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A HUMAN RIGHTS APPROACH TO BENEFIT-SHARING FROM THE USE OF DIGITAL SEQUENCE INFORMATION

Alex Reep

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ALEX REEP

Editorial Dejusticia

This policy brief outlines a human rights-based approach to the design and implementation of the multilateral mechanism and Cali Fund for benefit-sharing from the use of digital sequence information on genetic resources. Drawing on research conducted in Indigenous, Afro-descendant, and farming territories in Colombia, it highlights the urgent need for a fair and inclusive benefit-sharing system that recognizes the rights and contributions of Indigenous people and local communities (IP&LCs). This brief outlines critical recommendations for decision-making and advocacy in the wake of the 2024 United Nations Biodiversity Conference in an effort to ensure fair compensation and reciprocity for IP&LCs while addressing structural inequalities.

Keywords: digital sequence information (DSI), multilateral mechanism, Cali Fund, benefit-sharing, genetic resources.

Este informe de política propone un enfoque basado en los derechos humanos para desarrollar el mecanismo multilateral y el Fondo Cali para la distribución de beneficios derivados del uso de la Información de Secuencia Digital de los recursos genéticos. Basándose en la investigación realizada con los pueblos indígenas y las comunidades locales (PICL) de Colombia, destaca la urgente necesidad de un sistema de distribución de beneficios justo e inclusivo que reconozca los derechos y las contribuciones de los PICL. Con naciones ricas en biodiversidad como Colombia a la vanguardia de estos debates, este informe esboza recomendaciones fundamentales para la toma de decisiones y la promoción, tras la Conferencia de las Naciones Unidas sobre la Diversidad Biológica COP16 de 2024, para garantizar una compensación justa para los pueblos indígenas y las comunidades locales, al tiempo que se abordan las desigualdades estructurales.

Palabras clave: Información de Secuencias Digitales, Mecanismo Multilateral, Fondo Cali, Distribución de Beneficios, Recursos Genéticos.

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Contents

Introduction 9

Background on the Multilateral Mechanism and the Cali Fund 11

The Current State of Benefit-Sharing Legislation in Colombia 13

Case Study: Research Findings from Colombian Indigenous and Local Communities 17

Recommendations from Indigenous and Local Communities in Colombia Regarding Ethical DSI Use 22

Proposed Framework: Benefit-Sharing for DSI Use 24

Conclusion 31

References 31

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Introduction

BACK TO CONTENTS

A single sequence from a wild bean on an Indigenous reservation in Colombia could offer the key to resistance against a disease that threatens food crops across the world. Who owns and gains value from the digital sequence information (DSI) produced when genetic resources from plants, animals, or microbes are sequenced? The norm for centuries—the **legacy of scientific colonialism, or "biopiracy"**—has been to take genetic resources without providing sufficient compensation to those who conserved and shaped these unique genomes. Biopirates extract knowledge or resources from communities without their consent, violating collective rights (Reid, 2009).

The leading approach to addressing biopiracy is "**benefit-sharing**," in which the benefits derived from the use of DSI are fairly distributed among the countries or communities of origin. Benefits might be monetary, such as royalties from pharmaceuticals and other commercial products made using DSI, or non-monetary, such as information exchange and technology transfer (Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization to the Convention on Biological Diversity, 2011). Although benefit-sharing agreements are intended to recognize and compensate traditional knowledge holders and biodiversity stewards, they remain disconnected from the political and economic realities of local communities (Wynberg, 2023).

How does scientific colonialism express itself—and how can we move toward justice—as genetic resources go from physical to digital? Benefit-sharing from the use of *physi-*

cal genetic resources was established in the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization, the 2010 supplementary agreement to the United Nations Convention on Biological Diversity. However, these protocols were written before the cost of genome sequencing plummeted. Since that time, DSI from genetic resources has become increasingly accessible. Much of it is uploaded into open source databases in the Global North. Some argue that this is advantageous: it democratizes access to the primary tool in biodiversity conservation. Others argue that this is plunderous: it extends and facilitates a long legacy of using resources from the Global South for the benefit of the Global North. The lack of laws enforcing benefit-sharing risks a **global free-for-all in which companies and institutions can use DSI without compensating any of the stewards of genetic resources**, many of whom are from the biodiverse communities of the tropics and subtropics, located in the Global South.

What constitutes "equitable" benefit-sharing from the use of DSI was up for debate for the *fourth* time at the 16th Conference of the Parties (COP16) to the Convention on Biological Diversity, hosted in Cali, Colombia, in October 2024. The results of the benefit-sharing debate at COP16 have implications for the future of biodiversity research and the global conservation movement. This brief, based on ten months of semi-structured interviews with genetic resource stewards from Indigenous and local communities in Colombia regarding their perception of "fair and equitable" benefit-sharing, in addition to a literature review on benefit-sharing from the use of DSI, offers considerations and actionable recommendations to guide policy makers in integrating a human rights perspective into the development and implementation of the new multilateral mechanism for benefit-sharing from the use of DSI on genetic resources, including the Cali Fund.

Background on the Multilateral Mechanism and the Cali Fund

DSI, the data derived from genome sequencing an organism, drives breakthroughs in medical, agricultural, and environmental innovations. This information can include the details of an organism's DNA and RNA, in addition to other "omics" (e.g., transcriptomics, metabolomics) and even associated traditional knowledge. The definition of DSI is still up for debate (DSI Scientific Network, n.d.). DSI has already proven invaluable in efforts such as the development of vaccines during the COVID-19 pandemic, advancing climate-resilient crop varieties, and safeguarding biodiversity (Meridian Institute, n.d.). From diagnostic kits to conservation strategies, open access to DSI fuels global advancements, enabling responses to some of the most pressing challenges of our time.

BACK TO CONTENTS

Despite the many uses of DSI, there exists a tense debate regarding *where* most sequence data come from and the ethicality of making those data open source if their origins are unknown. Companies and researchers in economically rich, biodiversity-poor nations benefit from using the genetic resources of low-income, biodiversity-rich countries, many of which are in the tropics and subtropics of the Global South. In "Myth-Busting the Provider-User Relationship for Digital Sequence Information," Scholz et al. (2021) reject the idea that low- and middle-income countries are predominantly the *providers* of DSI from genetic resources and that high-income countries are predominantly the *users*. The United Kingdom, United States, China, and Canada provide the majority (67%) of the global DSI dataset (WiLDSI, 2024), meaning that institutions in these countries have uploaded and shared the most data. However, this does not necessarily reflect where the genetic material originally came from, as only 14.6% of all sequences in the International Nucleotide Sequence Database Collaboration database referenced in the Scholz et al. study include country-of-origin information (Scholz et al., 2021). The lack of country-level provenance information for the majority of sequences complicates any effort to draw conclusions regarding the current flow of global genetic

information. This gap in provenance information contributes to a sensation among Indigenous people and local communities (IP&LCs) in both the Global North and Global South that their stewardship of genetic resources is unacknowledged, as DSI use is separated from the physical resources they are derived from and the permissions required to access these resources (Golan et al., 2022).

Historically, access to genetic resources has been regulated under the bilateral benefit-sharing model established in the Convention on Biological Diversity and its Nagoya Protocol. The Nagoya Protocol obliges the users of physical genetic resources to share benefits with the nations and communities from where these resources originate. However, DSI is being uploaded into databases with unregulated access and use, meaning that benefit-sharing mechanisms are often circumvented (Meridian Institute, n.d.). International laws vary significantly in terms of whether a "genetic resource" includes its derivatives and their DSI. Therefore, DSI is perceived as a loophole that inhibits fair and equitable benefit-sharing for the commercial use of genetic resources (Scholz et al., 2022).

To address this gap and the transnational nature of DSI, governments at COP15 in 2022 agreed to establish a **multilateral mechanism**, including a **global fund,** to ensure that benefits derived from DSI are fairly shared (Conference of the Parties to the Convention on Biological Diversity, 2022). Under the traditional bilateral benefit-sharing system from the use of genetic resources, resource "users" (scientists and industry) establish mutually agreed terms (MAT) and obtain the free, prior, and informed consent (FPIC) of "providers" (resource stewards and traditional knowledge holders). In contrast, the new multilateral mechanism—rather than navigating individual FPIC and MAT procedures for each project—is intended to promote open access and limit complexity for companies and research institutions using DSI by encouraging them to contribute to a global fund. The multilateral mechanism may additionally address the unequal power dynamics between DSI users and providers in bilateral negotiations (Bagley, 2022). The multilateral mechanism and

global fund seek to not only redistribute financial benefits but also strengthen the capacity of these communities through technology transfer and equitable involvement in decision-making.

At COP16 in 2024, governments adopted a decision on DSI that stipulates how the multilateral mechanism and global fund (referred to as the Cali Fund) will be operationalized (Conference of the Parties to the Convention on Biological Diversity, 2024). Under this agreement, qualifying businesses using DSI for commercial use are encouraged to contribute 1% of their profits or 0.1% of their revenue to the fund. Notably, half of the Cali Fund will be dedicated to supporting the self-identified needs of IP&LCs. This decision from COP16 will be essential to upholding global commitments to biodiversity, safeguarding the rights of IP&LCs, unlocking the benefits of DSI, and ensuring that all nations—particularly those rich in biodiversity—are compensated fairly for their contributions to global scientific advancement.

Several challenges remain: How will the multilateral mechanism function in practice, and how will funds be distributed transparently among those who steward genetic resources, particularly IP&LCs? Further, what type of benefits (monetary vs. nonmonetary) will be shared for different types of DSI use, and *how* they will be shared?

The Current State of Benefit-Sharing Legislation in Colombia

The existing legal landscape in Colombia regarding benefit-sharing for the use of DSI derived from genetic resources is complex and evolving. While no regulation explicitly addresses DSI, existing agreements stipulate the responsibilities and conditions associated with access to and the use of genetic resources. For example, once a user accesses genetic resources and produces DSI, the user then controls how the information is managed—whether it is deleted, saved, or uploaded to public or private databases—unless otherwise specified in the access contract. If the DSI is uploaded to a public database, however, the

BACK TO CONTENTS

user must clearly identify the geographical origin of the genetic resource from which the DSI was derived. In Colombia, genetic resources are recognized as a distinct category of goods, situated between the biological resource that contains them and the intellectual property derived from the discovery of genetic information (Colombian Government, 1997). **More precise regulations are required to address the specific challenges posed by DSI within the broader context of access and benefit-sharing regulations.**

The Colombian Constitution contains several provisions related to genetic resources, which can be interpreted as covering DSI. Article 63 of the Constitution declares certain assets, such as national parks and communal lands, as inalienable, imprescriptible, and not subject to seizure. Article 81 mandates that the state regulate the entry, exit, and use of genetic resources in accordance with national interests, underscoring the state's authority over genetic resources. While these articles do not explicitly address genetic resources, the Constitutional Court has interpreted genetic resources as part of the nation's patrimony and thus protected under these principles. If the biologically active genes come from a species native to Colombia, genetic resources are considered "public domain assets," making the Colombian state the exclusive owner of the genetic resources. Articles 8, 79, 80, 88, and 333 provide additional constitutional grounding for the state's authority and responsibility over genetic resources as public goods.

The **Convention on Biological Diversity was ratified in Colombia** through Law 165 of 1994, which reaffirms Colombia's sovereign rights over its genetic resources. The law establishes that benefits derived from the use of the nation's genetic resources—for research, technology, or commercial purposes—must be shared with the Ministry of the Environment *and* the IP&LC community of origin, if using the community's traditional knowledge or if genetic information was derived from a native biological resource located within their territories. Sentencia C-519 of 1994 affirmed the constitutionality of the Convention on Biological Diversity and its domestic implementa-

tion through Law 165. In this ruling, the Constitutional Court emphasized the state's duty to protect and conserve biodiversity, aligning with the convention's objectives. Sentencia C-137 de 1996 reviewed the constitutionality of Colombia's participation in the International Centre for Genetic Engineering and Biotechnology, affirming that while international cooperation in biotechnology is permissible, the Colombian state has a constitutional duty to regulate and oversee genetic resources and to ensure that their use aligns with national interests and constitutional mandates.

The **Ministry of Environment is the national competent authority** for granting access to genetic resources for which Colombia is the country of origin and provider (Decree 730 of 1997). Within the ministry, the Genetic Resources Group and the Sustainable and Green Business Office propose mechanisms for fair and equitable benefit-sharing, with support from the ministry's Sub-Directorate of Education and Participation when traditional knowledge is involved (Decree 3570 of 2011). Any individual or institution intending to **access genetic resources in Colombia** must notify the Ministry of Environment and specify the following: the resource being accessed, the purpose of access (whether for research or commercialization), and how the resource will be used. If the activities are commercial in nature, a formal contract of access to genetic resources is created. If access is granted, the individual or entity must develop a contract with the Ministry of Environment that specifies the coordinates of where the resources will be collected, the duration of the agreement, the activities to be undertaken, sampling methods, and reporting requirements—in addition to the prior informed consent and mutually agreed terms with the contracting party providing genetic resources (CBD, 1992, art. 15). The contract also defines the portion of benefits that must go to the Colombian government, as the inalienable owner of the nation's genetic resources. If DSI is deposited in a database, the contract details and origin of the genetic resource from which the DSI was obtained must be published (United Nations Convention on

Biological Diversity Ad Hoc Technical Expert Group on Digital Sequence Information on Genetic Resources, 2020).

The right of the state to grant access to genetic resources, however, is conditioned by the constitutional rights of Indigenous, Afro-Colombian, and campesino communities to grant or deny access to their territories. Decision 486 of 2000 of the Andean Community recognizes the rights and authority of Indigenous, Afro-Colombian, and local communities over their "biological and genetic heritage" and traditional knowledge (Andean Community, 2000). Accordingly, the Ministry of Environment may issue an access contract only with the explicit consent of these communities.

To reduce the bureaucratic burden on non-commercial DSI users, **many scientific activities are exempt from the access contract requirement** (Minambiente, 2021). This allows scientists to conduct their work without acknowledging the Colombian origin when publishing DSI in public databases. In this case, the decision to attribute provenance information is left to the researcher or the institution responsible for the study. The researcher cannot patent the genetic resources, but DSI is considered part of the researcher's discovery when it is made public, and they retain control over the discoveries made.

In Colombia, there is **currently no explicit legal requirement to share benefits if a company, individual, or institution uses DSI derived from Colombian genetic resources.** Under Colombian law, DSI is not considered the same as genetic resources. Consequently, there is no legal obligation to contribute to benefit-sharing when using DSI. However, at the international level, the decision on DSI adopted at COP16 provides the most relevant legal basis for benefit-sharing from the use of DSI. According to paragraph 1 of the annex to the decision, the multilateral mechanism for benefit-sharing applies to DSI that is (i) publicly available in compliance with applicable national legislation; (ii) not subject to mutually agreed terms established at the time of access to the genetic resources from which the DSI is derived, unless those terms permit its public availability; and (iii) not already covered by other international access and

benefit-sharing agreements, unless those agreements opt to use the multilateral mechanism (Conference of the Parties to the Convention on Biological Diversity, 2024). The outcomes of the COP16 negotiations may influence Colombia's legal approach to benefit-sharing from the use of DSI, particularly if its national legislation evolves to align with the framework of the multilateral mechanism.

Beyond the more DSI-specific regulations required to address how access and benefit-sharing regulations apply to DSI in Colombia, there also exists a **significant gap in monitoring and surveillance**. Colombia's Ministry of the Environment, much like any nation's access and benefit-sharing authority, lacks the capacity to ensure that entities using genetic resources fully comply with benefit-sharing. **As regulations currently stand, compliance relies on the good faith of the genetic resources user.**

Further, Colombian regulations focus primarily on natural resources rather than on genetic resources or DSI specifically. Debates persist about whether such regulations adequately guarantee IP&LCs' effective participation in decision-making and ensure fair and equitable benefit-sharing (Silvestri, 2016). A comprehensive consideration of the needs, opinions, and priorities of IP&LCs on the use of DSI derived from their territories will be essential to advancing global biodiversity conservation priorities.

Case Study: Research Findings from Colombian Indigenous and Local Communities

Additional insights and on-the-ground context is provided by research conducted by Alex Reep between October 13, 2023, and May 17, 2024, with twenty-two individuals from indigenous and local communities from five departments of Colombia. The research was conducted through Fulbright Colombia and was approved by the Institutional Review Board of the Alliance of Bioversity International and the International Center for Tropical Agriculture on July 27, 2023. Interviewees were

BACK TO CONTENTS

asked about what they consider to be "fair and equitable" benefit-sharing for the use of DSI derived from the genetic resources on their territories. Data were analyzed using qualitative coding and AI Assist with MAXQDA 24 software. The Gioia et al. (2013) method supported the identification of themes by systematically recognizing patterns in interview and field note data. Key findings are discussed below.

Understanding Local Context

The way in which IP&LCs care for and relate to nature, their worldview, and their cosmovision all affect the way they conceptualize DSI, participate in research, and hope DSI derived from their territories is governed. In order to develop truly "fair and equitable" benefit-sharing models, researchers must make a concerted effort to understand the local context from which DSI originates. In this regard, specific considerations from interviewees include the following:

- → It is important to consider **power dynamics and the politics of "in-groups versus out-groups"** within communities, as this affects whose opinions are heard and how benefits are shared. For example, a person from the department of Chocó displaced to the capital city of Bogotá may hold traditional knowledge associated with the use of borojó, a medicinal fruit endemic to the Colombian Pacific, even though she is now dislocated from where the tree grows. Under the benefit-sharing system, must she claim membership in a well-organized, governmentally recognized council in order to benefit from her knowledge on the use of borojó? Forced displacement and migration raise questions regarding who counts as a plant genetic resource steward in a territory with evolving population dynamics (Wynberg, 2023).
- → Conceiving of oneself and the other biotic and abiotic factors that make up ecosystems as intricately connected has implications for how genetic infor-

mation is understood and valued. Many Indigenous groups and community members with **nature-based cosmologies** recognize the intrinsic value of the life forms sequenced to produce DSI. Several interviewees from the Misak Indigenous community in Cauca explained how using DSI from their territories to genetically alter other plants, particularly when used to produce "terminator seeds" that lose their capacity to reproduce, is spiritually offensive. As noted by Edier Muelas Calambás, an organizer of the Jardín Botánico las Delicias in the department of Cauca, "We are sure that the biodiversity within our territory should remain natural and should not be modified. If information from here is manipulated in other territories, there's little we can do. However, right now we're fighting for the protection of nature in general, across all territories." Community members' opinions regarding the use of DSI extracted from the genetic resources of their shared territory should help shape how that information is shared and protected over time.

→ **Experiences with biopiracy and colonization:** Extractive science and exploitative governance have severely damaged the relationship between community members and outsiders, including representatives of the scientific community and government officials. All interviewees offered personal examples of biopiracy that had occurred in their territories. For example, traditional medicine healers from the village of San Cipriano in Valle de Cauca mentioned having to hide their medicinal plants in the jungle to avoid theft from "ecotourists." Confronting and addressing this exploitative past will require multicultural legislation and methods that go beyond Western-style agreements, such as the Nagoya Protocol.

Valuing Genetic Resource Stewards as Technology Co-Creators

Rather than considering benefit-sharing a bureaucratic hurdle and an impediment to research, the users of DSI can view it as an *opportunity* to recognize genetic resource stewards, validate their contributions, and fuse knowledge systems to strengthen mutual efforts. Many IP&LC interviewees emphasized their interest in **engaging actively in scientific research** about their genetic resources as a means of strengthening traditional knowledge, learning more about the biodiversity they steward, promoting local conservation efforts, and commercializing products made with the sustainable use of the biodiversity in their territories. Interviewees suggested the following:

- → IP&LCs should **develop protocols to negotiate DSI use** on their own terms, ensuring that their knowledge is not exploited or patented without their consent. Biocultural protocols may be developed by IP&LCs to establish their customary values, rights, and rules about their biocultural heritage. These protocols can help ensure that IP&LCs' rights are recognized and that these communities have the capacity to negotiate equitable agreements with external parties (International Institute for Environment and Development, 2012). IP&LCs should be granted similar **dignity and respect as commercial entities** in these agreements, with legally enforceable contracts that protect their rights.
- → Researchers should establish **genuine partnerships with sustained relationships** to promote the dignity, self-determination, and equitable participation of IP&LCs in DSI use. Several interviewees emphasized their interest in equitably collaborating with scientists in the R&D process to learn more about the chemical composition of plant medicines, ensure that research outcomes serve the community's needs, and use technology to strengthen—rather than replace—cultural practices. Duanner Castaño,

a conservationist from the village of Pance in Valle de Cauca, insisted that "institutions must involve local people in a more active way—they need to make relationships healthy again, because there's a lack of trust due to the coercive approach that was taken in the past." Building trust must involve confronting the legacy of biopiracy, taking time to understand the diverse needs and perspectives of IP&LCs, and involving IP&LCs actively in research and decision-making processes.

Protecting DSI to Prevent Biopiracy

The creation of the Convention on Biological Diversity, negotiated and adopted at the Earth Summit in Rio de Janeiro in 1992, can be understood as a reaction to the 1980 US Supreme Court case *Diamond v. Chakrabarty*. In the case, the Supreme Court ruled that genetically modified organisms could be patented, marking the first time that a living organism was deemed patentable. People became concerned that biotechnology companies would then claim intellectual property rights over genetically engineered organisms and genetic resources. This raised concerns, particularly among the biodiversity-rich nations of the Global South, that their resources and traditional knowledge could be extracted, modified, and patented without recognition, benefit-sharing, or consent. IP&LC interviewees connected these phenomena to DSI and made the following observations regarding data governance:

- → IP&LC interviewees have felt the damaging effects of the commercialization and privatization of their seeds, recipes, and resources. Many expressed concern that DSI will become another privatized resource, available exclusively to well-resourced institutions and individuals. These observations resonate with the recommendations of Maōri benefit-sharing expert Katie Lee Riddle, who insists that "the mindset around databases which hold DSI from genetic resources must shift from a Western private property

perspective towards a guardianship role on behalf of IP&LCs, future generations, and humanity." Rather than fully open-access data, she recommends a **co-governance model** in which IP&LCs have an equal say in the management of national reference databases for DSI (Taiuru et al., 2022).

→ Above all, IP&LC interviewees expressed the desire to **maintain long-term control over the use of their DSI**, with community members involved in decision-making and research processes over time. Lorena Matabanchoy, a leader of the Quillasinga Indigenous community in Nariño, focused on the ethical uses of DSI derived from the genetic resources in her community, noting: "Each time someone wants to use the sequence [DSI] for something new, they should return to the community to ask permission. They should explain what they're using the [DSI] for."

BACK TO CONTENTS

Recommendations from Indigenous and Local Communities in Colombia Regarding Ethical DSI Use

Recommendations for Scientists

Scientists using DSI must confront the legacy of biopiracy in order to build trust, understand the diverse needs and perspectives of IP&LCs, and involve them actively in research and decision-making processes. Scientists can adopt benefit-sharing mechanisms more progressive than those they are obligated to follow by strengthening the capacity of their IP&LC research partners. Scientists using DSI can consider the following suggestions from IP&LC interviewees:

1. Fairly compensating IP&LCs for the use of their knowledge and resources (benefit-sharing)
2. Tailoring benefits to support community-identified priorities
3. Supporting local IP&LC-led conservation efforts

4. Strengthening farmers' rights in institutional operations
5. Acknowledging IP&LCs' contributions by tagging and labeling metadata
6. Ensuring full transparency with how DSI is used and how it is intended to be used over time
7. Sharing research results with IP&LCs

Recommendations for Government Officials

Addressing the disconnect between governmental decisions and the needs and perspectives of IP&LCs requires more inclusive and equitable policymaking processes. Strengthening the engagement of IP&LCs in these processes will enhance the recognition of the rights and contributions of Indigenous, Afrodescendant, and campesino communities in Colombia. Government officials should prioritize collaboration and informational exchange with these groups as a means of respecting their traditional knowledge and environmental stewardship. Policymakers creating forward-thinking policies to regulate DSI and genetic resources should consider the following suggestions from IP&LC interviewees:

1. Strengthening grassroots multilateralism for increased stakeholder engagement within national processes (rather than only at international forums)
2. Providing more comprehensive information to communities about their rights
3. Guaranteeing sustainable livelihoods in the countryside to promote biodiversity stewardship
4. Streamlining governmental bodies to ensure that benefits are shared fairly with IP&LCs
5. Facilitating greater IP&LC involvement in government programs and projects related to biodiversity, forestry, and climate change
6. Promoting IP&LC representation within government

7. Strengthening recognition of the role of campesinos in biodiversity conservation
8. Officially recognizing the importance of IP&LC-led conservation efforts and IP&LC contributions to sustainable development

Proposed Framework: Benefit-Sharing for DSI Use

BACK TO CONTENTS

The multilateral mechanism and Cali Fund must guarantee the equitable sharing of monetary and non-monetary benefits among all stakeholders, with special consideration for the communities providing genetic resources. This means centering the rights of IP&LCs to free, prior, and informed consent at every stage of DSI use. With human rights principles at the forefront, Dejusticia recommends the following ideas and principles:

Policy Consideration 1: Rights-Based Approach

The Convention on Biological Diversity and its Nagoya Protocol establish clear guidelines for benefit-sharing and mutually agreed terms. These agreements emphasize the importance of respecting, preserving, and maintaining the knowledge, innovations, and practices of IP&LCs.

- → Key to upholding IP&LC rights and promoting greater equity in global biodiversity governance is ensuring that IP&LCs are treated as *partners in* rather than mere *sources of* biological and genetic research. A model for co-producing knowledge with IP&LCs is the Wise Ancestors project, which braids Western scientific technologies with Indigenous science and traditional ecological knowledge.
- → The Convention on Biological Diversity's bilateral model has been critiqued for being transactional, as it treats plant genetic resources for food and agriculture as commodities that can be owned, instead of as

public goods. A more inclusive and just multilateral mechanism for DSI may rely on uplifting farmers' rights (Wynberg et al., 2021).

→ Caution must be taken to avoid the pitfalls of "forced inclusion," where marginalized groups may be pressured to adopt or claim an identity tied to governmental recognition, such as that of an Indigenous group, in order to access benefits from the use of their own knowledge or resources. Such practices risk undermining the integrity of IP&LCs' cultural identities and rights (Wynberg et al., 2023).

→ IP&LCs can establish "community biocultural protocols" to establish their customary values, rights, and rules about their biocultural heritage to help ensure that their rights are recognized and that they have the capacity to negotiate equitable agreements with external parties (International Institute for Environment and Development, 2012).

Policy Consideration 2: Equitable and Representative Decision-Making

While many policy discussions take place at the national or international level, it is local communities who will experience the immediate, context-specific consequences of these decisions. The bilateral structure of access and benefit-sharing under the Convention on Biological Diversity—where a "provider" and "user" negotiate mutually agreed terms—often oversimplifies the diversity of IP&LC perspectives. Representation in these negotiations has often been limited to a small group of individuals who may not reflect the broader interests of the communities they represent (Wynberg et al., 2023).

→ To ensure that the multilateral mechanism for DSI operates fairly, **IP&LCs seeking direct involvement in decisions that impact them should be included** so their perspectives, knowledge, and values are integral to the policy framework. Failing to include these voices risks overlooking the nuanced ways in which

communities value nature, perceive risk, and assess proposals for the use of genetic resources (Kofler et al., 2018). Examples of authentically connecting local groups with policy design and implementation can be found at the Voices for BioJustice project.

→ Legal, bureaucratic, and language barriers, in addition to social marginalization, prevent many IP&LCs from participating meaningfully in these processes (Wynberg, 2023). Without **concerted efforts to address inequalities**, the decision-making process of the multilateral mechanism will continue to favor politically connected and well-organized groups while leaving out the most vulnerable (Wynberg, 2023).

Policy Consideration 3: Transparent Governance

To ensure representation and accountability in the multilateral mechanism, a **transparent public process is necessary to determine who holds claims to genetic resources**, such as specific plants, and to ensure that all voices are heard in benefit-sharing negotiations.

→ Local knowledge must be recognized within its own norms, and negotiating spaces must be less intimidating and more inclusive of the diverse worldviews and capacities of IP&LCs (Wynberg et al., 2023).

→ Policymakers should deeply consider: How can control over deliberations be transferred to local leaders? What structures are in place to guarantee that historically marginalized voices are uplifted in negotiations (Kofler et al., 2018)?

→ Ensure that the **final versions of access and benefit-sharing agreements are available publicly** in order to combat the culture of secrecy and to assuage the fear of legal repercussions for convening outside official meetings (Wynberg et al., 2023).

Policy Consideration 4: Capacity Strengthening

Capacity strengthening not only equips IP&LCs with the skills needed to engage in DSI governance but also reinforces their role as stewards of biodiversity and champions of sustainable innovation. The "capacity sharing" model goes a step further to encourage mutually beneficial collaboration among the stakeholders of DSI use (Lezak, 2024). Half of the Cali Fund must support the self-identified needs of IP&LCs, with a focus on enabling their full participation in the governance, research, and benefit-sharing processes related to DSI. Programs aimed at enhancing IP&LC capacity would empower these communities to **effectively engage in negotiations, use the genetic resources they steward, and manage the resulting benefits**, ensuring their long-term participation in global biodiversity conservation initiatives.

- → Currently, IP&LCs are disconnected from the digital infrastructure and scientific tools needed to access and benefit from DSI, widening the gap between those who steward biodiversity and those who utilize it in scientific and breeding communities. Addressing this gap requires not only **technological access but also a recognition and inclusion of diverse knowledge systems**, including traditional and Indigenous ways of understanding agrobiodiversity (Wynberg et al., 2021). Enabling communities to leverage advanced tools such as genomics and bioinformatics could strengthen the conservation and sustainable use of biodiversity (Scholz et al., 2022).
- → **Technology sovereignty** emphasizes the rights of IP&LCs to control the tools, techniques, and infrastructures—both digital and material—that they use to manage their genetic resources. This ensures that knowledge and natural resources remain in the hands of the communities that steward them, promoting alternative systems that respect collective ownership. Moreover, technology sovereignty values consent-based sharing of Indigenous and lo-

cal knowledge that has been passed down through generations, enhancing biodiversity and supportive ecosystem processes, which are critical to adapting to climate change (Montenegro de Wit, 2022).

Policy Consideration 5: Data Sovereignty

The proposed multilateral mechanism for DSI does not currently regulate access to data or require the tracing of the country of origin (United Nations Convention on Biological Diversity Open Ended Working Group, 2021). Effective DSI governance must respect IP&LCs' rights to control and benefit from the data derived from the genetic resources they steward, while ensuring that tracking and tracing mechanisms do not impose impractical burdens or unintended consequences for researchers using DSI. By promoting data sovereignty through flexible governance frameworks, the multilateral mechanism can empower IP&LCs to maintain control over their data and ensure that benefits derived from DSI are distributed equitably.

- → A key approach is **integrating both the FAIR (findable, accessible, interoperable, and reusable) and CARE (collective benefit, authority to control, responsibility, and ethics) principles**. While FAIR principles focus on how data can be managed and used to generate benefits for biodiversity conservation (Klünker & Richter, 2022), CARE principles ensure that Indigenous data sovereignty is respected, promoting IP&LCs' rights to govern and control their data. Joint integration of these principles can balance open access with respect for IP&LCs' rights (McCartney et al., 2022).
- → **Open and responsible** data governance offers a practical framework to manage DSI in a way that ensures fair and equitable use. Open and responsible data governance aligns with the FAIR principles while promoting guidelines for practitioners on responsible data management, ensuring that DSI use sup-

ports benefit-sharing and biodiversity conservation goals (Weizenbaum Institut, n.d.).

→ Ensuring proper **provenance information for data linked to IP&LCs** can enhance benefit-sharing. Unclear connections between IP&LCs and their data impede these communities' ability to govern, make decisions, and derive benefits from the future use of their traditional knowledge and resources. Big data in the life sciences (complex datasets with DSI) exacerbate the risk of misappropriating traditional knowledge, often due to missing Indigenous provenance in metadata. To address this, mechanisms such as Biocultural Labels allow Indigenous communities to identify and maintain authority over biocultural materials and data. These labels ensure that the origin, provenance, and control of resources are recognized and respected within research and data repositories (Golan et al., 2022). Additionally, the "dynamic consent" approach of the Native BioData Consortium allows study participants to remove their samples or data through an online portal at any point (Jones, 2024).

→ The debate between open-access DSI and restrictions for benefit-sharing is another important issue. Unrestricted open-access data eliminate the need for ongoing consultation with IP&LCs, meaning that they also remove opportunities to mitigate harm, discuss benefits, and address issues of equity and autonomy. A more flexible **"open as possible, closed as necessary" approach** better aligns with IP&LC aspirations to govern the use of their traditional knowledge and resources, ensuring that their data are used responsibly and equitably (Golan et al., 2022).

Policy Consideration 6: Just Finance

While article 9 of the Nagoya Protocol *encourages* users and providers of genetic resources to contribute to biodiversity

conservation, the Global Biodiversity Framework makes this a *mandatory* requirement, ensuring that disbursements from the global fund are used for projects aimed at conservation and sustainable development (Deplazes-Zemp, 2019). The Cali Fund must be designed, implemented, and distributed with justice and equity at the forefront to ensure that biodiversity-rich countries, particularly low- and middle-income countries, receive fair compensation for the use of DSI derived from the genetic resources on their territories (Bagley, 2022). The financial mechanism must uphold principles of distributive justice, transparency, and inclusivity while tackling broader systemic inequalities in global financial and economic systems.

- → Contributions to the Cali Fund are **morally required on the grounds of distributive justice**. Users of DSI from genetic resources, whether they import resources from provider states or use them within their own countries, should pay into the Cali Fund to ensure equitable benefit-sharing. While states may pay into the fund using a dividend on the financial profits generated from genetic resources, they also have the flexibility to levy taxes on DSI users or subsidize contributions from other revenue streams (Deplazes-Zemp, 2019).
- → The allocation of these funds must be transparent and open, ensuring that resources are directed where they are most needed. **Disbursement should prioritize biodiversity-rich, low-income countries**, which bear the highest conservation costs and profit the least from genetic resources (Deplazes-Zemp, 2019).
- → To ensure that the benefits of this funding reach local communities, **disbursements could be project-based** rather than allocated solely to governments. Project-based schemes are more likely to promote collaboration between biodiversity-rich and infrastructure-rich countries, supporting concrete conservation initiatives that address the needs of local communities. Such projects can also generate em-

ployment opportunities, enhance food and livelihood security, and build local capacity—all essential components of a just financial framework (Deplazes-Zemp, 2019). The new multilateral mechanism must challenge the state-centeredness of access and benefit-sharing legislation to promote distributive justice.

Conclusion

A human rights-focused implementation of the multilateral mechanism for DSI and the Cali Fund is not only a legal and ethical obligation but also a strategic imperative to maintain the integrity and sustainability of global biodiversity. To succeed, the international community needs a broad, interdisciplinary coalition of scientists, information technologists, gene bank managers, breeders, farmers, conservationists, IP&LCs, members of the public, and civil society organizations to work together to develop common goals and systems. We at Dejusticia urge national governments and decision-makers at future COPs to the Convention on Biological Diversity to consider the principles and recommendations outlined here, ensuring that the multilateral mechanism and Cali Fund are operationalized in an equitable, just, and inclusive manner.

BACK TO CONTENTS

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This policy brief outlines a human rights-based approach to the design and implementation of the multilateral mechanism and Cali Fund for benefit-sharing from the use of digital sequence information on genetic resources. Drawing on research conducted in Indigenous, Afro-descendant, and farming territories in Colombia, it highlights the urgent need for a fair and inclusive benefit-sharing system that recognizes the rights and contributions of Indigenous people and local communities (IP&LCs). This brief outlines critical recommendations for decision-making and advocacy in the wake of the 2024 United Nations Biodiversity Conference in an effort to ensure fair compensation and reciprocity for IP&LCs while addressing structural inequalities.