

LIVING LAW AND GMO REGULATION: A COMPARATIVE STUDY OF INDONESIA AND THE EUROPEAN UNION

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ABSTRACT

Comparative research on genetically modified organisms (GMOs) in Indonesia and the European Union has concentrated on institutional design, risk assessment, and labelling, leaving largely unexamined how such regulation intersects with the living law of the customary and indigenous communities who are frequently the de facto custodians of the plant genetic resources on which biotechnology draws. This study addresses that gap by advancing a single central proposition: Indonesia's legal framework for genetic utilization cannot satisfy the classical juridical ideals of justice, legal certainty, and utility unless it is grounded in the living law (Ehrlich) and adat-law tradition (Van Vollenhoven, Ter Haar, Soepomo) that has long governed local genetic resources, and is aligned with the access and benefit-sharing (ABS) architecture of the Nagoya Protocol. Employing normative legal research with conceptual, comparative, and living-law approaches, the study compares the European Union's precautionary, risk-based biosafety regime under Directive 2001/18/EC with Indonesia's fragmented, product-based regulatory framework, and evaluates the doctrinal basis for recognizing customary and indigenous rights over genetic resources, namely the constitutional basis (Article 18B(2) of the 1945 Constitution), the jurisprudential basis (Constitutional Court Decision No. 35/PUU-X/2012), and the statutory basis (Article 77 of Law No. 11 of 2019). The analysis finds that Indonesian positive law recognizes such rights only implicitly and fragmentarily, and argues that consolidating this recognition, through enactment of the pending Draft Law on Adat Communities and domestic implementation of the Nagoya Protocol's prior-informed-consent and benefit-sharing mechanisms, is a necessary, rather than merely supplementary, condition for a just, certain, and beneficial GMO regulatory regime. The study recommends harmonized, transparent legislation supported by comprehensive risk assessment, mandatory labelling, and

traceability, so as to reconcile scientific progress with the living law and socio-cultural realities of Indonesia's pluralistic society.

Keywords : GMO Regulation; Genetic Resources; Customary Law; Indigenous Peoples; Biosafety.

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I. INTRODUCTION

The regulation of genetically modified agricultural products (GMAPs) has emerged as a critical area in global environmental and food law, driven by the rapid advancement of biotechnology and its implications for human health, environmental safety, and trade. Genetically modified (GM) products were first introduced to the market in 1996.¹ In Indonesia, genetically modified organisms (GMOs) are regulated through a multi-agency framework that includes the National Agency of Drug and Food Control (BPOM), the Ministry of Agriculture, the Ministry of Environment and Forestry, and the Biosafety Commission for Genetically Engineered Products (KKH).² These agencies collectively administer a system that largely adopts a product-based regulatory approach, whereby regulation focuses on the characteristics of the end product rather than the process used to create it. Indonesia's legal instruments, such as BPOM Regulation No. 6 of 2018 and the updated BPOM Regulation No. 19 of 2024, outline the parameters for GMO food safety assessment, labeling, and market approval.³

Biotechnology plays a pivotal role in genetic engineering, defined as the scientific discipline concerned with the utilization of living organisms in production processes to generate goods or services.⁴ Through biotechnological applications, plant quality can be enhanced via genomic manipulation, particularly through the insertion of foreign genes, resulting in transgenic plants.⁵ Advances in science and technology have enabled the application of genetic engineering across multiple sectors, including food production, agriculture, forestry, pharmaceuticals, and industrial processes.⁶ Proponents argue that genetic engineering offers substantial economic benefits while posing no significant risks to human health or the environment.⁷ However, concerns persist regarding the use of gene donors, genes of interest, promoters, and terminators derived from microbial sources. Nevertheless,

¹Toto Hadiarto and Bahagiawat Amirhusin, "Perkembangan Pemanfaatan, Regulasi dan Metode Deteksi Produk Rekayasa Genetika Pertanian di Indonesia," *Jurnal Penelitian Pertanian Tanaman Pangan* 39, no. 1 (2020): 61–71, <https://doi.org/10.21082/jp3.v39n1.2020.p61-71>.

²Ministry of Agriculture Regulation No. 50/2011.

³National Agency of Drug and Food Control (BPOM), Regulation No. 6/2018 on Supervision of Genetically Engineered Food Products; BPOM, Regulation No. 19/2024.

⁴Adam Muhshi, Fakultas Hukum, Laporan Hasil Penelitian (Jember: Fakultas Hukum, Universitas Jember, 2016).

⁵Soeryo Adiwibowo, "Integrating Socioeconomic Considerations into Biosafety Public Participation on Development of Biotechnology Policy in Indonesia" (2016).

⁶Undang-Undang Nomor 21 Tahun 2004 tentang Pengesahan Cartagena Protocol on Biosafety to the Convention on Biological Diversity.

⁷Hadiarto and Amirhusin, "Perkembangan Pemanfaatan, Regulasi dan Metode Deteksi Produk Rekayasa Genetika Pertanian di Indonesia."

extensive research has demonstrated the safety of these components, as they are not sourced from human pathogens.⁸

In the current globalized trade environment, establishing comprehensive legal protections for scientific innovations has become essential. Indonesia's regulatory framework governing genomic biotechnology remains ambiguous and inadequately systematized, with relevant provisions dispersed across numerous legislative documents.⁹ The nation demonstrated its commitment to international biosafety standards through the ratification of the Cartagena Protocol on Biosafety to the Convention on Biological Diversity via Law No. 21/2004, a legislative action reflecting Indonesia's recognition of its significant biological diversity and the imperative for sustainable management approaches. The adoption of the Cartagena Protocol represents a direct consequence of Indonesia's earlier ratification of the Convention on Biological Diversity through Law No. 5/1994.

The constitutional foundation for scientific development in Indonesia derives from Article 31(5) of the 1945 Constitution, which mandates that the state shall advance science and technology while upholding religious values and national unity to enhance civilization and human welfare. The current regulatory landscape reveals significant fragmentation, highlighting the need for systematic legal analysis. The rapid advancement of genomic technologies and their application in creating novel biological entities requires thorough examination of the legal status of organisms developed through these innovative techniques, which represent a distinct category requiring specific regulatory consideration.¹⁰

The accelerated progress in scientific and technological innovation, particularly concerning the application of genomic technologies in agricultural development, necessitates corresponding advancements in legal scholarship. Within this context, legal discovery, defined as the scholarly examination and formulation of legal principles by jurists through scientific inquiry and doctrinal analysis, assumes critical importance.¹¹ Such jurisprudential developments are essential for fostering sustainable legal evolution that harmonizes the fundamental ideals of justice, legal certainty, and societal utility, principles originally articulated by Gustav Radbruch in his theory of legal ideals, which remain foundational to contemporary legal philosophy and practice.

Ministerial Regulation No. 25/2012 constitutes a pivotal regulatory instrument by mandating Environmental Risk Analysis (Analisis Risiko Lingkungan/genetic AMDAL) as a compulsory component of the authorization process for transgenic plant dissemination, establishing a critical regulatory mechanism. Legal scholarship, particularly analyses published in the *Jambe Law Journal*, underscores the necessity of incorporating both precautionary

⁸Muhshi, Fakultas Hukum.

⁹Piet Van der Meer et al., "The Status under EU Law of Organisms Developed through Novel Genomic Techniques," *European Journal of Risk Regulation* (2020): 1–20, <https://doi.org/10.1017/err.2020.105>.

¹⁰Muliadi Nur, "Rechtsvinding: Penemuan Hukum (Suatu Perbandingan Metode Penemuan Hukum Konvensional dan Hukum Islam)," *Penemuan Hukum*, 2021.

¹¹Muliadi Nur, "Rechtsvinding."

principles and ecological justice concepts into statutory frameworks to adequately safeguard constitutional environmental rights.¹²

The regulation of genetic resources, however, cannot be reduced to statutory and administrative instruments alone. Long before the state promulgated biosafety legislation, adat and indigenous communities across the archipelago had already developed their own normative orders governing the selection, exchange, and stewardship of local plant genetic material, from heirloom rice varieties to communal seed banks. Eugen Ehrlich's theory of the living law (*lebendes Recht*) holds that the rules which actually govern social conduct are frequently found not in enacted statutes but in the lived practices of associations, families, and communities.¹³ This living-law dimension is expressly acknowledged, if only partially, within Indonesia's own constitutional order: Article 18B(2) of the 1945 Constitution obliges the state to recognize and respect customary law communities (*kesatuan masyarakat hukum adat*) and their traditional rights, while Article 77 of Law No. 11 of 2019 protects indigenous knowledge and local biological specimens from uncontrolled transfer.¹⁴

Recent scholarship on Indonesia's GMO regulation has developed along several distinct lines, none of which fully integrates the living-law dimension pursued in this article. First, comparative and institutional studies have mapped Indonesia's regulatory architecture against those of neighbouring jurisdictions: Oktavia, Ardiansyah, and Alfarisi (2025) compare GMO risk-management practices in Indonesia, Malaysia, and Thailand and find that all three states rely on centralized risk-assessment and risk-communication institutions while leaving community-level participation largely unaddressed; Cadizza, Mainita, and Nurhafni (2024) similarly catalogue Indonesia's genetic-engineering rules alongside those of several developed states but stop at institutional and procedural comparison, without examining the position of customary rights-holders. Second, food-safety-oriented studies such as Mahdewi and Banjarani (2020) evaluate Indonesia's implementation of the Cartagena Protocol and the Convention on Biological Diversity through the narrower lens of consumer food safety, leaving the constitutional and adat-law status of genetic resources outside their scope. Third, intellectual-property-oriented scholarship, most notably Masrur, Yulia, Zainol, and Akpoviri (2024), has documented the structural weaknesses of Indonesia's Material Transfer Agreement regime, including its limited capacity to monitor compliance and its exposure to biopiracy, but frames the problem primarily through patent law rather than through the constitutional recognition of customary and indigenous communities as rights-holders. What these three strands share is a common limitation: each treats Indonesia's genomic governance as a matter of institutional design, food safety, or intellectual

¹²Waspihah et al., "From Bean to Benefit: How Indonesian Intellectual Property (IP) Law Protects the Coffee Farmers in Indonesia?," *Jambe Law Journal* 7, no. 2 (2024): 429–53, <https://doi.org/10.22437/home.v7i2.443>.

¹³Eugen Ehrlich, *Fundamental Principles of the Sociology of Law*, trans. Walter L. Moll (Cambridge, MA: Harvard University Press, 1936), 493. Ehrlich's concept of the "living law" (*lebendes Recht*) refers to the rules of conduct that actually govern social life, as distinct from the norms enacted and enforced by the state.

¹⁴Article 18B(2) of the 1945 Constitution of the Republic of Indonesia; Law No. 11 of 2019 on the National System of Science and Technology, art. 77.

property, and none asks whether or how the living law of adat and indigenous communities, who have long selected, exchanged, and stewarded the very genetic material that biotechnology draws upon, should shape the regulatory framework itself. This article addresses that gap by integrating the comparative analysis of Indonesian and European Union GMO regulation with an explicit doctrinal account of living law, customary law, and indigenous peoples' rights, and it does so by pursuing two research questions: first, how do Indonesia and the European Union differ in their legal regulation of genetically modified agricultural products; and second, how can customary (adat) law and the rights of indigenous and local communities be integrated into Indonesia's GMO regulatory framework so that it satisfies the ideals of justice, legal certainty, and utility.

Building on the established analysis of justice, legal certainty, and utility as the foundational ideals of genomic law, this study extends the inquiry to examine how living law, hukum adat, and the rights of indigenous peoples can, and should, be integrated into Indonesia's regulatory framework for genetically modified agricultural products, so that the resulting legal order reflects not only the formal demands of positive law but also the socio-cultural realities of Indonesia's pluralistic society. The Method section below sets out the normative legal research design used to pursue the two research questions identified above.

II. RESEARCH METHOD

This study employs normative legal research methodology (*penelitian hukum normatif*), triangulating three complementary approaches, each selected for a distinct analytical function. The conceptual approach is used to clarify the meaning and doctrinal content of the three juridical ideals, namely justice, legal certainty, and utility, that this article treats as evaluative criteria; it does so through systematic examination of legal doctrines developed by legal philosophers (Radbruch, Bentham, Mill, Posner, Rawls, Nonet and Selznick) and Indonesian jurists (Rahardjo, Saptomo). The comparative approach is used to test how these criteria are realized differently in Indonesia and the European Union; it proceeds through structured comparison of specific legal instruments, principally Directive 2001/18/EC on the deliberate release of GMOs, Regulation (EC) No. 1831/2003 on traceability and labelling, and the European Union's 2023 proposal for the regulation of plants obtained by new genomic techniques, COM(2023) 411 final (Winter, 2024; Lukasiewicz et al., 2024), on the European side, against Ministerial Regulation No. 25/2012, Government Regulation No. 26/2021, and BPOM Regulations No. 6/2018 and No. 19/2024 on the Indonesian side, along five analytical variables: risk-assessment methodology, authorization procedure, labelling and traceability requirements, public-participation mechanisms, and institutional architecture. Legal materials for the comparative analysis were purposively selected for their direct doctrinal relevance to these five variables and were interpreted through systematic legal interpretation (grammatical, systematic, and teleological), with normative conclusions drawn by triangulating the resulting doctrinal findings against the justice, certainty, and utility framework established through the conceptual approach.

In addition to these two approaches, the study employs a living-law lens, drawing on the classical Indonesian adat-law scholarship of Van Vollenhoven, Ter Haar, and Soepomo, to identify how customary communities regulate access to, and the exchange of, local plant genetic resources; this approach is used specifically to test whether, and how, the justice, legal certainty, and utility criteria established above must be reformulated once the living law of adat and indigenous communities is taken into account. Primary legal materials consist of Indonesian statutes and regulations, European Union directives and regulations, Constitutional Court jurisprudence, and international instruments concerning biosafety, biodiversity, and indigenous peoples' rights, supplemented by secondary materials drawn from legal scholarship and legal-anthropological literature published, for the most part, within the last decade. The research utilizes two legal-discovery methods: comparative interpretive analysis, which conducts systematic juxtaposition of Indonesian and European Union legal instruments along the five variables identified above, and prospective legal-policy analysis (*analisis kebijakan hukum prospektif*), used here in place of the loosely defined label "futuristic interpretive analysis", which evaluates existing regulatory frameworks against a normatively justified reform proposal (the integration of living law and Nagoya Protocol-consistent access and benefit-sharing mechanisms into Indonesia's GMO regulation) and specifies the concrete legislative and regulatory steps required to reach it.¹⁵

III. ANALYSIS AND DISCUSSION

A. Regulatory Framework and Biosafety of GMOs in the European Union

Since the early 1990s, the European Union's regulatory framework for genomic applications has evolved into one of the most comprehensive and precautionary biosafety systems in the world. It specifically addresses two primary domains of concern: (1) the release of genetically modified organisms (GMOs) into the environment, and (2) the utilization of modified microorganisms. This comprehensive legal system pursues four fundamental objectives.

First, the protection of human, animal, and environmental health through rigorous safety evaluations prior to market authorization of transgenic products. Directive 2001/18/EC of the European Parliament and Council explicitly states in Article 5 that safeguarding public health and ecosystems necessitates stringent control measures for deliberate environmental release of GMOs.¹⁶ The regulatory framework mandates a step-by-step introduction principle for transgenic products, designed to systematically evaluate potential risks, requiring comprehensive assessment of both direct and indirect effects on human health and ecological systems. Authorization for release is granted only after competent authorities verify

¹⁵Cornelis van Vollenhoven, *Het Adatrecht van Nederlandsch-Indië*, vol. I (Leiden: E.J. Brill, 1918); B. Ter Haar, *Adat Law in Indonesia*, trans. E. Adamson Hoebel and A. Arthur Schiller (New York: Institute of Pacific Relations, 1948).

¹⁶Directive 2001/18/EC of the European Parliament and of the Council of 12 March 2001 on the Deliberate Release into the Environment of Genetically Modified Organisms, art. 5.

product safety, with mandatory involvement of scientific committees and researchers.

Second, the European regulatory framework emphasizes harmonized procedures for conducting risk assessments and authorizing the release of genetically modified products, designed to promote efficiency, transparency, and compliance with clearly defined timelines. Article 18 of Directive 2001/18/EC outlines the procedural requirements for evaluating and managing the risks associated with the deliberate release of GMOs into the environment, mandating standardized risk assessment protocols adhered to by national competent authorities and applicants alike.¹⁷ This harmonization is essential not only for maintaining biosafety but also for facilitating the smooth functioning of the internal market for genetically modified products.

Third, the regulatory framework mandates explicit and standardized labelling requirements for GMO products placed on the market, requiring comprehensive disclosure of technical information, including potential environmental risks, safety measures, and emergency response protocols. All GMO products sold within the European Union must carry a clear label disclosing the presence of genetically modified organisms, accompanied by detailed supporting documentation, thereby empowering consumers to make informed choices while reinforcing public trust in the governance of biotechnology.

Fourth, the regulatory framework mandates comprehensive traceability systems for GMO products throughout market distribution, serving as a critical support system for supply chain management through rigorous information documentation and facilitating effective response to unforeseen circumstances.¹⁸ GMOs, defined as organisms whose genetic material has been artificially altered through biotechnology,¹⁹ can be categorized into four distinct generations of genetic modifications: (1) single-trait modifications, (2) stacked-trait combinations, and (3–4) advanced modifications including near-intragenic, intragenic, and cisgenic variations.²⁰ In the Indonesian context, given the inevitable circulation of GMO products, robust monitoring and periodic traceability verification become essential regulatory requirements, particularly given potential environmental, health, and safety implications.

Furthermore, the European regulatory framework incorporates the precautionary principle as a fundamental tenet of environmental protection. As analyzed by Latifah and Imanullah in the *Jambe Law Journal*, this principle empowers regulatory authorities to implement preventive measures even amid scientific uncertainty regarding potential environmental risks.²¹ Directive 2001/18/EC institutionalizes this approach through mandatory

¹⁷Directive 2001/18/EC, art. 18.

¹⁸Albertus S. I. Putra, Yusuf Priandari, and Yuniaristanto, "Analisis Ketelusuran Rantai Pasok Hortikultura Berorientasi Ekspor dengan Metode SCOR (Studi Kasus)," *Seminar Nasional IENACO* (2016): 404–11.

¹⁹Yuwono Prianto and Swara Yudhasasmita, "Tanaman Genetically Modified Organism (GMO) dan Perspektif Hukumnya di Indonesia," *Al-Kauniyah: Jurnal Biologi* 10, no. 2 (2017): 133–42, <https://doi.org/10.15408/kauniyah.v10i2.5264>.

²⁰Prianto and Yudhasasmita, "Tanaman Genetically Modified Organism (GMO)."

²¹Emmy Latifah and Moch Najib Imanullah, "Applying Precautionary Principle in Fisheries Management," *Jambe Law Journal* 1, no. 1 (2018): 13–34, <https://doi.org/10.22437/jlj.1.1.13-34>.

environmental risk assessments conducted by independent scientific panels prior to GMO approval, demonstrating the application of precautionary measures to safeguard biodiversity, ecosystem integrity, and public health, which are core pillars of contemporary environmental jurisprudence.²²

This precautionary architecture is not, however, static or uncontroversial, and a purely descriptive account of it risks overstating its coherence. Guida's (2021) analysis of Court of Justice of the European Union jurisprudence on the precautionary principle shows that the Court has, in practice, adopted a comparatively narrow interpretation of the scientific-uncertainty threshold, constraining member states' capacity to impose unilateral cultivation bans and thereby revealing a persistent tension between centralized risk governance and national or sub-national autonomy, a tension directly instructive for Indonesia's own multi-agency, and at times overlapping, division of authority among BPOM, the Ministry of Agriculture, the Ministry of Environment and Forestry, and the Biosafety Commission. More recently, the European Union's own 2023 proposal to relax authorization and labelling requirements for products of new genomic techniques (NGTs), critically examined by Winter (2024) as deficient in legal certainty and sustainability safeguards, and by Lukasiwicz, van de Wiel, Lotz, and Smulders (2024) for its weakening of consumer-facing transparency, demonstrates that the European model Indonesia might otherwise be tempted to adopt wholesale is itself in normative flux. The lesson for Indonesia's comparative regulatory design is accordingly not to import the European Union's precautionary architecture as a finished template, but to draw selectively on its stronger elements, namely harmonized risk-assessment timelines, mandatory labelling, and traceability, while avoiding the erosion of public participation and transparency that the Union's own more recent reforms illustrate as a live risk even within a mature regulatory system.

B. Construction and Discovery of Genomic Utilization Law in Indonesia

The constitutional guarantee for the application of science and technology is explicitly provided in Article 28C of the 1945 Constitution of the Republic of Indonesia. This constitutional provision necessitates further elaboration through implementing regulations, reflecting the state's authority to regulate the development, utilization, and application of GMO products. Initially established through Law Number 18 of 2002, this regulatory framework was subsequently repealed and replaced by Law Number 11 of 2019 concerning the National System of Science and Technology, which provides comprehensive regulation of institutional roles, master planning for advancement, organizational structure, ethical considerations, resource management, network development, implementation oversight, and community participation.

²²Latifah and Imanullah, "Applying Precautionary Principle."

Of particular significance is Article 77 of Law Number 11 of 2019, which establishes protective measures for Indonesia's biological and cultural resources by strictly prohibiting the transfer of biodiversity materials, local specimens, socio-cultural assets, and indigenous knowledge, whether in physical or digital form, when the required testing can be conducted domestically. Where testing must be performed abroad, the legislation mandates a material transfer agreement as a prerequisite. These provisions demonstrate Indonesia's effort to balance technological advancement with the protection of national biological resources and traditional knowledge, a theme this article revisits in the discussion of living law below.²³

The regulatory framework governing material transfer in the agricultural sector is specifically addressed in Government Regulation Number 26 of 2021, whose Article 39 establishes legal provisions for individuals or legal entities seeking to conduct searches and collections of Plantation Genetic Resources, requiring formal authorization from the Minister and comprehensive documentation including a Material Transfer Agreement for cases involving export of materials from Indonesian territory.²⁴ Within this framework, such materials are termed Genetic Resources, defined as biological materials derived from plant, animal, or microbial sources that contain functional units of heredity, possessing either demonstrated or potential value.

Regarding genetically modified organisms, intellectual property protection may be secured through patent mechanisms, provided the agricultural products demonstrate sufficient novelty, inventive step, and industrial applicability compared to existing varieties. However, implementation must be carefully managed to balance private innovation incentives with public interest, food security, and the protection of traditional knowledge systems.

The philosophical foundation of law, as articulated by Socrates, positions justice as the supreme legal virtue, necessitating that legislative instruments ensure equitable outcomes for society, a principle of particular significance in genomic regulation, where equitable frameworks must simultaneously protect inventors' rights, consumer interests, and environmental integrity. As elucidated by Philippe Nonet and Philip Selznick, ideal legal systems comprehend public interests and deliver substantive justice.²⁵ Current GMO regulations remain inadequate in providing comprehensive legal safeguards, particularly for vulnerable stakeholders including local agricultural producers and consumers,²⁶ highlighting the critical need for robust and continuous monitoring mechanisms.

²³"Undang-Undang Nomor 11 Tahun 2019 tentang Sistem Nasional Ilmu Pengetahuan dan Teknologi" (2019), art. 77.

²⁴"Peraturan Pemerintah Nomor 26 Tahun 2021 tentang Penyelenggaraan Bidang Pertanian," Pub. L. No. 26 Tahun 2021 (2021), art. 39.

²⁵Howard S. Erlanger and Michael Sosin, "Legal Orders and the Dynamics of Change. Review: Law and Society in Transition: Toward Responsive Law by Philippe Nonet and Philip Selznick," *Contemporary Sociology* 8, no. 2 (1979): 217.

²⁶Prianto and Yudhasasmita, "Tanaman Genetically Modified Organism (GMO)."

These legal advancements are consistent with Gustav Radbruch's tripartite theory of legal values, which identifies justice, legal certainty, and utility as the foundational pillars of a sound and effective legal system. In the context of genomic regulation, equitable governance must strive to harmonize these three principles while addressing the complex and evolving nature of genetic modification technologies and the four distinct generations of genetic engineering, each characterized by differing scientific methodologies, risk profiles, and societal implications.²⁷

1. Aspect of Justice in the Utilization of Genetics

The evolution of legal philosophy has given rise to a multitude of theoretical frameworks within the domain of justice theory, rendering the concept inherently abstract, contested, and highly dependent on contextual, cultural, and jurisprudential variables. Philippe Nonet and Philip Selznick's responsive law theory posits that effective legal systems must achieve substantive objectives through comprehension of societal needs and commitment to substantive justice,²⁸ underscoring the instrumental function of law as a tool for shaping normative conditions capable of addressing complex societal needs within the specific socio-cultural context of Indonesian society.

The formulation of effective regulatory frameworks faces significant challenges arising from the often-conflicting interests of diverse stakeholders. In the context of globalization, increasing pressure to establish harmonized legal standards frequently gives rise to legal transplantation, wherein regulatory models developed in one jurisdiction are adopted by others without congruence with local socio-legal realities, leading to tensions in implementation. Careful harmonization is therefore required to reconcile these divergent interests through selective adaptation, tailoring legal frameworks to reflect local values and institutional capacities while accommodating international norms.

The disparity in the valuation of genomic resources between developed and developing nations warrants critical examination. As a biodiversity-rich developing country, Indonesia faces the dual challenge of fostering equitable genomic innovation while advancing its broader developmental goals, requiring adaptive regulatory capacities that balance global competitiveness with the protection of vulnerable stakeholders. Indonesia's constitutional framework, anchored in the Pancasila philosophy and the 1945 Constitution, imposes a normative obligation to ensure ongoing legal harmonization throughout policy implementation, aligning with John Rawls's conception of procedural justice, which views participatory legitimacy as an essential condition for the just governance of emerging technologies.

Environmental considerations constitute an essential dimension of genomic governance. The precautionary principle serves as a critical instrument for ecological protection, mandating preventive measures amid scientific uncertainties, particularly regarding environmental release of GMOs.

²⁷Wahyu Yun Santoso et al., "Signifikansi Pendekatan Kehati-Hatian dalam Pengaturan Organisme Transgenik di Indonesia," *Jurnal Hukum Lingkungan Indonesia* 4, no. 1 (2017): 87–110, <https://doi.org/10.38011/jhli.v4i1.51>.

²⁸Erlangger and Sosin, "Legal Orders and the Dynamics of Change."

Strengthening regulations such as Government Regulation No. 26/2021 through comprehensive environmental impact assessments (Genetic AMDAL), public participation mechanisms, and ecological liability frameworks aligns with Nonet and Selznick's substantive justice model by protecting consumer rights, inventor interests, environmental integrity, and community welfare.²⁹

Applied concretely, the justice criterion therefore requires two specific amendments to current Indonesian rules: Government Regulation No. 26/2021 should be revised to make environmental-impact assessment (Genetic AMDAL) and public-participation procedures mandatory rather than discretionary preconditions for authorizing genetic-resource collection, and BPOM Regulation No. 19/2024 should be read, consistently with Rawlsian procedural justice, as requiring publication of risk-assessment dossiers for public comment before market authorization; this is a transparency requirement the regulation does not currently make explicit.

2. Aspects of Legal Certainty in the Utilization of Genetics

The realization of legal certainty fundamentally depends on effective law enforcement processes, as these concepts are intrinsically interrelated; professional and competent law enforcement serves as the primary mechanism for achieving genuine legal certainty.³⁰ This principle manifests most distinctly in continental European legal systems that prioritize codified law, a tradition inherited by Indonesia through its colonial legal legacy.³¹ Judicial approaches to case adjudication, as conceptualized by Ade Saptomo, typically employ three methodological frameworks: legalistic, interpretative, and anthropological perspectives.³² The present analysis adopts the legalistic approach to examine legal certainty in genomic applications, where certainty represents the guaranteed enforcement of legal provisions to ensure rightful claimants receive their due protections against arbitrary actions.

The theoretical foundation of legal certainty requires thorough understanding of its core principle as the essential spirit of legal regulations and the genesis of all legal provisions.³³ Current genomic regulations demonstrate significant shortcomings in addressing the diverse needs and competing interests of various stakeholders. The absence of comprehensive, integrated legislation results in incomplete realization of legal certainty, which ideally should provide unambiguous protections to all parties, including clear delineation of civil rights and obligations, freedom from conflicting interpretations, absence of normative contradictions, and practical enforceability.

²⁹L. O. Angga, I. N. Nurjaya, and R. Safa'at, "Formulation of Precautionary Principles in the Policy of in the Field of Agricultural," *JL Pol'y & Globalization* 31, no. 1 (2014): 31–41, https://heinonline.org/hol-cgi-bin/get_pdf.cgi?handle=hein.journals/jawpglob31§ion=5.

³⁰Suwardi Sagama, "Analisis Konsep Keadilan, Kepastian Hukum dan Kemanfaatan dalam Pengelolaan Lingkungan," *Mazahib* 15, no. 1 (2016): 20–41, <https://doi.org/10.21093/mj.v15i1.590>.

³¹Sagama, "Analisis Konsep Keadilan."

³²Ade Saptomo, *Hukum dan Kearifan Lokal* (Jakarta: Grasindo, 2009).

³³Satjipto Rahardjo, *Ilmu Hukum* (Bandung: Alumni, 1986).

The legal framework governing the utilization of genetic resources must be designed to ensure legal certainty, safeguarding the rights and obligations of all relevant stakeholders. This includes the recognition and protection of customary or traditional rights that have long existed and evolved within local communities. Within a framework that avoids normative contradiction, it is essential to establish clear and well-defined boundaries for the application of science and technology in the field of genetics, balancing the protection of intellectual discoveries with the imperative to promote innovations that yield broad public benefit, thereby harmonizing legal certainty with legal utility so that regulatory clarity serves both individual rights and the wider societal interest.

Beyond procedural certainty, genomic regulations must incorporate robust environmental safeguards, integrating the precautionary principle to prevent ecological damage from state or private sector activities, including GMO releases and agricultural biodiversity utilization. Legal certainty must therefore encompass not only individual rights protection but also ecological security, requiring strengthened Genetic Environmental Impact Assessment (AMDAL) mechanisms, continuous monitoring systems, and stringent environmental sanctions for violations, reflecting a comprehensive approach in contemporary environmental legal philosophy that emphasizes substantive justice for both human communities and ecosystems.³⁴

Concretely, the legal-certainty criterion is unmet wherever a single genetic resource can be subject to overlapping and potentially inconsistent authorizations, an environmental permit under Government Regulation No. 26/2021, a food-safety approval under BPOM Regulation No. 19/2024, and a patent under the Patent Law, without any single provision specifying the order of precedence or the mechanism for resolving conflicts between them; closing this gap, rather than merely restating the value of certainty in the abstract, is what the legalistic approach adopted here demands.

3. Aspects of Legal Benefits in the Utilization of Genetics

Within the framework of legal ideals, the principle of utility functions as a vital complement to the foundational principles of justice and legal certainty. Utility, in this context, is understood as the law's capacity to promote collective welfare and contribute to societal happiness, aligning closely with Satjipto Rahardjo's jurisprudential view that law is a dynamic instrument meant to serve the people and deliver real, human-centered benefits.

Within the domain of genetic utilization, the formulation of laws must prioritize human welfare, assessed based on the law's contribution to societal happiness, where compliance stems not from fear of sanctions but from genuine recognition of necessity. Legal theory has evolved in response to the ambiguous pursuit of justice, leading to the development of positive law, which remains subordinate to natural law, a higher-order legal framework not

³⁴Irfan Dhiaulhaq A.R. Muhammad and Dodik Setiawan Nur Heriyanto, "Striking a Balance Between Job Creation and Sustainability: The Need to Establish a True Environmental Protection Authority in Indonesia," *Jambe Law Journal* 7, no. 1 (2024): 1–21, <https://doi.org/10.22437/home.v7i1.317>.

created by human institutions.³⁵ Utilitarian philosophers Jeremy Bentham and John Stuart Mill established the foundational principle that law should maximize happiness for the greatest number; Mill further refined this doctrine through the normative principle of utility and the psychological basis of human nature positing an innate human tendency toward social harmony.³⁶

The development of legal frameworks governing genetic applications must incorporate the psychological dimension of law, particularly its impact on societal perceptions and well-being. In line with Richard Posner's law and economics perspective, such happiness is understood as the cumulative societal benefit generated through legal rules and policies. Genomic regulatory frameworks should therefore be designed to optimize public interest outcomes, ensuring that technological advancements in genetics contribute positively to societal welfare while maintaining legal integrity and ethical balance.

Moreover, the utilitarian assessment of genomic law must incorporate environmental considerations. The benefits of legislation should extend beyond economic gains and individual welfare to include comprehensive ecological protection, integrating precautionary principles and ecological justice to ensure sustainable natural resource management. True utility, therefore, lies in laws that harmonize human interests with ecological preservation, reflecting the utilitarian ideal that the greatest happiness is contingent upon environmental sustainability.³⁷

In concrete terms, the utility criterion is satisfied only if the economic gains from genetically modified agricultural products are measured net of their ecological and distributive costs; this is a calculation current Indonesian regulation does not require any authorizing agency to perform, and which this article accordingly identifies as a specific, addressable gap rather than a general aspiration.

C. Living Law, Customary Law (Hukum Adat), and Indigenous Peoples' Rights in the Regulation of Genetic Resources

If the analysis of justice, legal certainty, and utility above is to be complete, it must confront a normative order that positive genomic legislation has so far only gestured toward: the living law of Indonesia's customary and indigenous communities. Eugen Ehrlich distinguished between the norm for decision applied by courts and the living law that actually governs everyday social conduct, arguing that the latter is the true center of gravity of legal development.³⁸ Applied to genetic resources, this distinction is far from academic: the local rice, cassava, and horticultural landraces that frequently serve as source material, known as donor genes, for genetic modification have, in most cases, been selected, exchanged, and improved over generations

³⁵Ibnu Artadi, "Hukum: Antara Nilai-Nilai Kepastian, Kemanfaatan dan Keadilan," *Hukum dan Dinamika Masyarakat* 4, no. 1 (2006): 67–81.

³⁶Artadi, "Hukum: Antara Nilai-Nilai Kepastian."

³⁷Muhammad and Heriyanto, "Striking a Balance Between Job Creation and Sustainability."

³⁸Eugen Ehrlich, *Fundamental Principles of the Sociology of Law*, trans. Walter L. Moll (Cambridge, MA: Harvard University Press, 1936).

according to customary rules that have never been codified in national legislation.

This living normative order is the subject matter of Indonesia's classical *hukum adat* scholarship. Van Vollenhoven's mapping of the archipelago into distinct *adat* law circles demonstrated that customary communities possess their own coherent legal systems governing land, kinship, and natural resources, rather than a homogeneous mass of undifferentiated custom.³⁹ Ter Haar's concept of *beschikkingsrecht*, defined as the communal right of avail, further clarifies that an *adat* law community holds a standing entitlement to the land, water, flora, and fauna within its territory, an entitlement that logically extends to the plant genetic resources found there.⁴⁰ Soepomo likewise emphasized that *hukum adat* is a living, communal law rooted in the concrete life of the community rather than an abstract system of individual rights.⁴¹ Read together, these three foundational accounts of *hukum adat* provide the doctrinal vocabulary through which the customary stewardship of genetic resources can be recognized within Indonesia's positive legal order.

Indonesian positive law has, in fact, already taken preliminary steps in this direction, even if in a fragmented manner consistent with the broader regulatory fragmentation identified earlier in this article. Article 18B(2) of the 1945 Constitution obliges the state to recognize and respect customary law communities and their traditional rights, so long as these remain alive and consistent with the development of society and the principles of the unitary state. The Constitutional Court gave that provision concrete effect in Decision No. 35/PUU-X/2012, holding that customary forest is not state forest but forest located within the territory of an *adat* law community, a ruling that, by analogy, strengthens the position that biological and genetic resources found within *adat* territory are similarly subject to communal, rather than purely state, authority.⁴² Law No. 6 of 2014 on Villages further operationalizes this recognition by providing a legal vehicle, the *desa adat*, through which customary communities can exercise self-governance over their traditional territory and resources.⁴³ And, as discussed above, Article 77 of Law No. 11 of 2019 prohibits the uncontrolled transfer of biodiversity materials, local specimens, and indigenous knowledge, implicitly acknowledging that such knowledge belongs to identifiable communities rather than being *res nullius* available for unrestricted appropriation.⁴⁴

³⁹Cornelis van Vollenhoven, *Het Adatrecht van Nederlandsch-Indië*, vol. I (Leiden: E.J. Brill, 1918). Van Vollenhoven mapped the archipelago into nineteen distinct *adat* law circles (*rechtskringen*), each possessing its own living normative order governing land, kinship, and communal resources.

⁴⁰B. Ter Haar, *Adat Law in Indonesia*, trans. E. Adamson Hoebel and A. Arthur Schiller (New York: Institute of Pacific Relations, 1948). Ter Haar developed the concept of *beschikkingsrecht*, the communal right of avail held by an *adat* law community over the land, water, flora, and fauna within its territory.

⁴¹R. Soepomo, *Bab-Bab tentang Hukum Adat* (Jakarta: Pradnya Paramita, 1982).

⁴²Constitutional Court of the Republic of Indonesia, Decision No. 35/PUU-X/2012, declaring that customary forest (*hutan adat*) is not state forest but forest located within the territory of an *adat* law community.

⁴³Law No. 6 of 2014 on Villages, art. 6 and arts. 96–109 concerning *Desa Adat*.

⁴⁴Law No. 11 of 2019 on the National System of Science and Technology, art. 77, which prohibits the transfer of biodiversity materials, local specimens, socio-cultural assets, and indigenous knowledge where domestic testing is feasible.

A methodological caveat is necessary here to avoid overstating what Decision No. 35/PUU-X/2012 actually holds. The Constitutional Court's ruling speaks directly, and only, to customary forest (*hutan adat*) under Law No. 41 of 1999 on Forestry; it does not itself adjudicate rights over genetic material, plant landraces, or biological specimens, and no subsequent decision has extended its holding to genetic resources as such. The claim advanced in this article, that biological and genetic resources found within *adat* territory are similarly subject to communal rather than purely state authority, is accordingly offered as a doctrinal analogy grounded in the shared constitutional basis (Article 18B(2)) and the shared factual predicate (customary territorial control) of the two situations, not as a proposition already settled in positive law. Recognizing genetic resources within *adat* territory as subject to communal authority would require either a further Constitutional Court ruling extending the Decision 35/PUU-X/2012 rationale by analogy, or, more directly, express statutory recognition through the pending Draft Law on *Adat* Communities or an amendment to Law No. 11 of 2019; until one of these occurs, the analogy remains a doctrinal argument for reform rather than a description of settled law.

The practical stakes of this doctrinal gap are not merely theoretical. Indonesia's 2006–2007 dispute with the World Health Organization over the sharing of H5N1 avian-influenza virus samples, in which the Indonesian government suspended sample-sharing over concerns that pharmaceutical companies would patent vaccines derived from Indonesian biological material without any benefit flowing back to Indonesia, is frequently cited in the biopiracy literature as the clearest illustration of what is at stake when a state's sovereign and communal claims over genetic material are not matched by an operative benefit-sharing mechanism (Masrur et al., 2024). A structurally similar dynamic recurs at the sub-national level: Matuankotta and Holle's (2022) study of customary forest exploitation in Maluku documents how Forest Concession Rights (*Hak Pengusahaan Hutan*) and forest-utilization business permits issued by the state to private corporations have repeatedly been granted over territories that customary law communities regard as their own, with only a small fraction of Maluku's customary territories having received formal state recognition. Genetic resources present the same structural vulnerability in miniature: whenever a permit-issuing authority, whether for forest concessions, plantation genetic-resource collection under Government Regulation No. 26/2021, or GMO field trials, treats *adat* territory as available for authorization without first establishing who holds the underlying customary right, the resulting permit is exposed to exactly the kind of conflict Matuankotta and Holle describe for forest resources and that Indonesia experienced internationally over H5N1. Recent efforts to resolve this structural gap, including sustained advocacy for the Draft Law on *Adat* Communities (Arizona, 2023; Saswoyo & Pura, 2023) and documented institutional confusion over which level of government may formally recognize a customary law community (Jayuska et al., 2025), confirm that the absence of a consolidated statute is not a merely academic concern but an active source of legal uncertainty with direct consequences for how genetic resources located in *adat* territory are, and are not, protected.

What remains absent is a comprehensive statute that consolidates this recognition into an enforceable regime of rights. The Draft Law on Adat Communities (Rancangan Undang-Undang Masyarakat Adat, previously titled RUU Masyarakat Hukum Adat) has been under deliberation in the House of Representatives for more than sixteen years and, as of 2026, remains listed as a Prolegnas Priority bill, with the legislature publicly targeting its enactment within the year. Until that framework legislation is passed, the recognition of customary rights over genetic resources continues to depend on a patchwork of sectoral regulations, constitutional interpretation, and judicial precedent, a state of legal uncertainty that sits uneasily with the very principle of legal certainty examined in the preceding section.⁴⁵

International law supplies a more developed vocabulary for linking customary and indigenous rights specifically to genetic resources, and Indonesia's GMO regulatory framework would benefit from drawing on it more explicitly. Article 8(j) of the Convention on Biological Diversity requires contracting parties, subject to national legislation, to respect, preserve, and maintain the knowledge, innovations, and practices of indigenous and local communities relevant to the conservation and sustainable use of biological diversity, and to encourage the equitable sharing of benefits arising from their utilization.⁴⁶ The Nagoya Protocol operationalizes this obligation through a formal access and benefit-sharing (ABS) regime, requiring prior informed consent and mutually agreed terms for access to genetic resources and associated traditional knowledge, an instrument Indonesia has itself ratified through Law No. 11 of 2013, yet has not fully translated into its GMO-specific legislation.⁴⁷ The United Nations Declaration on the Rights of Indigenous Peoples goes further still, affirming indigenous peoples' right to maintain, control, protect, and develop their cultural heritage, traditional knowledge, and the genetic resources of the seeds and plants they have traditionally used.⁴⁸ ILO Convention No. 169 similarly obliges states to respect the special importance of the relationship indigenous and tribal peoples have with the lands and resources they occupy or otherwise use.⁴⁹ At a more technical level, Article 9 of the International Treaty on Plant Genetic Resources for Food and Agriculture recognizes Farmers' Rights, including the right to save, use,

⁴⁵"18 Tahun Mandek, DPR Optimistis RUU Masyarakat Adat Disahkan Tahun Ini," Hukumonline, May 9, 2026, <https://www.hukumonline.com/berita/a/18-tahun-mandek--dpr-optimistis-ruu-masyarakat-adat-disahkan-tahun-ini-lt6a01b1a2dcd29/>; "Bolak Balik Masuk Prolegnas, Akankah DPR dan Pemerintah Serius Sahkan RUU Masyarakat Adat?," Mongabay Indonesia, January 27, 2026, <https://mongabay.co.id/2026/01/27/bolak-balik-masuk-prolegnas-akankah-dpr-dan-pemerintah-serius-sahkan-ruu-masyarakat-adat/>. As of mid-2026 the bill, renamed from RUU Masyarakat Hukum Adat to RUU Masyarakat Adat, remains under deliberation in the House of Representatives as a Prolegnas Priority for 2026.

⁴⁶Convention on Biological Diversity, opened for signature 5 June 1992, 1760 UNTS 79 (entered into force 29 December 1993), art. 8(j).

⁴⁷Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, adopted 29 October 2010 (entered into force 12 October 2014); ratified by Indonesia through Law No. 11 of 2013 on the Ratification of the Nagoya Protocol.

⁴⁸United Nations Declaration on the Rights of Indigenous Peoples, G.A. Res. 61/295 (13 September 2007), art. 31.

⁴⁹International Labour Organization Convention No. 169 concerning Indigenous and Tribal Peoples in Independent Countries (1989), arts. 2, 5, and 15.

exchange, and sell farm-saved seed, a right directly relevant to the customary seed-exchange practices that sustain local plant genetic diversity.⁵⁰

Ratification, however, is not self-executing. Law No. 11 of 2013 transposes Indonesia's international consent to the Nagoya Protocol into domestic law, but it does not by itself create the operational mechanisms needed to make prior informed consent and benefit-sharing enforceable in practice, namely a national ABS focal point with clear authority over genetic resources used in GMO research, a standard prior-informed-consent procedure specific to adat and indigenous communities (as distinct from general government-level authorization), model mutually-agreed-terms contracts, or a benefit-sharing fund or registry. This gap is precisely the one Masrur et al. (2024) identify in Indonesia's Material Transfer Agreement regime: the framework permits access to genetic material and imposes disclosure obligations, but lacks the institutional capacity to monitor compliance and, critically, does not require the consent of the customary or indigenous community from whose territory the material originated, only that of the national government. Park and Park's (2025) comparative analysis of benefit-sharing design under the Nagoya Protocol suggests one direction for closing this gap: calibrating the scope and duration of any resulting intellectual-property protection to the marginal social benefit it generates, rather than granting open-ended protection that captures value without a corresponding flow of benefit back to the resource's community of origin. Until such mechanisms are enacted, Indonesia's ratification of the Nagoya Protocol remains, in the terms used earlier in this article, an instance of legal uncertainty rather than legal certainty: an international commitment without the domestic architecture required to give it operative effect for GMO-relevant genetic resources specifically.

This comparative international framework also sheds useful light on the earlier discussion of legal transplantation. The European Union's biosafety regime, precautionary as it is, was developed within a legal culture that addresses traditional knowledge chiefly through geographical indications and plant variety protection⁵¹ rather than through a standing constitutional recognition of customary law communities. Transplanting the European model wholesale, without adapting it to Indonesia's own living law, would risk precisely the tension between transplanted legal constructs and local socio-legal realities identified earlier in this article. A more coherent path is for Indonesia to build its GMO and genetic-resource regulations around its own constitutional and adat-law foundations, namely Article 18B(2), Decision 35/PUU-X/2012, and Article 77 of Law No. 11/2019, while using the Nagoya Protocol's access and benefit-sharing architecture as an international point of reference rather than a template to be copied without adaptation.

The practical implications for the justice, legal certainty, and utility framework developed above are threefold. First, the justice dimension of genomic regulation is incomplete without recognition of adat and indigenous

⁵⁰International Treaty on Plant Genetic Resources for Food and Agriculture, opened for signature 3 November 2001, art. 9 (Farmers' Rights).

⁵¹ Rani Pajrin and others, 'Undrop as an Effort to Protect Farmers Rights in Realizing the Development of a Sustainable World Food System', *International Journal on Minority and Group Rights*, 30.3 (2022), 484–99 <<https://doi.org/10.1163/15718115-bja10098>>.

communities as stakeholders, not merely as objects of protection, whose free, prior, and informed consent should be sought before local plant genetic material is accessed for research or commercial genetic modification.⁵² Second, legal certainty requires the enactment of the pending Draft Law on Adat Communities, or, in the interim, the issuance of implementing regulations under Law No. 11/2019 that specify concrete procedures for identifying customary rights-holders, documenting their living law, and concluding benefit-sharing agreements consistent with the Nagoya Protocol. Third, utility, understood following Satjipto Rahardjo as law's capacity to deliver real, human-centered benefit, is best served when the economic and scientific gains of biotechnology are shared with the very communities whose long-term stewardship of local genetic diversity made those gains possible in the first place.⁵³ Integrating living law into genomic regulation is therefore not a departure from the Radbruchian ideals of justice, certainty, and utility that anchor this article, but a necessary condition for their fulfilment within Indonesia's plural legal order.

IV. CONCLUSION

This article set out to answer two questions: how Indonesia and the European Union differ in regulating genetically modified agricultural products, and how customary and indigenous rights can be integrated into Indonesia's GMO regulatory framework. On the first question, the comparison shows that the European Union's precautionary, harmonized, and, since 2023, contested regime differs from Indonesia's fragmented, multi-agency, product-based framework not merely in institutional detail but in the underlying allocation of authority over risk, information, and, ultimately, genetic material itself.

On the second question, and as the article's central and original contribution, the analysis demonstrates that Indonesia's genomic regulation cannot satisfy the Radbruchian ideals of justice, legal certainty, and utility on positive law's own terms unless it is grounded in the living law of adat and indigenous communities. This is not an additional normative preference layered onto an otherwise complete framework: Section II.C showed, through the constitutional text of Article 18B(2), the analogical, not direct, extension of Constitutional Court Decision No. 35/PUU-X/2012, Article 77 of Law No. 11 of 2019, and the unresolved gap in Indonesia's domestic implementation of the Nagoya Protocol's access and benefit-sharing architecture, that the justice, certainty, and utility of current genomic regulation are each incomplete for exactly the same reason: none of the three currently reaches the customary communities who are the *de facto* stewards of the genetic resources in question. The contribution of this article is therefore to show that living law is not peripheral to genomic governance but a necessary condition for the fulfilment of positive law's own stated ideals; this is a doctrinal link the existing comparative literature reviewed in the State of the Art section above has not drawn.

⁵²Ade Saptomo, *Hukum dan Kearifan Lokal* (Jakarta: Grasindo, 2009).

⁵³Satjipto Rahardjo, *Ilmu Hukum* (Bandung: Alumni, 1986). Rahardjo's later writings on progressive law (*hukum progresif*) situate legal meaning within lived social practice, a position that resonates closely with Ehrlich's sociology of living law.

Realizing this integration requires enactment of the long-pending Draft Law on Adat Communities, domestic implementing regulations that specify concrete prior-informed-consent and benefit-sharing procedures consistent with the Nagoya Protocol, and, at a minimum, a clear administrative rule resolving the order of precedence among overlapping environmental, food-safety, and patent authorizations over the same genetic material. Future research should test the sector-specific benefit-sharing mechanisms this article recommends against emerging cases, once the Draft Law on Adat Communities is enacted, to determine whether statutory recognition on paper in fact reaches the customary communities it is intended to protect.

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