

# Comparison between the various International Conventions on Plant Varieties and Biological Forms along Farmers Rights

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**Abstract**—This paper examines the complex global legal framework governing plant genetic resources, biodiversity, and intellectual property. It explores the inherent tension between the TRIPS Agreement and UPOV Convention, which prioritize private innovation and commercial breeder rights, and the Convention on Biological Diversity (CBD) and Nagoya Protocol, which emphasize national sovereignty and the protection of traditional knowledge. Through an analysis of key treaties including the ITPGRFA (Seed Treaty) and the Cartagena Protocol, the study highlights the "clash of systems" between industrialized patent models and the sui generis systems of biodiversity-rich nations like India. By reviewing landmark case laws such as PepsiCo vs. Indian Farmers and the Rooibos Case, the paper concludes that a sustainable future requires a "middle ground" that balances corporate incentivization with the fundamental rights of local farmers and indigenous communities.

**Index Terms**—Genetic resources, Biodiversity, intellectual property, fundamental rights, Indigenous communities

## I. Introduction

The management of life forms—ranging from microscopic genetic sequences to high-yield crop varieties—has become one of the most contested arenas in international law. As biotechnology and global trade have expanded, the world has moved away from viewing nature as a "common heritage of mankind" toward a structured landscape of Intellectual Property Rights (IPR) and Sovereign Rights.

At the heart of this evolution are two competing philosophies. On one side stands the drive for harmonization and privatization, led by the WTO's TRIPS Agreement and the UPOV Convention, which seek to provide robust legal protections for plant breeders to encourage innovation and food security. On the other side is the movement for equity and conservation, embodied by the CBD and its supplementary protocols (Nagoya and Cartagena), which aim to prevent "biopiracy" and ensure that the benefits of genetic wealth are shared fairly with the countries and communities of origin.

For developing nations, particularly those with vast natural biodiversity like India, these international mandates present a double-edged sword: the need to attract private investment through strong IP laws versus the necessity of safeguarding the "seed sovereignty" of millions of small-scale farmers. This report details the specific mechanisms of these international instruments, their practical impacts through case law, and the

emerging challenges posed by the "digitalization" of genetic resources. In this paper the author has tried to compare different types of international conventions regarding the protection of the plant varieties, biological diversity and intellectual rights and their breeders with the pros and cons of international conventions on the plant varieties.

## **II. International Convention for the Protection of New Varieties of Plants**

The International Convention for the Protection of New Varieties of Plants (UPOV), which is headquartered in Geneva, was originally adopted in 1961 and subsequently revised in 1972, 1978, and 1991. Its primary objective is to encourage the development of new plant varieties by granting Plant Breeders' Rights (PBRs) to those who innovate in the field. To qualify for this protection, a new variety must meet the specific DUS criteria, meaning it must be Distinct, Uniform, and Stable.

To receive a certificate of protection, a breeder must prove that their variety is not just "new," but that it meets the DUS criteria: Distinctness: The variety must be clearly distinguishable from any other variety already known in the "common knowledge" pool. Uniformity: Every plant within the variety must show the same characteristics. Stability: These characteristics must remain the same through repeated cycles of propagation (e.g., if you replant the seeds, the next generation looks exactly like the first). Under the 1991 Act, the breeder's power was expanded from just "selling the seeds" to controlling the production, conditioning (cleaning/treating), stocking, and even the import/export of the variety. The convention has been revised several times, but the 1991 Act is the most significant. It drastically strengthened breeders' rights by: Extending protection to all plant genera and species, increasing the duration of protection (usually to 20–25 years), requiring breeders' authorization for production, conditioning, sale, and even export/import of the variety.

### **India's Unique Stand: The PPV&FR Act (2001)**

India is a notable non-member of UPOV. Instead of adopting the UPOV 1991 model, India exercised its right under the WTO-TRIPS agreement to create a *sui generis* (unique) system. The Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act is globally unique because it:

1. Grants rights to Breeders (to encourage innovation).
2. Grants rights to Farmers (to save, use, sow, resow, exchange, share, or sell their farm produce, including seeds of a protected variety, as long as they don't sell them as "branded" seeds).
3. Grants rights to Communities (for their role in conserving genetic resources) (Brahmi et al., 2004).

Advantages: Encourages the creation of high-yield, drought-resistant, and pest-resilient crops essential for a growing population. By providing "patent-like" protection, it encourages giant agro-tech firms to bring their

best technology to a member country through Private investment. Allows a breeder in one country (e.g., France) to easily protect and sell their variety in another (e.g., Vietnam) using a standardized legal language Global harmonization by the help of the developed nations

Disadvantages: The disadvantages exhibits weakens farmers' Rights traditionally, farmers saved seeds from one harvest to sow the next. UPOV 1991 makes this "Farmer's Privilege" optional and highly restricted. The high cost of DUS testing and legal registration often prices out small, local breeders, favoring multinational corporations. Traditional "landraces" (local seeds) often fail the Uniformity test because they are naturally diverse, meaning they cannot be protected under UPOV.

## Case Laws

### 1. PepsiCo vs. Indian Farmers (2019-2021)

This is the most critical modern case regarding plant rights in India. PepsiCo (which owns the Lay's brand) sued several farmers in Gujarat for growing the FL-2027 potato variety (used for chips) without a license. The Conflict: PepsiCo claimed exclusive rights under the PPV&FR Act. The Outcome: Following intense pressure from farmers' rights groups, India's PPV&FR Authority eventually revoked PepsiCo's registration on the grounds that the company had provided incorrect information and that the legal action against farmers was against "public interest." This case proved that in India, Farmers' Rights can override corporate claims. (Cullet, 2021).

### 2. The "Nadorcott" Mandarin Case (European Union)

In Europe (where UPOV 1991 is the standard), the owners of the Nadorcott mandarin variety sued farmers who had planted trees before the variety was officially granted protection. The European Court of Justice had to decide if the breeder could claim royalties on the *fruit* (harvested material) itself. This case demonstrates the "extended" reach of UPOV 1991, where a breeder's control doesn't stop at the seed but extends to the actual food sold in supermarkets.

### 3. The "Pink Lady" Apple (Trade Secrets vs. PBRs)

The Pink Lady apple is a classic example of how UPOV-style protections allow for "Club Varieties." Only certain farmers are allowed to grow the variety, they must pay royalties for every tree, and they must follow strict quality controls. This shows how UPOV facilitates a highly controlled, high-profit commercial agricultural model.

The current global situation is a "clash of systems." On one side, developed nations and the UPOV Secretariat are pressuring developing countries to adopt the 1991 Act through bilateral trade agreements. On the other side, biodiversity-rich nations like India, Thailand, and parts of Africa are resisting, arguing that UPOV 1991 is a threat to seed sovereignty and food security.

Under these regulations, breeders are granted exclusive rights over the production, sale, export, and import of their varieties, with the 1991 revision significantly strengthening these protections. While the UPOV system offers several advantages—such as encouraging agricultural innovation, attracting private investments and harmonizing international protection standards—it also faces significant criticism. Disadvantages include the weakening of farmers' rights, particularly under the 1991 Act, as it restricts the traditional practice of saving and exchanging seeds. Furthermore, the system is often seen as favoring multinational seed companies and remains largely unsuitable for the informal, traditional seed systems found in countries like India.

Looking at the evolution of this landscape, the past was characterized by limited breeder protection and strong traditional farming practices. In the present day, there is increasing pressure on developing nations to adopt the rigorous UPOV 1991 standards. However, the future will likely see continued resistance from biodiversity-rich countries who prefer to push for sui generis systems that better fit their local contexts. Notably, India is not a member of UPOV, choosing instead to follow its own legal framework known as the Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act of 2001.

UPOV provides a robust framework for industrial plant breeding and private investment, its "one-size-fits-all" approach often fails to account for the millions of farmers who rely on informal seed exchange. The future of plant protection will likely depend on finding a middle ground—much like India's PPV&FR Act—that respects the commercial needs of the modern breeder while safeguarding the ancient, fundamental rights of the farmer.

### III. Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD) is a landmark international treaty that was adopted during the 1992 in Rio Earth Summit. This was Administered by the United Nations Environment Programme (UNEP), it has achieved near-universal participation with 196 member countries, notably with the United States being the only major nation that has not ratified the agreement. The convention is built upon a "triple goal" framework: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits (ABS) arising from the utilization of genetic resources (Mgbeoji, 2006).

The Convention on Biological Diversity (CBD) is the "Magna Carta" of the environmental world. Opened for signature at the 1992 Rio Earth Summit and administered by the United Nations Environment Programme

(UNEP), it represents a global commitment to protecting the variety of life on Earth. With 196 member parties, it has achieved near-universal participation—the United States is notably the only major sovereign nation that has not ratified it. The CBD moved away from seeing nature as a "free-for-all" resource and established a triple-goal framework:

The CBD fundamentally shifted the legal status of biological resources. Previously, genetic resources were often treated as a "common heritage of mankind," but the CBD established the sovereign rights of states over their own natural resources. This means that any country or entity wishing to access genetic material must obtain Prior Informed Consent (PIC) from the provider country. Furthermore, the convention places a significant emphasis on the recognition of traditional knowledge, ensuring that the wisdom of indigenous and local communities is respected and that they receive a share of the benefits when their knowledge leads to commercial or scientific breakthroughs.

The CBD basically changed international law by declaring that biological resources are not the "common heritage of mankind," but are subject to the sovereign rights of nations.

- A. Prior Informed Consent (PIC): Any entity (like a pharmaceutical company) wanting to access a country's genetic resources must get permission from that government first.
- B. Mutually Agreed Terms (MAT): Access is granted only after a contract is signed detailing how the benefits (money or technology) will be shared.
- C. Traditional Knowledge: Article 8(j) of the CBD mandates that the knowledge of Indigenous Peoples and Local Communities (IPLCs) must be respected and protected.

The history of the CBD reflects a massive shift in how humanity views nature of CBD:

Firstly, before this convention, genetic resources were generally treated as a "common heritage," allowing researchers and corporations to collect samples globally without legal obligation to the source country. We are currently in an era defined by state sovereignty and the establishment of complex ABS frameworks, such as the Nagoya Protocol, which aim to ensure that if a medicine is developed from a rainforest plant, the local community benefits.

Presently the focus is now shifting toward Digital Sequence Information (DSI). As biotechnology advances, scientists no longer need physical seeds or leaves; they can simply use digital genetic codes. Regulating this "digital" biodiversity to ensure fair sharing remains the next great frontier for the CBD.

Advantages One of the greatest strengths of the CBD is that it protects biodiversity-rich countries (often in the developing world) from "biopiracy" by providing a legal foundation for Access and Benefit-Sharing

(ABS) mechanisms. It empowers indigenous communities by giving them a seat at the table regarding their ancestral lands and resources. It gives indigenous people a legal voice in how their ancestral lands and traditional medicines are used. It links environmental protection directly to economic development, making conservation profitable for poor nations. Provides a legal shield for biodiversity-rich (often developing) nations against the unauthorized exploitation of their resources

Disadvantages: However, the convention faces significant hurdles, including weak enforcement and a lack of a global "police force" to ensure compliance. The CBD lacks a "global police force" or a mandatory court. If a country or company breaks the rules, penalties are often difficult to apply. There are also inherent conflicts with other international agreements like TRIPS (Trade-Related Aspects of Intellectual Property Rights) and UPOV, which prioritize private intellectual property over collective or sovereign rights. Many nations also struggle with implementation challenges at the national level, finding it difficult to translate these complex international goals into functional domestic laws. Translating these high-level international goals into working domestic laws is technically and financially difficult for many countries

## Case Laws

### 1. The Maya ICBG Dispute (Mexico)

In the late 1990s, a massive project (ICBG) aimed to document the medicinal plants used by the Maya people in Chiapas, Mexico. However, the Maya communities protested, claiming they had not given proper Prior Informed Consent and that their traditional knowledge was being "stolen" for potential pharmaceutical patents. Because of the principles established by the CBD, the project was eventually cancelled, setting a massive precedent for indigenous rights.

### 2. The Kani Tribe and "Arogyapacha" (India)

This is a classic success story of the CBD's philosophy. Scientists in India discovered that the Kani tribe used a plant (*Trichopus zeylanicus*) for instant energy. The scientists developed a drug called "Jeevani" from it. Following the spirit of the CBD, a trust fund was set up, and 50% of the license fee and royalties were shared with the Kani tribe. This is one of the world's first successful examples of "Access and Benefit Sharing."

### 3. The "Enola Bean" Patent Case

A US citizen bought a bag of yellow beans in Mexico, planted them in the US, and eventually received a patent for "Enola beans." He then tried to stop Mexican farmers from exporting their own traditional yellow beans to the US. This "biopiracy" case caused an international outcry. While the patent was eventually

overturned, it served as a primary reason why nations pushed for the stricter Nagoya Protocol under the CBD framework.

The CBD has successfully shifted the global mindset from exploitation to partnership. By replacing the "common heritage" model with "sovereign rights," it has given developing nations the leverage to protect their natural wealth. However, as we move into the age of synthetic biology and digital DNA, the convention faces its toughest challenge yet. The present situation requires a delicate balance: we must ensure that the "digital" version of nature remains a tool for global innovation while ensuring that the physical stewards of that nature—the countries and the indigenous people—are never left behind

#### IV. Cartagena Protocol on Bio-safety

The Cartagena Protocol on Biosafety serves as the primary international legal framework governing the movement of genetically modified life forms across borders. Adopted in 2000 as a supplementary agreement to the Convention on Biological Diversity (CBD), it became effective in 2003. Its core mission is to ensure that the rapid advancements in modern biotechnology do not compromise global biodiversity or human health, particularly when Living Modified Organisms (LMOs) are transferred from one country to another (Cartagena Protocol, 2000). The protocol focuses on the biosafety of LMOs balancing technological progress with environmental caution through several key mechanisms:

- A. Advance Informed Agreement (AIA): This procedure ensures that before an LMO is imported for the first time, the exporting country must provide detailed information, allowing the importing country to make an informed decision.
- B. The Precautionary Principle: This allows countries to take protective action even if scientific certainty regarding a specific risk is not yet fully established.
- C. Risk Management: It mandates rigorous scientific assessments to identify and manage potential adverse effects on biological diversity.
- D. Biosafety Clearing-House (BCH): An online platform designed to facilitate the exchange of scientific, technical, and legal information regarding LMOs.

Advantages: Safeguards natural ecosystems and human health from unforeseen biological risks. This empowers individual nations with the legal right to reject the import of specific GMOs. Encourages the development of robust national biosafety laws and regulatory frameworks. The genetic resources (like plants, microbes, or animals) or the traditional knowledge associated with them, the benefits are shared fairly with the country or community of origin.

Disadvantages: The strict regulations and documentation required can slow down the international biotechnology trade. Risk assessments often face "scientific uncertainty," making it difficult to prove or disprove long-term impacts. Many developing nations lack the technical expertise and infrastructure to implement these complex safety standards.

In summary, the Cartagena Protocol is a vital safeguard that bridges the gap between innovative biotechnology and environmental preservation. While it provides a structured "safety-first" approach for nations to manage LMOs, its effectiveness is often challenged by the high costs of compliance and the technical limitations of developing countries. Ultimately, it remains a cornerstone of international environmental law, ensuring that the pursuit of scientific progress does not come at the expense of the planet's biological integrity.

## V. Nagoya Protocol

The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization is a landmark international treaty. Adopted in 2010 in Nagoya, Japan, and entering into force in 2014, it acts as a legally binding supplement to the Convention on Biological Diversity (CBD). While the CBD established the general principle of "Access and Benefit Sharing" (ABS), the Nagoya Protocol provides the specific "rulebook" to ensure that when companies or researchers use

The Protocol moves beyond voluntary guidelines to create mandatory ABS compliance. This is structured around following three pillars:

- a. Access and Benefit Sharing (ABS): Users must obtain Prior Informed Consent (PIC) from the provider country before accessing resources. Furthermore, they must negotiate Mutually Agreed Terms (MAT) to decide how benefits will be shared.
- b. Types of Benefits: Benefits are not always just cash payments. They are categorized as: Monetary: Royalties, milestone payments, or license fees. Non-Monetary: Technology transfer, scientific collaboration, training of local researchers, and sharing of research results.
- c. Protection of Traditional Knowledge

The Protocol specifically protects the rights of Indigenous Peoples and Local Communities (IPLCs). If a cosmetic company uses a traditional herbal remedy as the basis for a new skin cream, they must share the profits with the community that held that knowledge (Nagoya Protocol, 2010).

Advantages: Stops the "theft" of resources where entities patent natural products without permission. This provides a clear roadmap for both "providers" (developing nations) and "users" (biotech /pharma companies). It provides local communities a seat at the table and a share in the global bio-economy. Navigating the different national laws of every country can be a bureaucratic nightmare for scientists.

Disadvantages: High costs and long wait times for permits may cause researchers to avoid certain high-biodiversity regions. It is very difficult to track and enforce these rules once a genetic sample has crossed international borders.

The Evolution of Nagoya Protocol Under the original 1992 CBD, ABS was largely voluntary. There was no global mechanism to punish "Biopiracy," leading to many disputes. But, presently now have binding obligations. Countries must set up "Checkpoints" (like patent offices) to verify that users have followed ABS laws. The biggest challenge is Digital Sequence Information (DSI). Modern scientists often don't need a physical leaf; they just need the DNA sequence data uploaded to the cloud. The future of the Protocol involves regulating this "digital" genetic data.

## **Case Laws**

### **1. The Rooibos Case (South Africa)**

This is one of the most famous successes of the Nagoya Protocol. For years, the Rooibos tea industry flourished without rewarding the indigenous San and Khoi people, who originally discovered the plant's uses. In 2019, a landmark industry-wide agreement was reached. The tea industry now pays a percentage of the "gate price" into a trust fund for these communities, recognizing their traditional knowledge (Vermeulen, 2019).

### **2. The Hoodia Plant Dispute (Biopiracy Example)**

Before the Nagoya Protocol was fully realized, the Hoodia cactus was used by the San people to suppress hunger. A UK-based firm patented the active ingredient for weight-loss products without initial consent or benefit-sharing. This case became a catalyst for the Protocol, highlighting the need for mandatory legal protections to prevent "biopiracy."

### **3. Argan Oil (Morocco)**

Morocco has used the Protocol to protect Argan oil. They established strict geographical indications and ABS agreements, ensuring that European cosmetic giants like L'Oréal contribute to the preservation of Argan forests and the economic upliftment of the local Berber women's cooperatives who process the oil.

The Nagoya Protocol transformed the "wild west" of genetic prospecting into a regulated, ethical system. By bridging the gap between the technology-rich North and the biodiversity-rich South, it ensures that nature's "green gold" is not exploited but shared. While the administrative burden is high, the Protocol is essential for ensuring that the global biotechnology revolution is both sustainable and socially just.

## **VI. International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)**

The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), often called the "Seed Treaty," is a comprehensive international agreement aimed at ensuring global food security. Adopted in 2001 and administered by the Food and Agriculture Organization (FAO), it recognizes that no country is self-sufficient in plant genetic resources. To feed the world, nations must cooperate and share the genetic building blocks of our food supply.

Unlike other treaties that focus on conservation generally, the ITPGRFA is specifically tailored to the needs of farmers and breeders in the agricultural sector (Esquinas-Alcázar, 2005).

This Treaty operates through a unique system designed to bypass the complex, bilateral negotiations usually required by the Nagoya Protocol.

- a. **The Multilateral System (MLS):** The heart of the treaty is a "global pool" of genetic resources. It currently covers 64 of the world's most important crops (listed in Annex I), which account for 80% of the food we derive from plants.
- b. **Standard Material Transfer Agreement (SMTA):** To keep the process simple, the treaty uses a standardized contract called the SMTA. When a researcher or company wants a sample from the global pool, they don't negotiate for years; they sign this uniform agreement that dictates how the seeds can be used and how benefits must be shared.
- c. **Recognition of Farmers' Rights:** This is a groundbreaking feature. The treaty acknowledges the enormous contribution that local and indigenous communities and farmers have made to the development of the world's wealth of plant genetic resources. It protects their right to save, use, exchange, and sell farm-saved seeds.

**Advantages:** It facilitates the breeding of climate-resilient and high-yield crops. The SMTA removes the "red tape," allowing seeds to move quickly between researchers. Unlike the UPOV (which favors commercial breeders), the Seed Treaty explicitly champions the rights of traditional farmers.

**Disadvantages:** The "Annex I" list only covers 64 crops. Important crops like soy and many vegetables are currently excluded. The Benefit-Sharing Fund has struggled to collect significant monetary contributions from

the private sector The Friction exists between the "free exchange" philosophy of the treaty and the "private ownership" model of patents.

Initially the convention was on Crop germplasm was often treated as a "common heritage of mankind" with free, unregulated exchange, which sometimes led to exploitation without return. Presently, there is a Structured Multilateral System. Access is facilitated, but it is tied to legal obligations to share benefits if a commercial product is developed. In future there is a push to expand Annex I to include all plant genetic resources. Additionally, there is a heated debate over Digital Sequence Information (DSI)—ensuring that if a company uses the *genetic code* of a seed from the pool, they still pay into the benefit fund.

## Case Laws

**1. The Benefit-Sharing Fund (Global Example):** The Treaty's Benefit-Sharing Fund has invested millions into projects in developing countries. For example, in Malawi and Vietnam, the fund has supported "Community Seed Banks." These banks allow farmers to access diverse local varieties that are more resistant to pests and climate change, directly applying the "Farmers' Rights" pillar of the treaty.

**2. CIMMYT and Wheat Varieties:** The International Maize and Wheat Improvement Center (CIMMYT) holds thousands of samples in the MLS. Breeders in India or Brazil can request wheat samples from CIMMYT via an SMTA to breed varieties that can survive extreme heat. This happens daily and is the primary reason the treaty is considered the backbone of modern agricultural research.

**3. The "DivSeek" Controversy (DSI Conflict):** While not a "court case" in the traditional sense, the DivSeek International Network dispute serves as a major "case study" in treaty law. DivSeek aimed to characterize the genomes of seeds in the treaty's pool. Developing nations and NGOs argued that making this data public without a benefit-sharing mechanism would allow companies to bypass the SMTA, effectively "stealing" the genetic value through digital means. This has led to ongoing negotiations to update the treaty's rules for the digital age.

Conclusion: The ITPGRFA is a vital tool for human survival. By treating the world's most important food crops as a shared resource rather than private property, it ensures that breeders can continue to innovate in the face of a changing climate. While its financial mechanisms need strengthening and its scope needs expansion, it remains the only global instrument that balances the rights of commercial breeders with the ancient rights of the farmers who fed the world for millennia.

## VII. Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)

The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) is the most comprehensive multilateral agreement on intellectual property (IP). Adopted in 1994 during the Uruguay Round of trade negotiations, it is administered by the World Trade Organization (WTO). Unlike environmental treaties like the CBD or Nagoya Protocol, TRIPS is a trade-driven agreement. Its primary objective is to harmonize IP standards globally, ensuring that innovators have a minimum level of protection for their inventions in every WTO member country. This creates a "level playing field" for international commerce but often creates tension with traditional agricultural practices and biodiversity conservation (WTO-TRIPS, 1994).

### The Plant-Related Provision: Article 27.3(b)

This is the most controversial and significant part of TRIPS regarding biology and agriculture. It sets the rules for what can and cannot be patented: 1. Countries may exclude plants and animals (other than micro-organisms) from being patented. Even if a country does not allow patents on plants, it must provide protection for "plant varieties" using: 1. Patents: Strongest protection, often restricting seed saving. 2. Sui Generis System: A "unique" system tailored to the country (e.g., UPOV-style Breeder's Rights). A mix of both patents and specialized plant laws.

Advantages: Provides clear rules for biotech companies to invest in research without fear of their inventions being copied. It Reduces trade friction by ensuring that IP respected across borders. Proponents argue that IP protection encourages companies to share their technology in foreign markets. Disadvantages: The standards were largely designed by industrialized economies with advanced R&D sectors. Strict Intellectual property rules often make it illegal for farmers to save and swap seeds, a practice essential for food security. It allows for the "privatization" of natural resources and traditional knowledge if they are slightly modified (Encourages Biopiracy)

Before 1994, there was no global IP obligation. Many developing nations did not allow patents on medicines or seeds to keep them affordable. Presently, Plant variety protection is mandatory. Most countries have adopted the UPOV (International Union for the Protection of New Varieties of Plants) model to satisfy WTO

requirements. In prospects to future, There are ongoing reform debates. Developing nations (like India, Brazil, and South Africa) are pushing for a "disclosure requirement" where patent applicants must prove they obtained genetic resources legally under the Nagoya Protocol.

## Case Laws

### 1. The Turmeric Patent Case (India vs. USPTO)

In the mid-1990s, the US Patent and Trademark Office granted a patent to researchers for the "use of turmeric in healing wounds." The Indian government challenged this, providing ancient Sanskrit texts to prove that this was "Prior Art" (existing knowledge). Under TRIPS-era scrutiny, the patent was revoked. This case highlighted how TRIPS-style patenting can lead to biopiracy of traditional knowledge.

### 2. Monsanto vs. Schmeiser (Canada)

This famous case involved a farmer, Percy Schmeiser, whose fields were contaminated with Monsanto's "Roundup Ready" canola via wind/pollen. Monsanto sued him for patent infringement. The Canadian Supreme Court ruled in favor of Monsanto, stating that while the farmer didn't *buy* the seeds, he "used" the patented invention by harvesting the crop. This case illustrates the immense power TRIPS-compliant patents give to corporations over traditional farming (Monsanto vs. Schmeiser (2004)).

Today, the TRIPS Agreement sits at a crossroads. While it has successfully standardized IP protection for the digital and pharmaceutical ages, its application to "life forms" remains a point of global friction. The current trend is a push for a "TRIPS-plus" approach in bilateral trade deals (which are even stricter), while simultaneously, the "Global South" is fighting for a "WIPO Treaty on Genetic Resources," which would force patent offices to respect the Nagoya Protocol. Ultimately, TRIPS ensures that innovation is rewarded, but the challenge remains to ensure that these rewards do not come at the cost of the world's poorest farmers or the planet's remaining biodiversity.

## VIII. Conclusion

The global landscape of plant variety protection and biodiversity management is no longer a monolith, but a fragmented "clash of systems." While the UPOV 1991 Act and TRIPS provide the high-octane legal fuel for the modern agro-industrial complex, they often overlook the informal seed systems that sustain global food security. Conversely, the CBD and the Nagoya Protocol have successfully shifted the moral and legal needle toward "Access and Benefit Sharing," ensuring that indigenous voices are finally heard in the halls of global commerce.

The "Seed Treaty" (ITPGRFA) offers a glimmer of hope for a middle path, treating essential food crops as a shared resource that belongs to everyone yet requires a contribution to a common fund. However, as demonstrated by the PepsiCo vs. Indian Farmers case, the ultimate test of these laws occurs at the national level. India's *sui generis* PPV&FR Act serves as a vital case study in how a nation can fulfill international trade obligations under TRIPS while explicitly protecting the ancient right of a farmer to save and resow seeds—a right that predates any modern patent office.

As we look toward a future dominated by Digital Sequence Information (DSI) and synthetic biology, the challenge will be to ensure that "nature in a cloud" does not become a loophole for circumventing the hard-won protections of the Nagoya Protocol. The goal for the next decade of international law must be to move beyond a "one-size-fits-all" approach and create an integrated framework where the laboratory-bred seed and the farmer-saved landrace can coexist for the benefit of a hungry planet.

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