. Smaller farmers or cooperative groups sometimes face difficulties navigating EU-level procedures, which can require complex documentation, scientific proof of historical use or ties to the region, and repeated interactions with national and European authorities. While Regulation (EU) 2024/1143 aims to simplify procedures through digitization and more transparent guidelines, real-world implementation can still be onerous, especially for producers with limited resources or technical expertise.

Moreover, GIs can sometimes exacerbate power imbalances within local communities. The advantage may fall to those already possessing capital and networks, while smaller or more marginalized producers struggle to participate meaningfully in the GI's governance structure. Producer groups, in principle, are democratic or at least representative bodies, yet they can be dominated by a handful of large producers who might have narrower interests concerning biodiversity. If, for example, large producers prefer to streamline production using fewer genetic lines or rely on standardized feed, the GI's biodiversity potential can be undermined. This dynamic underscores the importance of robust internal governance rules that ensure equitable representation and decision-making. (Rizzuto, 2024)

Another challenge lies in the success of GI-labelled products themselves. Though many GIs establish a premium market niche, not all manage to maintain it (Quiñones Ruiz, 2018). Market realities, such as consumer price sensitivity or competition from cheaper imitation goods, can erode the profitability that once sustained biodiversity-friendly production. The revised scope of protection under Regulation (EU) 2024/1143 helps mitigate this problem, yet global trade complications and online marketplaces can still pose risks. Enforcement across borders, especially in non-EU jurisdictions, remains complicated, although the EU's bilateral trade agreements increasingly include GI protections, offering some legal avenues for recourse.

Critics also highlight the fact that biodiversity conservation, while theoretically encouraged, is still not always a firm requirement across all GIs. The scope for genuine biodiversity impact depends heavily on how each consortium designs its specifications and how strictly national authorities or third-party certifiers enforce them (Cristallo, 2025). Many GIs do flourish on the basis of intangible cultural reputations rather than explicit biodiversity attributes, which can mean that, in practice, biodiversity is more a side effect than a central objective. Proponents of GIs argue that as consumer demand for "sustainable," "heritage," and "eco-friendly" products continues to rise, more consortia will see the benefits of foregrounding biodiversity in their marketing and production rules. The potential is undeniably strong, but it depends on the synergy of effective governance, conscientious production, supportive market contexts, and consistent legal backing.

10. Future perspectives and recommendations

The evolving discourse around GIs and biodiversity suggests that the system is poised to become a core instrument of agroecological transformation, but certain steps must be taken to enhance its efficacy. One recommendation is the adoption of adaptive management strategies that allow GIs to respond to both ecological and socio-economic changes. Instead of freezing traditional methods, consortia could design product

specifications that integrate ongoing research findings, potentially introducing new landraces or refining breeding methods in a way that remains true to the product's identity. Flexible specifications that permit innovative, biodiversity-friendly practices could prevent the ossification of local knowledge while still preserving authenticity.

Another pressing need is to support smaller producers who often face the steepest barriers to GI adoption. Technical assistance and financial incentives for biodiversity-oriented practices, such as covering the costs of genetic testing or training in seed multiplication, would help these producers contribute more robustly to the GI system.

In addition, greater collaboration between research institutions and GI consortia is advisable. Academic studies can help measure the biodiversity outcomes of specific GI rules, clarifying which aspects—like breed specificity, rotational grazing, or pesticide restrictions—are most beneficial. Coupled with long-term ecological monitoring, such evidence can guide incremental improvements in the product specification. These collaborations can also enhance consumer transparency by providing scientifically grounded data on why a product is truly biodiversity-friendly.

An important recommendation lies in broadening the scope of recognized resources in GI documentation. Rather than focusing solely on direct production inputs, consortia could be encouraged to consider the entire ecosystem context, including pollinator habitats, water management, and soil microbe diversity. Although the new regulation permits a more comprehensive approach, explicit guidance on how to integrate such information could help producer groups draft robust, ecosystem-focused product specifications that genuinely champion local biodiversity.

It is likewise essential to reinforce consumer awareness through educational campaigns and targeted labelling. Many consumers already recognize the EU logos for PDO, PGI, or TSG, but they may be less informed about the biodiversity elements behind these labels (Leone, 2021). Public authorities and producer groups can work together to develop communication materials that highlight how local breeds or plant varieties shape the flavour, texture, or aroma of the product and how these genetic resources would be at risk without a GI framework. Linking such narratives to broader environmental discussions—like climate change and resilience—can deepen consumer appreciation and make them more willing to pay a premium, which in turn supports conservation efforts at the farm level.

Finally, global collaboration is increasingly important. The EU maintains a portfolio of trade agreements with GI provisions, reflecting a growing international awareness of the need to global approach to sustainability (Di Lauro, 2018). By using these agreements as platforms for sharing best practices in biodiversity management, the EU and its partners can expand the conservation benefits of GIs beyond Europe. International recognition of GIs may also foster improved sustainability standards in other regions with similarly rich agricultural histories. As climate change threatens many traditional farming systems, the model of local identity plus biodiversity stewardship has the potential to gain traction worldwide, safeguarding genetic resources of global significance (Di Lauro, 2022).

11. Conclusion

Geographical Indications represent a unique confluence of legal protection, cultural valorisation, and potential ecological stewardship. The revised legal framework articulated in Regulation (EU) 2024/1143 consolidates previous rules for wines, spirits, and agricultural products under a single instrument and explicitly references sustainability and biodiversity objectives (Albisinni, 2024). In doing so, it further legitimizes a path that many producers, stakeholders, and local communities have already been pursuing: the adaptive management of agricultural biodiversity through collective governance and market-based recognition.

It is evident that GIs can shield localized animal breeds from extinction, incorporate heritage plant varieties into mainstream production, and embed longstanding cultural practices into product specifications. This synergy has allowed many rural areas to avoid the uniformity of industrial models, preserving both ecological complexity and intangible heritage. By converting intangible local resources into market

assets, GIs can generate a stable income stream that underwrites biodiversity-friendly practices. The presence of a strong GI can therefore reduce the vulnerability of rural economies, discourage out-migration, and foster pride in local identity, all while ensuring that distinctive genetic resources remain actively used.

The debate is not without nuance. Overly rigid product specifications, administrative hurdles, and possible domination by large stakeholders can hamper GIs' capacity to foster biodiversity. Ensuring equitable governance, flexible adaptation to changing environmental conditions, and robust enforcement against fraudulent uses of GI names are all ongoing tasks. Nonetheless, the overarching direction points to GIs being an increasingly central part of the EU's effort to realign agriculture with sustainability imperatives, especially in an era of pressing climate and ecological challenges.

In a future shaped by climate uncertainty and evolving consumer demands, the potential of GIs to promote biodiversity will likely expand. Producer groups may incorporate explicit requirements to protect local species, governments may incentivize synergy between GIs and protected areas, and global dialogues may lead to stronger international support for origin-based products. While not a panacea, GIs have demonstrated a remarkable capacity to align economic, cultural, and environmental values under a single cooperative framework. By drawing on collective action, intellectual property rights, and scientific knowledge, GIs can help shape an agricultural landscape that retains its character, resilience, and biological richness for future generations. In that sense, the ongoing evolution of GIs within EU legislation and beyond offers an inspiring blueprint for how local communities, markets, and ecosystems can flourish together in an increasingly globalized world.

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