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# The Evolution of International Agrobiodiversity Governance: Exploring Institutional Effectiveness and the Integration of Digital Sequences Information

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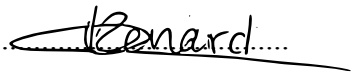
# Declaration

I, Valentine Renard, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature.....  .....

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# Abstract

The international biodiversity governance regime is a complex web of policies and regulations that has the potential to address pressing global issues like food security, promoting farmers' development, or even biodiversity crisis alleviation, but that is also concerned with ethical dilemmas related to the unfair distribution disparities of benefits from genetic resources, the commercialization of nature's components, and the unrecognized exploitation of indigenous and local communities' work. This paper explores the historical development and current state of affairs surrounding the governance of agrobiodiversity focusing especially on the fair and equitable achievement of benefit sharing from the utilization of plant genetic resources. The study examines four international agreements related to plant genetic resource, the IUPGR, the CBD and NP, the ITPGRFA, and the KMGBF, as case studies within the biodiversity governance regime. This with the aim to clarify whether the agreement's status as regulatory or market-based and pertaining a stewardship or ownership approach correlate to its institutional effectiveness degree. The research project also seeks to uncover the challenges and opportunities for the governance of genetic resources that raised from the advance of digital sequences information as a new outstanding kind of data, which undeniably created interconnections between these agreements, in the similar manner that, in my opinion, decades-old sovereign rights and property quarrels have. Additionally, the paper aspires to emphasize the potential of multilateral mechanisms for future development of biodiversity agreements. In the first part, the analyses of the four case studies detail how the agreement's relationship to the two sets of independent variables influence its output and outcome from an institutional effectiveness point of view, and if relevant what broader international and national impacts it has generated. In the second part, the paper explores the relationship between DSI and the governance of agrobiodiversity as a highly controversial topic in international fora negotiations.

# List of abbreviations

| | |
|---|---|
| ABS | Access and Benefit Sharing |
| AHTEG | Ad Hoc Technical Expert Group |
| CBD | Convention on Biological Diveristy |
| CGIAR | Consortium of International Agricultural Research Center |
| COP15 | 15th meeting of the Conference of the Parties |
| DSI | Digital Sequences Information |
| FAO | Food and Agriculture Organization |
| GR | Genetic Resources |
| IPLC | Indigenous People and Local Communities |
| IPRs | Intellectual Property Rights |
| ITPGRFA | International Treaty on Plant Genetic Resources for Food and Agriculture |
| IUPGR | International Undertaking on Plant Genetic Resources |
| KMGBF | Kunming-Montreal Global Biodiversity Framework |
| MAT | Mutually Agreed Terms |
| MLS | Multilateral System |
| NP | Nagoya Protocol |
| OEWG | Open Ended Working Group |
| PGR | Plant Genetic Resources |
| PGRFA | Plant Genetic Resources for Food and Agriculture |
| PIC | Prior Informed Consent |
| PVP | Plant Variety Protection |
| R&D | Research and Development |
| SMTA | Standard Material Transfer Agreement |
| TK | Traditional Knowledge |
| TRIPS | Trade Related Intellectual Property Rights |
| UPOV | International Union for the Protection of New Varieties of Plants |
| WTO | World Trade Organization |

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# Chapter 1: Introduction

## I. Problem framing

The use of plant genetic resources for food and agriculture (PGRFA) can be traced back to ancient times, more than 10.000 years ago farmers were already selecting genetic variations in wild species that were favorable for the development of their crops. Genetic resources (GR) can be envisioned as any genetic material of plant, animal, microbe, or other organism containing functional units of heredity that are of actual or potential value for human exploitation (GEMET, 2021). Plants have certain characteristics that make them either suitable for domestication and usable in agriculture, or not. Being able to work with these characteristics, making use of a the widest possible pool of genetic diversity, is one the most precious resources that humans have for food security and development worldwide. The risk of losing genetic diversity spurred the creation of facilities and programs for maintaining and rescuing this richness. The related issues surrounding access, ownership, and control of this overly important resource required the development of policies. Undoubtedly, some of the most contentious issues relating to plant genetic resources (PGR) are shaping its access and laying out its ownership management. Experts dating back to Darwin affirmed that breeders and farmers have stewarded over genetic diversity for millennia. Traditional selection of crops came to be as a response to human needs. Historically, there was no such notion as ownership regarding seeds and plant genetic resources, instead an approach called stewardship described all the components of agrobiodiversity as part of the global commons which occurred to be publicly shared for the good of all humankind (Andersen, 2006, 2016a,b; Wynberg et al., 2021). However, formal development of productiver crops and inter-crossed varieties crafted by breeders in government research centers along with the rise of genetical science brought value to the art of plant breeding. Modern controversies on Breeders' rights, Farmers' rights and Intellectual Property Rights (IPRs) formally established the shift from publicly to privately funded research and the increasing appraisal of PGR commercialization, which have added complexity to the governance of PGR (Smith et al., 2016; Wynberg et al., 2021).

The initial International Undertaking on Plant Genetic Resources for Food and Agriculture (IUPGR) emerged as the first framework for PGRFA use and conservation (Cooper, Engels, Frison, 1994). It was created to ensure that PGR which could have economic or social value for agriculture would be preserved, evaluated, and made available for breeding and scientific purposes (FAO, 1983). In their study on the evolution of benefit sharing, Morgera and Tsioumani (2010) reveal that for some developed countries the adoption of such agreement created disagreements, mainly due to their advances in developing modern varieties for crops thus implicating intellectual property protection, directly opposing the concept of common heritage that founded the very basis for the agreement. As a response to rises in all kinds of IPRs and fears of biopiracy, the Convention on Biological Diversity (CBD) came to be, alongside a strong legal principle of national sovereignty over GR that thereupon replaced the notion of GR as common heritage oh mankind. Through its third overarching objective, the CBD aimed at bettering prior inequities by providing a framework under which access to a country's GR and sharing of the benefits arising from the utilization of a country's GR would be managed and regulated (CBD, 1992). This decision clarified how to both get access to GR and then share the benefits arising from its use between those who provided and those who used the GR, in a fair and equitable way. Access and Benefit Sharing (ABS) was conceived to be a set of internationally agreed terms regulating GR. In pursuit of a legally binding structure ruling over ABS, the Nagoya Protocol (NP) came to be as an insurance that ABS rights, applied

to both commercial and non-commercial users, to protect, conserve, and use biodiversity by making it profitable as well as ethical, would be honored (CBD, 2011). The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) was adopted to address specific issues in agriculture, due to the recognition that PGRFA required particular considerations, primarily thanks to their nature of being the sole basis of farming and the backbone of food security worldwide (FAO, 2004). The aim of the ITPGRFA is to support the conservation and sustainable use of plant genetic resources for food and agriculture, and the fair sharing of benefits derived from their uses. Despite sharing the same objectives with the CBD, the International Treaty's means to attain them are utterly different. Under the ITPGRFA, a multilateral system is the headliner mechanism to ABS, wherein genetic resources should remain in the public domain and not be subject to exclusive IPRs (FAO, 2004).

ABS is an important issue in international environmental fora that aim to find a balance between the interests of developed and developing countries for GR. Indeed, the situation is one were GR-rich countries from the Global South, whom are often the providers of GR, wish to conserve them and receive a percentage of the profits generated from their utilization, while capacity-rich countries from the Global North, whom are mostly the users of GR, wish to exploit them and build profits out of their commercialization (Smyth, 2020). The CBD and its NP clarified rules on ABS, which assumed to hold great perks, may it be for users who benefit from open access to bioinformation, for providers that receive the fruits from their creations, and for nature through protection and conservation efforts (CBD, 1992; CBD, 2011). Nevertheless, implementing good ABS, as exposed by Tvedt (2006), has been challenging due mainly to the value arising from the use of GR being created by private parties under the jurisdiction of another party or grouping of parties. Accordingly, for a party to be legally obligated to share the benefits of its utilization, the government of the country must have implemented an obligation under national laws, which constitutes obstacles for global governance. This reality aligns with Young's (2011) theory that the international landscape has such an anarchic character because of its very design consistsing of numerous sovereign states, which are somewhat competent at managing natural resources under their own jurisdiction, but when needed as a coherent society, establish complex interactions often at the expense of successful governance. In addition, the limited capacity of communities, often being those that would require it the most, to fulfill their needs through the creation and use of contracts make the CBD and NP's approaches insufficient to the fulfillment of their objectives (Tvedt, 2006). Therefore, the multilateral mechanism (MLS) for ABS included under the novel Kunming-Montreal Global Biodiversity Framework (KMGBF) could provide an avenue for finding a legal situation that would ensure fair and equitable benefit sharing from the utilization of GR (CBD, 2022b). This represents a historical moment for agrobiodiversity governance, as Digital Sequences Information (DSI) has added yet another layer of complexity to the already complicated task of attaining fair and equitable benefit sharing from GR utilization.

The emergence of the novel ability to digitalize biological information came around at the same time as the development of other genome editing technologies, big data, and synthetic biology. As much as these innovations can be different in scope and depth, when combined they could have the potential to change decades-old constraints to plant engineering and modification as expressed by Leskien (2021) and Smyth et al. (2020). DSI allows for genetic sequenced data from a plant endemic to an indigenous territory to be published in a public open-access database, from where a lab across the world can use it to create a patented product without need for the physical plant, nor the commitment to compensate the origin community for the genetic material they made available (Pandey & Ghosh, 2022; Smyth et al., 2020). While the possibility to access these PGR online and uncoupled from their biological material brings up a spectrum

of new possibilities and irrevocable benefits such as open-science, public health, and a more resilient future for agriculture, the mechanism in place shortcuts communities' access to benefit-sharing as well as brings complex interdisciplinary challenges for regulation (Leskien, 2021). At the same time, huge inequalities rise in cases where the drugs, medicined, vaccines, and seeds producing profits to industries do not reach the very regions from which they originated (Chandrasekhar, 2022).

International governance of DSI from GR can be seen as an attempt to balance the need for scientific research and innovation with the need to redistribute the benefits from utilization of GR in order to protect people's rights and incentivize the conservation of biodiversity (CBD, 2022b). However, the transformative technological shift that digital publicly accessible resources represent is creating a governance gap, and the lack of information and knowledge on how to regulate internationally over intangible openly accessible common pool resources must be faced (Leskien, 2021). Indeed, the ability to sequence rapidly and cost-efficiently a numerous amount of plant organisms from various sources has yielded an enormous volume of data. It has become increasingly difficult to track and trace the origin of the sequences utilized for a final product's production (CBD, 2022b). The issue subsists around the governance of ownership of data in a context where data cannot directly be owned. Open data can be accessed, used and shared by anyone. Closed data is not available to anyone outside the system that controls it. Common beliefs around the almighty benefices of open data are that it leads to positive outcomes for everyone (Leskien, 2021). Yet, access and usage being constrained by resource availability, infrastructure, and fiscal constraints, prove that barriers can change these outcomes. Another aspect to be considered when data is accessed online is the lack of obligations towards the source of the genetic resource, ultimately leading to a reduced sum of benefits shared (Smyth et al., 2020). Particularly, conceptual questions on political pathways to deal with this novel kind of data are arising. Confusion on the nature of DSI and on the characteristics of their definition, on whether they comprise genetic resources by themselves or if they arise from the utilization of genetic resources. Debates on copyrights, plant breeder's rights regimes, protection of trade secrets and undisclosed test data are taking place. And lastly, uncertainty is rising regarding how to deal with DSI in a context that recognizes and tries to increasingly include traditional knowledge holders and indigenous people and local communities (IPLC) within benefit-sharing mechanisms.

Even if the KMGBF still lacks implementation actions and will need a couple more years before being fully workable, the arrangement of 196 parties on the difficult issues which resides inside is a great breakthrough. Many stakeholders share a concern about its ambitions concerning sharing of benefits arising from GR and DSI. This study will focus on doing a thorough analysis of the past and current systems ruling over PGR's management to discuss their institutional effectiveness, as well as exploring the link that DSI created between them, and uncovering the challenges and opportunities that arise from DSI as new outstanding kind of data. Three overarching objectives are being pursued across some of the main agreements within the agrobiodiversity governance regime, out of which four international PGR-related agreements have been chosen as case studies in this essay. These objectives are, with limited changes across forum, first the conservation of biological diversity, second the sustainable use of the components of biodiversity, and third the fair and equitable sharing of the benefits arising from the utilization of genetic resources (FAO, 1983, 2004; CBD 1992, 2011, 2022c). Importantly, the focus of this paper will especially be positioned on the objective of ensuring fair and equitable benefit-sharing from utilization of genetic resources. The rationale behind this direction to concentrate on this third objective was born from a dual reasoning. The rise of biological information digitalization obviously spurred new developments in the management

of ABS from genetic resources (Smyth et al., 2020) providing an already appealing motive for renewing investigation on the topic. But the promise of a consensus-based decision, between often opposed developed and developing countries, regarding a 10-year-long vision on management of biodiversity and the prospect of a renewed human-nature relationship (IISD, Earth Negotiation Bulletin, 2022), induced my interest in ABS experiences and the lessons they can provide for presuming what will come from future biodiversity governance actions.

# II. Problem statement, Objective, and RQs

This thesis analyses the historic development of the governance of agrobiodiversity, focusing especially on the fair and equitable sharing of benefits from the utilization of GR. The operationalization of two sets of independent variables, one relating to the choice of environmental policy instrument and the other expressing the approach to agrobiodiversity governance and recognition of farmer's rights, is conducted to guide the investigation of environmental agreements governing over plant genetic resources' outputs, outcomes, and potential impacts. The objective is to explore weather a relationship between agrobiodiversity management perspective and policy instrument design, and institutional effectiveness of regime could be drawn from four subtly different cases of PGR agreements. This idea is driven by the conjunction of two variables: encompassing either a stewardship or ownership approach towards agrobiodiversity governance, along with either a regulatory or market-enabling instrument for environmental policy. As an addition to this first objective, this paper has the purpose to explore the innovative topic of the disruptive technology that DSI represents, and considering it as a cross-cutting element connecting the dots between FAO's two mechanisms and the CBD's convention, protocol, and newly agreed framework. DSI being a major dealmaker in today's negotiations, and highly influential for big decisions to be taken in the decade to come, the creation of a regulatory systems covering DSI, embodied within the newly-agreed on KMGBF, is a major achievement as it will positively support national governments and international institutions in governing the utilization of genetic resources and is a step closer to attaining the goal of global fairness in distribution of and access to biodiversity. Access and benefit sharing is believed to be at the center of reaching worldwide equity, aiding countries from the Global South in their development, as well as acting towards biodiversity protection.

This thesis encompasses components of both social and political science by embracing notions in environmental governance and regimes theory through the focus on theories of institutional effectiveness, as well as adopting important concepts from agrobiodiversity management and welfare responsibility. In this study I address the following research questions.

1. What are the historical and contemporary international agrobiodiversity-related agreements for governing plant genetic resources? How have these mechanisms developed over time and what factors have influenced their development?
2. How does an international agrobiodiversity-related agreement's relationship to its agrobiodiversity management approach and policy instrument design impact its institutional effectiveness degree, specifically focusing on the attainment of fair and equitable benefit-sharing from genetic resources?
3. To what extent have different international agrobiodiversity-related agreements achieved the objective of ensuring fair and equitable benefit sharing from the use of GR, from an institutional effectiveness point of view?

4. How has the emergence of DSI affected the governance of PGR, and what challenges and opportunities does this pose for fair and equitable benefit-sharing?

The rest of this thesis is organized as follows: Chapter 2 presents the theoretical framework, which explains the concepts of two opposed agrobiodiversity governance approaches and two distinct designs of policy instruments. The chapter also, through basis in academic literature, outlines how institutional effectiveness of environmental regimes is commonly measured, and subsequently clarifies the hypothesis to be tested along with the research findings' expectations. Chapter 3 outlines the case study method used to structure the remainder of the study, and chapter 4 presents the full analysis of the IUPGR, the ITPGRFA, the CBD and NP, and the KMGBF, as case studies. Each study begins with a presentation of the case and highlights its broad purpose. Then follows a description of the mechanisms included in the agreement, and a process of coding the regimes as under the stewardship or ownership approach as well as under market-based or regulatory type of policy instrument. Ultimately, an evaluation of the institutional effectiveness achievements of each individual regime is conducted. Chapter 5 discusses the cross-cutting topic of DSI and aims to bring insights linking the four case studies together. Finally, chapter 6 concludes by providing an overview of the results of the analysis, considering the methodological limitations of the study, and presenting recommendations for future research.

# Chapter 2: Theoretical Framework

In any model aiming to capture a cause-effect relationship between components of a situation there exist two kinds of variables. A simple way to picture it is a linear relationship wherein the independent variable acts as the 'cause', and the dependent variable receives the 'effect' of the changes in the situation. In the model that I shaped for the purpose of this study project, the approach of governance to agrobiodiversity is used as independent variable, as we want to explore its effects through four case studies. Agrobiodiversity can be governed through a stewardship or an ownership approach, and this study will analyze if regime institutional effectiveness has been influenced by the variation in this independent variable. Additionally, the choice of environmental policy instrument is also used as independent variable, as we are interested in the effects that the choice between regulatory or market-based instrument could have caused on the regime institutional effectiveness of the four case studies selected too.

## I. Independent variables

### 1. Governance of agrobiodiversity

Visser et al. (2019) defines governance of agrobiodiversity as a system of values. There exist conflicting approaches based on divergent values and rationale creating different governance patterns. Within each system a collection of actors is involved, power dynamics are influencing their interactions, and ultimately their ability to influence the management of agrobiodiversity. Actors involved in agrobiodiversity usage and management can perform from district perspectives and apply sometimes clashing rationales to back up their decisions regarding access, use, exchange, and conservation of biological components of diversity. Andersen (2017) notes that achieving conservation and sustainable use of agrobiodiversity is also highly dependent on farmers' ability to maintain these resources on their farms, also called in-situ conservation, and this is itself dependent on the recognition of farmers' rights through different provision on access and benefit sharing under a certain context dictated by the very rationale that is chosen to govern over these resources.

As described by Wynberg et al. (2021) agrobiodiversity has been managed throughout history under a stewardship approach, recognizing farmers' and breeders' participation in working with diverse organisms, and at the conservation of biological diversity for the overall common good. A dominant vision that was applied worldwide up until international agreements shifted this global common perspective on PGR management towards an increasingly capital-oriented ownership approach subjecting PGR to sovereign rights of states as well as privatization under IPRs, plant variety protection (PVP), and other protective acts. These somewhat conflicting perspectives are two basic ways in which literature has been approaching farmers' rights and agrobiodiversity management (Andersen 2006, 2016a,b, 2017; Wynberg et al., 2021).

#### *1.1 The stewardship approach*

The stewardship approach encompasses the idea that components from agrobiodiversity belong to the public domain and are shared for the common greater good. This management perspective ruling over agrobiodiversity is based on the 'common heritage of mankind' principle (Andersen, 2017). This principle entails that PGR cannot be owned or monopolized by a single group of people or under a single interest (Andersen, 2016a). The stewardship approach pertains as important precondition the free and unencumbered access to germplasm flow, for farmers, breeders, and researchers. Visser et al. (2019) states that this approach recognizes the value of maintaining agrobiodiversity and is deeply grounded in collective

responsibility. The mechanisms underlaying the stewardship approach aims to recognize the contribution of famers and traditional knowledge holders as stewards of agrobiodiversity , and to effectively support them in continuing to do so by applying benefit sharing processes (Andersen, 2006, 2016a).

The stewardship approach, defined by Andersen (2006, 2016a,b) takes ground in the way in which it recognizes farmers as stewards and innovators of agrobiodiversity. Indeed, over the last millennia farmers have collectively contributed to the development of the wide crop diversity available today, laying down the very foundation of our food and agriculture system (Wynberg at al., 2021) The ambition driving the stewardship approach is to uphold enough legal space for farmers to keep on stewarding over agrobiodiversity (Andersen 2017). This legal space is wherein rights to save, use, exchange, and sell farm products is secured as 'protected commons'; that is materials that are freely available and exchanged for the benefit of all mankind but protected from appropriation (Andersen, 2017).

The main concern under this approach, as described by Andersen (2016a, 2017) resides in the decline or extinction of farmers' traditional knowledge (TK). Protection against this threat means keeping traditional knowledge alive and ensuring that it further develops among farmers and communities. The strategy put into place to avoid this loss is one of 'protection through sharing' wherein a managed system to share and exchange plant varieties, participatory plant breeding techniques, and traditional practices exists, along with the implementation of a strong system for the recognition of resources' rights. Under this approach, unrestricted sharing is of no concern as long as no IPRs impede the ongoing use and exchange of traditional varieties.

Benefit sharing under the stewardship approach is reliant on monetary benefits coming through subscription systems. Benefits are typically shared between steward or provider of PGR and the wider society through multilateral systems (MLS), support schemes, or cooperation (Andersen, 2016a,b). The benefit sharing system is grounded in the idea of rewarding and supporting farmers for their contribution in maintaining agrobiodiversity.

The weakness of this approach lays in the reality that without sufficient measures to avoid it, a stewardship approach might be underpinned by privatization of goods and information from the public domain by third parties so as to be subject to an ownership approach that would disincentivize people of sharing crop genetic resources, require a tendency to opt for stricter protection methods or isolation of resources, and ultimately reduce the agrobiodiversity available (Visser et al., 2019). In this way, monitoring and legal enforcement as well as measures to ensure that GR and TK remain in the public domain are needed for the idea of stewardship as management method to effectively work.

### *1.2 The ownership approach*

The ownership approach was born from the reality in which agrobiodiversity management bowed under the influence of capital; the flourishing economic value of biotechnologies shaped the character of research, while the growing interest in plant genetic resources and their germplasms for commercialization of issued products guided the expected results of these research (Andersen, 2006, 2016a,b, 2017; Wynberg et al., 2021;). The fundamental idea behind this perspective, according to Andersen (2016a) is that establishing clear ownership rights to genetic resources can promote breeding efforts together with sustainable use and conservation of agrobiodiversity. What is more, ownership rightsholders can assert control over their legally recognized resources so as to generate profits from trade or sale (Visser et al., 2019). The

ownership perspective is reliant on access and benefit-sharing legislation as much as farmers' intellectual property protection as key instruments (Andersen, 2017). This approach, states Visser et al. (2019) is grounded in affirmed national sovereignty over genetic resources and recognizes the value of extracting agrobiodiversity for the commodification of its components. Indeed, the mechanism underlaying the ownership approach aims to reward farmers and traditional knowledge holders individually or collectively for the genetic material originating from their territories and used for commercial purposes and/or protected through IPRs (Wynberg et al., 2021; Andersen 2016a,b).

Under the ownership approach, farmers are increasingly separated from the means of agrobiodiversity production to the advantage of agri-businesses and life science compagnies. The global expansion of intellectual property rights regimes in conjunction with the rapid advances in sciences and technologies has led to a landscape filled with mega-companies claiming ownership over an extensive amount of agrobiodiversity components and innovations. The key characteristics defining this system are the concentration of resources in few hands, and an enlarging pattern of accumulation and privatization (Wynberg et al., 2021). The system allows farmers the possibility to obtain IPRs on developed varieties, equally as breeders. In this way, the goal of this approach is to balance the power of intellectual property rights for farmers with breeders' rights (Andersen, 2016a).

The main concern under this approach is the risk of misappropriation of PGR and TK by commercial actors. Misappropriation would be taking place in a case where no prior informed consent from the owner of the resource was provided, and/or no benefit sharing on mutually agreed terms was negotiated prior to the use of GR, explains Andersen (2017). The system put in place to avoid misappropriation, also sometimes called biopiracy or bioprospecting, is one of applying dominant rights-based intellectual property regulation on genetic resources and associated knowledge, meaning that rightsholders get to decide who gets access to the resources and how could it be used (Andersen, 2016a; Andersen, 2017). Allowing actors to exclude each other from accessing and using GR is hence regularizing this issue of biopiracy, although also reducing the legal space for all to contribute to sustainably using and conserving crop genetic resources (Wynberg et al., 2021; Visser et al., 2019).

Benefit sharing under the ownership approach is reliant on monetary benefits arising from both IPRs through ABS and returns from commercialization. Agreements are generally contract-based between 'owner' and 'buyer' of genetic resources upon PIC and MAT so as to lay down a novel property rights scheme for the instance of the GR exchange (Wynberg et al., 2021; Andersen, 2016a).

The weakness of this approach resides in the very concept of viewing components of agrobiodiversity as a commodity that can be privately owned, and furthermore runs counter to the spur for publicly oriented open science that is called for in many settings nowadays. This management method also poorly accommodates the fact that exchanges of PGR are most often long-term commitments subject to complex nets of collaboration rather than brief straightforward bilateral contracts (Wynberg et al., 2021).

## 2. Environmental policy instruments

International regimes and their policy instruments are critical elements of global environmental governance. They are constructed with the objective to provide a legal basis for mediating competing interests in the dynamics of global socioeconomic and environmental changes

(Visser et al., 2019). As a way to understand the politics around international regimes, a distinction is made between market-enabling and market-regulating instruments. Levy and Prakash (2003) point out that the distinction is rarely so crystal-clear. In reality, regulatory regimes sometimes also create new markets, in the like manner that enabling regimes can impose types of regulatory components. A good example is the case of IPRs enforcement: primarily viewed as an element of the market-enabling approach because of the way it incentivizes investments in new technologies and trade in resultant products, however IPRs can also be seen as a form of protectionism for corporations that constraints competition, which is frequently associated with the regulatory approach (Levy & Prakash, 2003). In spite of that, it is often the perception of which approach has been chosen that is crucial for policymaking context.

### *2.1 The regulatory approach*

Traditionally, environmental policy instruments are regulatory in essence and their attributed regulations are called commands and control. When the government or any relevant institution in charge commands the reduction of an externality and subsequently controls the compliance of actors with performance and technological standards, one is making use of regulatory instrument type (Steinebach, 2019).

The regulatory approach has as its main purpose market regulation, by imposing constraints on aspects of corporate behavior, like sourcing, production, sale, and distribution of profits, as well as on environmental or societal aspects, such as workers' safety or environmental improvements. The instruments available under this approach often address the social cost of corporate operations. These are generally envisioned to be creating costly compliance requirements for industry, tend to raise final product prices and limit demand, and could also create barrier to entry for other players.

### *2.2 The market-based approach*

In contrast to regulatory instruments, environmental policies can also be aided by market-based instruments. These incentivize actors to reduce their externalities by changing the market context either positively by providing benefiting reasons to change strategies, such as trade schemes, or negatively by forcing the halt of harmful activities such as in the case of taxes (Steinebach, 2019).

Market-based approaches are generally praised for their capacity to harness market forces. The highlight lays in their potential, if well designed and implemented, to encourage individuals and/or corporate actors to undergo externality reducing efforts for their own interest and that collectively meet the purpose of the instrument.

The market-enabling approach has as its main purpose market liberalization, by expanding market opportunities and reducing transaction costs. It provides collective goods important to corporation, like standards, recognition, or enforcement of intellectual property rights. These tools are often designed to address market failures that reduce the overall welfare of society. Historically, banking, pharmaceuticals, agriculture, and electronics are sectors that have strongly supported multilateral market-enabling instruments. However, this mechanism could put certain types of corporations under competitive disadvantage by changing the context of existing markets.

Market-based instruments utilized in the context of biodiversity conservation are gaining stringent critics as they are blamed to nurture a trend towards the commodification of nature in

the way that components of nature can now be priced, traded, and compensated for by monetary means.

# II. Dependent variables

International environmental regimes, as defined by Young & Levy (1999), are "social institutions consisting of agreed-upon principles, norms, rules, procedures, and programs that govern the interactions of actors in specific issue areas." When looking for the effects of a regime, it is thus natural to expect some behavioral consequences. This raises the question of what exactly it entails for a regime to be effective. Political science recognizes three different measures of success in regime analysis. Output as the commitments of actors, outcome as the behavioral changes resulting from these commitments, and impact as the contribution to problem-solving arising from behavioral changes (Wolf, 2010). Following the frameworks imagined by Underdal (1992) and revised by Miles et al. (2002) as well as theories from Wolf (2010), when the object of the evaluation is regime formation, assessing times in which international agreements are signed, and later on, policies are articulated and domestic measures are taken, one is evaluating a regime's output. Generally, the output of a decision-making process are the norms, principles, and rules emerging from it, or the regulations and decisions at national level from members to the regime (Helm & Sprinz, 2000) that are created to push a commitment from idea to action (Young, 2011). Next, when the object is regime implementation, assessing times in which measures are in effect, and targeted groups are adjusting to them, one is evaluating a regime's outcome. Lastly, when the object is regime's repercussion on biophysical environment, assessing times in which nature responds to change in human behavior, one is evaluating regime's impact.

## 1. Institutional regime effectiveness

Institutions are most commonly defined by the set of principles, norms, rules, procedures, and programs that govern over the interactions of various actors in a set issue area (Levy et al., 1995). They often shape international environmental regimes as a tool to group actors together towards a common goal. As elucidated by Haas et al. (1993) there are good reasons for questioning the ability of international institutions at solving environmental problems, as in the current context, states maintain control while institutions are typically weak in regards with plant genetic resources governance. However, the objective is to figure out how international institutions make a difference in order to provide advice for leaders and decision makers in international governance. The political definition of effectiveness according to Levy et al. (1995) and Smieszek (2019) directs its attention to the relationship between actors and their changes in behavior following the operationalization of the regime. The major strength behind this vision is that it relates strongly with reality and emphasizes an observable indicator of success. The rational backing up this perspective is that no impact improving the state of the environment can be realized without first changing relevant actors' behaviors. However, even if changes in behavior is a necessary condition for attaining environmental impacts, it is not always sufficient (Young, 2011). Another important aspect to be taken into account, as stated by Smieszek (2019) is that institutions can be a trigger for positive impacts only if human activities play an important role in the degradation of the environment or resources at stake. International regimes are not actors themselves, instead they serve as guides for actors that then pursue their individual goals according to the rules of the games dictated by the regime. Through this lens one can understand the logic behind evaluating regime effectiveness with the extent to which it channeled changes in behavior to eliminate or ameliorate the problem that led to its creation.

## 2. Operationalization of institutional effectiveness under our model

Operationalization is a matter of turning abstract concepts into measurable observations. It is not an easy task to operationalize regime effectiveness because in a situation that lacks objective targets for success, as is the case for most of the agreements I will be analyzing, the author's subjective idea of success can be prevalent. This lack of criterion for assessing effectiveness of biodiversity agreements makes it increasingly difficult for researchers to affirm whether an instrument is working well or not. Standards are to be set individually, and even when well argumented and explained so as to be reproduced for further analysis, the comparison power of one study to the other is diminished by the lack of uniform and preestablished principles. In scholarly theory this issue is referred to as lack of universality. It regards a very context-specific operationalization that indeed helps analyzing real-life situations, but that creates a barrier to comparability of studies in case measures vary significantly or scales are subjectively chosen. Nevertheless, I aspire to be as consistent as possible with the standards chosen and methods used in the analysis so that these weaknesses burden this research project the least possible.

Regime effectiveness will be measured in terms of output, outcome, and plausible impacts, after receiving the effects from the two independent variables in the model (Underdal, 1992). For this study, I opted for actors' behavioral changes, or institutional change, as the object of evaluation. The selected standard against which to evaluate this object will be a mix of the normative stands of affairs and the problem-solving ability of the instrument towards a collective optimum. Under this standard, we determine how much of a problem can be solved collectively, the term collective optimum is used to refer to a solution that accomplishes all that can be accomplished for the collection of members and within current information and time constraints (Underdal, 1992; Miles et al., 2002). Among the various definitions of institutional effectiveness that exist, this paper adopts the political one, concerned with the extent to which a regime contributes to solving or mitigating the problems that led to its creation. Within that approach the focus rests on observable changes in the behaviour of actors that can be attributed to the implementation of a regime, and when analysis allows, that are also responsible for the improved environment. Various studies have analyzed the effectiveness of regimes in terms of institutional performance, rather than environmental impacts (Haas et al, 1993; Young, 2011; Young and Levy, 1999; Frantzi, 2008). Even though most recognize that environmental influence on nature is the ultimate purpose of international environmental accords, a common perspective is that institutional performance can be seen as the best proxy indicator of effectiveness (Underdal, 1992). To find out whether international regimes are actually yielding indented results or if progress has been stagnant, both regime wide assessment and evaluation of effects on the level of countries are necessary.

## 3. Variables to assess under our model

In order to measure the institutional effectiveness of the agreements under our four case studies, a clear explanation of the indicators to be used needed to be established. Here under is the selection of the indicators chosen to run through the analysis.

Implementation being the extent to which parties to an agreement are translating its provisions into their legal and political systems, looks at regime's output, and is a good starting point for evaluating effectiveness. According to Le Prestre (2017), implementation has to occur for a regime to be effective, whatever the way effectiveness is defined, nevertheless, Young (2011) warned that implementation does not guarantee effectiveness. Implementation might assess

that parties have adopted nationally the means to comply with the provision of an agreement. Wolf (2020) expressed that output of a commitment can also be evaluated through looking at its monitoring mechanism. The readers of this report have to keep in mind that provided the nature of the resource involved, the implementation of the regimes at hand are predominantly up to domestic legislations. Generally, political dynamics are different at international and national levels, with groups like industries being much more active at domestic levels, and actors such as states and federal systems holding the key to most of the success of the implementation processes (Le Prestre, 2017). The subsequent indicator, going beyond implementation, is compliance. Referring to the degree to which national behavior fits the obligations set by the regime they implemented. It measures the extent to which adopted laws are being followed as opposed to remaining unobserved, hence observes regime's outcome (Wolf, 2020). In our case of biodiversity regimes focusing on the fair and equitable sharing of benefits, it is important to note that effectiveness is commonly defined through the indicator of compliance when environmental problems are mainly an issue of co-operation and the purpose of the regime is a matter of minimizing free-riding problems (Le Prestre, 2017). It becomes clear that the matter of our four case studies to solve the issue around unfair distribution of ABS from GR is fitting well into this category of free rider issue and co-operation solution. Nevertheless, compliance as an indicator of effectiveness is often criticized due to the fact that countries could be in compliance with a regime's objectives even though they have done nothing to that end. This conformity may not even be related to the existence of the regime as compliance can be achieved without implementation (Le Prestre, 2017). Following from compliance usually stems the indicator of behavioral change in actors, but measuring effectiveness through it entails conceptual difficulties which gave rise to the use of another related indicator, co-operation. Co-operation focuses on stakeholders' commitment in favor of the regime's objectives by redefining actors' interest and preferences in terms of collective goals (Le Prestre, 2017). It measures the extent to which parties are pursuing collective actions that they would probably not have in the absence of the regime. In our cases, the focus will be to assess if and how many ABS permits and contracts have emerged as a clear action towards co-operation on the third common objective of the different regimes. This is a commonly used criteria for evaluating effectiveness of multilateral environmental agreements, the degree to which the original agreement leads to the development of new ones. The two benefit sharing indicators, still under the umbrella of co-operation, are the extent to which these ABS contracts prompted any monetary and non-monetary benefit-sharing activities. Through the lenses of co-operation and behavioral change, fulfilling all indicators would reflect an institutionally effective regime for attaining the objective of fair and equitable benefit sharing from GR. Two more lenient indicators have been included within the analysis, at both international and national level, to address achievements that do not fit into any of the preset categories of institutional effectiveness.

# III. Hypotheses & Expectations for findings

Since the analysis section of this paper assesses the relationship between variables, a hypothis is required to guide the data collection and experimentation processes. My predictions about which mix of agrobiodiversity governance pathway and policy instrument choice will lead to the highest regime effectiveness among the four case studies selected ruling over genetic resources and biodiversity is the following: "If an international agreement includes Stewardship alongside Regulatory characteristics, then the agreement will exhibit higher levels of institutional effectiveness." This hypothesis is based on what is already known about the topic at hand, guided by previous theories and studies, as well as my own assumptions of what this research will find out.

Findings from studies on environmental policies effectiveness, according to Steinebach's cross-national analysis (2019), tend to indicate that only regulatory type of instruments, also called command-and-control regulations, that are put into practice through well-developed implementation structures can be associated with achieving their indented purpose. While softer policy tools like market-based instruments have been showing no significant influence on the outcome of interest regardless of how well they are being executed. In their piece on policy instrument's choice for better environmental regulations, Taylor et al. (2012) document that when enforced, regulatory instruments enable governments to dictate actors' behaviors through law, thus providing that a relatively high level of individual stakeholders will comply. Underdal (1992) provided a theory in this similar line of thought, where regulations of 'command-and-control' type dictate behavior of actors through the agreement's text, hence behavior changes towards the goal of the agreement would have higher potential. For market-based instruments, Underdal (1992) expresses that behavior of actors cannot be predicted whatsoever, and Taylor et al. (2012) add that they are also less certain to deliver the requested outcome because actors might choose not to respond to market signal in the way that was intended by the policymaker. Furthermore, Regine Andersen (2017) mentioned in her article on stewardship and ownership that countries with regulations composed of direct benefit-sharing between owners and buyers of GR based on PIC and MAT, despite all efforts provided have so far not witnessed many instances of direct monetary benefit-sharing as a result of the legislation implemented. In addition, Andersen (2017) also mentioned that a survey dating back to 2005 proved benefit-sharing to be more promising when the recipients of funding activities were the agrobiodiversity maintaining farming community rather than the providers of genetic resources for commercial breeding. Community based exchanges and rewards system along the lines of the stewardship approach are thus more prone to lead to high amounts of benefit-sharing, and ultimately provide better regime effectiveness towards the global fairness goal, as the ownership approach in place has yet not proven to be so promising at reaching this intent.

# Chapter 3: Methodology

## I. Methodological approach: Case Study

This thesis aims to investigate the under-researched topic of DSI within the application of genetic resources governance through international agreements, to explore the relationship between agrobiodiversity governance perception along with policy instrument type and the institutional effectiveness of biodiversity-related regimes, and finally to describe the development throughout the years of difficulties in governing biodiversity-related agreements, partly due to the rise of IPRs and tried to make a point of showcasing the potential emergence of similar mechanisms concerning DSI. Case study methodology was used, as deemed from its fundamental purpose, to provide a holistic, in-depth, and detailed understanding of the context and processes involved (Meyer, 2001; Bogdan and Biklen (2003) in Lune and Berg (2017); Bowen, 2009). This methodology was selected because of its flexibility, allowing to tailor the study design and data collection processes to the research questions and for the adaptation of methods as data is gathered when studying complex and dynamic phenomena (Meyer, 2001). In this particular study, focusing on ongoing transformation and establishment of agrobiodiversity agreements, this adaptability was crucial. Being a standard methodology in the field of political science and an important element in negotiations of international agreements, I used insights from regime theory to bridge the gap between well-documented topics with many data available and more novel or understudied phenomena and to analyze the different accords that have been constructed for the sake of international biodiversity governance. Furthermore, this study used a comparative case study methodology to investigate four instances of biodiversity governance regimes, comprising two market-based regimes and two regulatory regimes, and a different mix of two envisioning stewardship values and two ownership values, to test a basic hypothesis. Based on the straightforward Mill's Method of Difference, cases were selected with different values on independent variables but with similar context characteristics and different values on dependent variable (Mill, 1869; Van Evera, 1997). Selecting cases that have very similar variables and controlling for context characteristics, will enable the elimination of potential causes for links and the difference in the outcome of interest can begin to be established due to a relationship between the variables of interest (Mill, 1869). There exist drawbacks to any non-experimental designs, and Mill's methods in particular, are subject to criticism within social sciences due to potential compromise in research validity resulting from case selection. However, by selecting most similar cases with closely related contexts and actors, such as the ones used in my study, a higher level of internal validity can be achieved. Internal validity is concerned with the extent to which the researcher can be confident that a cause-effect relationship demonstrated through a study cannot be explained by other factors than those under exploration (Bhandari, 2022). Despite this, I chose to use Mill's methods of analysis because they allow for the identification of covariation as a precursor to causal claims, which can provide basis for future research (Powner, 2015). Theories state that external validity of a study can improve as more cases are explored. Although I believe that all relevant existing cases related to the governance of agrobiodiversity with the objective of fair and equitable benefit-sharing have been explored under this project, the investigation of potential causal claims hence still serves as a valuable contribution to the field.

### 1. Justification of case selection

For this research project, I followed a systematic approach backed up by scholar literature, to select cases based on several criteria, including the similarity in background conditions, relevance to current policy concerns, variance on the independent and dependent variables, and

the ability to answer research questions (Lune & Berg, 2017). The selection of case studies is a crucial step in any research process, as it determines the validity and reliability of the conclusions drawn.

Firstly, I opted for multiple cases rather than a single case study to increase generalizability and improve external validity (Meyer, 2001). My choice of selecting four cases was grounded fundamentally in their individual relevance but also for the interest to study them as a group through historical evolution. This choice allowed for comparison and contrast between cases and enabled a more nuanced answer to the research questions. Secondly, the four cases were chosen based on their relevance to the independent variables and their variations in contextual factors. Qualitative sampling, according to Meyer (2001) is concerned with information richness and selects cases purposefully as opposed to randomly. Indeed, from the analysis part it will become clear that a different mix in the dimensions of independent variables is represented in each of the four cases, allowing to study all different variant of the possible matches. As for the context, cases varied according to factors relative to institution in charge, voluntary or legally binding character, or even benefit-sharing mechanism in place. Lastly, I selected cases that were clearly pronounced in their emphasis on the fair and equitable sharing of benefits from genetic resources utilization.

The four regimes selected for analysis were the only ones that fully met all the criteria. These regimes are embedded within the United Nation organization, which is a major environmental governance institution, providing them with institutional comparability. Despite their wide timeframes, ranging from 1983 at the earliest to 2022 as most recent, these regimes prove that the issue of governing agrobiodiversity has been an ongoing process for years, and have all seen actions from stakeholders emerging. While the available information on each regime may be not be equal, there are grounds for analytical comparison of their effectiveness at the institutional level. It is also important to note that impactful treaties achieve their effects through immediate socialization and short-term processes, meaning that there is no lag required between a regime's creation and its analysis (Hoffman et al., 2022). Therefore, I deemed it reasonable to include the most recent regime, the KMGBF, into the analysis.

## 2. Operationalization of variables

I operationalized the independent variables and the measurement of the dependent variable though indicators. To allocate a position to all of the four agreements on the two independent variables, I produced a table listing the main attributes of each of the four possibilities. The more attributes that I could tick off for each case, the more the agreement was perceived as envisioning the characteristic at hand.

*Table 1: Measure of Stewardship degree.*

| **Attributes of Stewardship approach** |
|---|
| PGR belong to the public domain and are protected from appropriation/ vision based in 'common heritage of mankind' |
| PGR are available and shared for common good |
| Vision based in 'common heritage of mankind' |
| Free and unencumbered access to PGR for farmers, breeders, scientists |
| 'Protection through sharing' management system |
| Recognize contribution of farmers and traditional knowledge holders as stewards of PGR |
| Recognize collective contribution in PGR and collective responsibility in conserving it |

*Table 2: Measure of Ownership degree.*

| **Attributes of Ownership approach** |
|---|
| Establishment of clear ownership rights to PGR/ vision based on 'national sovereignty over GR' |
| Assert control over legally recognized resource to generate profit from trade or sale |
| Reliant on access and benefit sharing legislation and/or intellectual property rights |
| Recognize the value of extracting agrobiodiversity and its commercialization |
| Concern of misappropriation solved by PIC & MAT, IPRs, and access legislations |
| Actors can exclude each other from access and use of PGR |
| Opposes the concept of open science |

*Table 3: Measure of Regulatory degree.*

| **Attributes of Regulatory instrument** |
|---|
| Imposing constraints and policies |
| Creating barriers to business relations |
| Government of institution commands reduction of externalities & controls the compliance with performance or technological standards |

*Table 4: Measure of Market-base degree.*

| **Attributes of Market-based instrument** |
|---|
| Expanding opportunities for market in biodiversity |
| Reducing transaction costs |
| Changing the context of existing markets |
| Fair but competitive market place |
| Facilitate business practices and relations |
| Aims at addressing previous market failures |

To measure the institutional effectiveness of the four cases at hand, I created a set of indicators, and a similar system as outlined here above was used, one point was awarded for each indicator checked off. This point scale allowed for a clear and standardized evaluation of the institutional effectiveness across cases, which will be crucial for comparing regimes.

*Table 5: Measure of Institutional Effectiveness.*

| **Institutional Effectiveness Indicator** |
|---|
| Established at international level (Agreement is adopted) |
| Implemented at national level (National policies & legislations) |
| Monitoring/Enforcing system |
| Countries compliance (Submit national reports, strengthen existing rules) |
| Access component of ABS is followed (Permits and contracts have emerged) |
| Benefit-sharing component of ABS is followed (Non-monetary returns have emerged) |
| Benefit-sharing component of ABS is followed (Monetary returns have emerged) |
| Other positive effects internationally |
| Other positive effects nationally |

# II. Data collection methods: Document analysis

In this study, document analysis was chosen as the primary method for collecting data. This qualitative method was chosen due to the case study attribute of the research design and its

specific aims. Qualitative research generate knowledge through observation, and subsequently link these through theories to bring out an explanation (Lune & Berg, 2017). I used keywords search on Scopus database and Google Scholar. The area of DSI related to GR being quite recent, I was able to browse through a majority of the relevant articles of scholar quality published and made available through the Scopus database, and within the access provided by NMBU from Google Scholar. A systematic review (Turney, 2022) was used to analyze the limited available information on both the IUPGR, and the newly developed KMGBF . In contrast, the amount of scholarly work completed on the CBD or the ITPGRFA was extensive, and I had to put limits to my research scope. Hence, I focused on information relating exclusively on actions pertaining to the third objective of fair and equitable benefit sharing from utilization of GR.

The research design of this study followed a spiraling research approach, where ideas lead to research, back to re-evaluating the idea and subsequently to design a re-evaluation of the theoretical approach. Lune and Berg (2017) define the spiraling research approach as an alternative to the common theory-before-research model where ideas and theory come before research and follow a linear evolution from information gathering to data collection, analysis, and finally results production. The unstructured design of the spiraling approach allows the re-evaluation of processes to be continuous throughout the design, analysis, and findings section of an empirical research, and most importantly leaves room for changes to be adopted even after findings have been initiated (Lune and Berg, 2017). The spiraling approach provided flexibility to the study, especially needed in the continuous an iterative context of the COP15 and its KMGBF, for which the lack thereof would have affected the validity of the research.

Document analysis was selected as the most effective method for this study because it provides a historical and contextual perspective on the phenomenon under study and is especially useful when studying institutional behavior and policy changes over time (Bowen, 2009). It also provides an objective and reliable source of data, as it is not influenced by biases of participants or researchers. Additionally, another asset of this method is the sample size that was available for the analysis. Surrounding the topic of fair and equitable benefit-sharing from GR utilization, an extensive number of documents have been created and made available. This large number of documents allowed for a broader understanding of the cases and diminished possible biases from author's interests in the matter. Finally, document analysis presented itself as the best method for answering my research questions, as all the required information was readily available through analyzing the different agreements' documents and texts, past reports on their negotiation and implementation processes, and, when available, statements on their efficiency and impacts. I considered conducting interviews with key informants but found no additional value in doing so for answering the research questions designed for this study. The topic being highly controversial, interests and opinions were subjective and highly context depended, making it difficult if impossible to code values leading to any relevant trends. I neither could envision how these would ultimately help in creating a cleared vision of the picture I am aiming to draw with this analysis. Thus, document analysis was deemed the most effective method for this study, for its strengths in providing historical and contextual perspective, being objective and reliable, and allowing for flexibility in analyzing complex and evolving cases.

# III. Sources of information

Providing clear explanations regarding sources of information in a research project is imperative for a replicable methodology. In this project, data were gathered from various sources, largely secondary sources in the form of text documents, but primary data were also collected in the form of actors' meetings and negotiation rounds, final texts, clearing house

databases, and institutions' data records. The aim was to select sources with different biases, so as to complement each other, as the topic under study is highly controversial.

Primary data was collected from various sources. Personal notes taken during an open-public DSI workshop held online by the Food and Agriculture Organization of the United Nations (FAO), official internal reports of negotiation sessions, draft hearing and meeting negotiation texts, and various final texts from the four agreements under study. ABS clearing house databases, FAO's data records on ITPGRFA advances, various country reports, and any available recognition of impact from the studied agreements at international or national levels were also relevant. Government documents, such as the final text from the adoption of an international agreement, were included due to their relevance in showcasing the decision-making process that led to the adoption of the new regime as well as defining the mechanisms within them. In addition to primary sources, secondary data, such as articles and reports written by authors in relevant academic literature, representing the basis for publicly available knowledge on a topic, were extensively used. They often provide useful summaries of relevant issues discussed at higher political levels. Scholar literature, in particular, played a significant role in data collection. Authors such as Andersen (2003, 2006, 2016a,b, 2017), Levy (2000, 2003), Tsioumani (2004, 2022) and Wynberg (2021) were among the principal sources of secondary data. These sources were reliable and of high quality, providing a valuable insight into the topic under study. Documents other than scholarly literature, such as the Earth Negotiation Bulletin, which documents policymaking processes at the very time they are happening, reports on daily outcomes of the COP15 leading to the adoption of the agreement to be studied in the fourth case, as well as provides relevant articles on topical matters, represented another type of valuable data. Media reports and press releases of academic quality were skimmed through to assess actors' various perspectives and after-thoughts on the advances of negotiations, providing yet another source of relevant information. When media and press released sources are not used in their current context for their main value of timeliness, retrospective reading can also be helpful in reconstructing events from the past and providing insight on the political context at the time the event took place.

# IV. Summing up

This project's comparative case study method analyzed the relationship between both agrobiodiversity management perspective and policy instruments choice, and regimes institutional effectiveness. The variables of interest have been operationalized by using frequently used indicators in literature or by creating novel indicators inspired from scholarly suggestions. In a broader sense, this project could add to our general understanding of regime design and their subsequent effectiveness level. Nonetheless, challenges, such as assessing the reliability of sources used due to highly politicized character of the topic have posed obstacle to this research. I made use of a wide array and a large number of sources so that they could balance each other. Additionally, I have attempted to be transparent with the different resources used for the readers to be able to judge the reliability of the research for themselves.

*Table 6: Overview of Methodological Framework.*

| | | | |
|---|---|---|---|
| **Methodology** | Case Study<br>*Historical and contextual in-depth analysis of four instances of a phenomenon* | | |
| **Data Source** | Primary data<br>*e.g. DSI FAO workshop, negotiation session reports, draft texts, final agreements, ABS clearing house database, national reports* | Secondary data<br>*e.g. Earth negotiation bulletin, scholarly articles, media reports, press releases* | |
| **Theory** | Agrobiodiversity management & Farmers' rights<br>*Stewardship and Ownership perspective* | Environmental policy<br>*Market-based instruments and Regulatory instruments* | Regime theory<br>*Institutional effectiveness* |

# Chapter 4: Analysis

## Case 1: The International Undertaking on Plant Genetic Resources

### 1. Presentation & Purpose

The IUPGR, also simply called the International Undertaking, was adopted in 1983 at a conference of the Food and Agriculture Organization of the United Nations. It was conceived in times of free access and exchange of plant genetic resources for food and agriculture, this line of thoughts being based on the premise that agricultural research and innovation, as well as world food security was directly dependent of it (Rose, 2004). The International Undertaking took the stand of including the widest possible definition of plant genetic resources, encompassing landraces, wild species, weeds, relatives of cultivated varieties, newly developed, traditional, and obsolete cultivars, as well as special genetic stock also called breeders' lines or mutants (Cooper, 1993; FAO, 1983).

Following Cooper (1993), Gepts (2004), as well as Pandey and Ghosh (2022)'s statements that the primary driver of efforts to securing an international agreement on PGR was also enacting as one of the main obstacles to its realization, the resolution of such a conflict in the near future would not be easily achieved. In the context that led to the creation of the IUPGR, there existed an unequal distribution of biodiversity and genetic resources between the countries from the Global South, or developing countries, and the countries from the Global North, or developed countries. Commonly, the Global South was home to a vast majority of the world's diversity but lacking capacity to utilize it. While developed countries had traditionally greater capacities and technologies to extract and utilize genetic resources, even though not holding so much diversity on their own territories. The asymmetry in availability of resources forced countries from the Global North to access and control PGR originating from Global South countries for research and development purposes. Nevertheless, developing countries who contributed, voluntarily or not, PGR and associated TK assets free of cost to developed countries under the spirit of common heritage were inherently facing an unfair situation. This situation was one in which landraces, traditional and wild varieties were freely available while the improved varieties defined as the product of recognized plant breeding were increasingly subject to plant breeders' rights and associated with charges in access and regulated exchanges (Gepts, 2004). Developed countries were increasingly protecting their activities though IPRs and other protection systems with the goal to safeguard and spur investments, and to generate a revenue stream from PGR uses (Smith et al., 2016). From the point of view of communities in developing countries, this approach to exchange of genetic resources was unfair, as rights regarding a good that was fundamentaly similar would vary depending on its provenance, and benefits would flow to one side of the traders only. One could simply have advocated that the best solution was to cut off these links of free access and rely solely on one's own resources. Yet, no region could be entirely self-sufficient for its crop genetic resources. Especially in developing countries, crop improvement heavily relied on non-indigenous varieties from developed countries, this making up the main argument in keeping the channel open for exchanges of PGR (Gepts, 2004). The development of such a situation led developing countries to demand for an international agreement ruling over the transfer and exchange of PGR. The main expectation laying the grounds for the adoption of the undertaking, according to developing countries demanding for it, was to put all PGR on an equal level by recognizing all sorts of varieties as a heritage of mankind.

The recognition of PGR as heritage of mankind implied that the concept of inter-generation equity was an important value within the undertaking, and in such wise, advocated for the need to preserve it for present and future generations (Cooper, 1993). The common heritage of mankind is a concept that is most likely borrowed from the Law of the Sea Conference, and its best shot at a definition is a juxtaposition of the following four elements. Firstly, no one should exploit a resource until rules to ensure that its exploitation will be in the common interests have been agreed upon. Secondly, no state should acquire more than its equitable share of the resource. Thirdly, a determination of what is equitable sharing of the resource need to be agreed on by all actors and considering the interests of those that have not been able to use the resource in the past. And lastly, an international authority should have the exclusive right to administer the resource (Bordwin, 1984). However, the applicability of these components of a definition needed to be adjusted for the specific context of PGR. Indeed, prior to the adoption of the treaty, PGR were already being exploited for economic and agricultural needs, and this without the existence of rules to protect the common interest. Furthermore, PGR were also subject to sovereign state under which they were located. Nevertheless, this concept of common heritage of mankind held great potential in providing a vision for a fair and equitable international agrobiodiversity management system. The creation of this agreement was both rooted in and justified by the aspiration to counteract the privatization of genetic resources by establishing their recognized status as common heritage of mankind (International Undertaking on Plant Genetic Resources: The Final Stretch, 2001). The rationale backing this aim up was to balance out the needs and wishes of developing and developed countries by allowing everyone to fully use their PGR for the benefit of agricultural development (Cooper, 1993).

Trends mostly emerging from developed countries were a strong opposition force to this common heritage principle. Bold intellectual property rights such as patents started to limit the availability of biotechnology-based products like modern varieties and their genetic material (Moore & Hawtin, 2014). The issue relative to genetic resources distribution and exchange is rooted in commodification, this process whereby an object is turned into a commodity by acquiring an economic value that can be sold and bought. Companies from developed countries would enter a process of commercialization of cultivars that were based on genetic resources originating from developing countries. Nevertheless, when developing countries would request a return compensation for their provision of raw material, industries and companies in industrialized countries had their government protect their creations through IPRs, and later internationally through the Trade Related Intellectual Property Rights (TRIPS) agreement of the World Trade Organization (WTO). This pursuit of intellectual protection on germplasm was mainly made without authorization from origin countries, nor appropriate compensation, this is sometimes referred to as biopiracy. The other threat developed as countries began imposing their sovereign rights over the plant genetic material available on their territories (Cooper, 1993). Even though 113 countries, the Consortium of International Agricultural Research Center (CGIAR), and many national seed collections adhered to the principle of common heritage and its benefit for conservation, research and development (R&D), and plant breeding. Several countries expressed their reservations. The adoption of the IUPGR was viewed, through the lens of certain industrialized countries, to decrease control over PGR by increasing the free international availability of gene stocks (Bordwin, 1984; Roa-Rodríguez & Van Dooren, 2008). While developing countries had concerns about making their GR available to developed countries who could undertake intellectual property patents over them (Moore & Hawtin, 2014). This reduction in control for seed industries in developed countries can be directly linked to the inclusion of the special genetic stock category of germplasm to the common heritage principle. This inclusion of special genetic stock was highly controversial among negotiators of the agreement. Breeders' lines were used to produce the varieties sold on

the market. When varieties are hybrids, the seeds grown by the crop thereafter and collected by the farmer are not suitable for planting, which creates a cycle wherein farmers must buy years after years their seeds from the breeders. These special genetic stocks pertained a huge capital investment for breeders that were hence keeping their conception as a trade secret. The American Seed Trade Association thus recognized the provisions of the undertaking and its free sharing of resources as undermining plant breeders' property rights and as an overall threat to the seed industry (Bordwin, 1984).

The regulatory system designed for the IUPGR was first meant as a legally binding instrument showcasing a regime supporting no restrictions on access to PGR. Its intent was not to reflect an international consensus on principles to govern over PGR but rather to establish these commitments as worldwide standards described Bordwin (1984). However, northern governments, specifically 8 industrialized countries, refused to agree to the terms of the undertaking due to legitimacy issues regarding their IPRs (International Undertaking on Plant Genetic Resources: The Final Stretch, 2001; Lightbourne, 2009). These countries were Canada, France, Germany, Japan, New Zealand, Switzerland, the United Kingdom, and the United States (Bordwin, 1984). The agreement was thus welcomed as a voluntary political commitment and had the status of a UN agency conference resolution, rather than a convention as formerly imagined (Rose, 2004). According to Bordwin (1984) even without legal force, the undertaking could have acquired international legal significance by customary law. This happens when regulations and principles are developing as general practice of states and thus seemingly accepted as law. Even if standing on rock solid grounds and portraying time-honored values, the IUPGR couldn't hold out against the multiple commercial pushes and political squeezes. Over less than 10 years, three annexes were added to the original text reshaping this unencumbered and free common space that the undertaking attempted to protect (FAO, 1994). These 'agreed interpretations' were created as a mean to find a balance between the interests of developed and developing countries, as much as between farmers and breeders. These updates helped spur greater acceptance of the undertaking by other actors than developing countries ones. In resolution 4/89, plant breeders' rights, as provided for under the International Union for the Protection of New Varieties of Plants (UPOV), were recognized as not incompatible with the undertaking. This resolution also recognized the enormous contribution that farmers have made towards conservation and development of PGR which is the basis for famers' rights (FAO, 1994). In resolution 5/89, the concept of farmers' rights is being fully endorsed. Farmers' rights can be defined as the rights arising from past, present, and future contributions of farmers in conserving and developing PGR, especially in centers of diversity (FAO, 1994). These rights are being vested for the purpose of ensuring benefits to farmers and supporting their contributions (Moore & Tymowski, 2005). Ultimately, these two additions to the original IUPGR made a distinction between 'raw' material that were part of the global commons, and 'modified' material that could be legitimately enclosed through PVPs (Roa-Rodríguez & Van Dooren, 2008). Yet, out of all text interpretations, resolution 3/91 has the most impact. It recognized that PGR were deemed under the sovereignty of national states, and that plant breeders' lines and famers' materials were solely available according to the decision of their developers during the development stages (FAO, 1994). A provision also preconized that farmers' rights be implemented through an international fund for PGR (Moore & Tymowski, 2005). In this instance, the undertaking entered a new era, the one of PGR ownership (Roa-Rodríguez & Van Dooren, 2008). Ultimately, article 15 of the CBD, as well as the TRIPS agreement, officially made obsolete the IUPGR and its vision of biodiversity as common heritage of mankind (CBD, 1992; Gepts, 2004).

## 2. Mechanisms in place

The grounds on which the undertaking resides is one at the crossroad of agriculture, environment, and commerce. The IUPGR provides an agreement on access to, and shapes a legal framework to conserve and use PGRFA. The 'code of conducts for germplasm collection and transfer' aims to help developing countries exercise their sovereign rights as well as suggesting ways to share benefits with communities providing original material. The model agreement for 'international network of ex situ collection' provides a way for governments or institutions to voluntarily place designated GR in the network to make it freely available and without restrictions for research, plant breeding, and conservation so as to secure a healthy food system over the long run (Cooper, Engels, Frison, 1994).

The IUPGR gathered multiple provisions, one was that the adhering governments would undergo exploration missions to identify PGR in danger of extinction or with currently unknown essential characteristics. Another provision referred to maintaining and creating legislative measures to protect and preserve PGR in their natural habitats in centers of diversity. A good example of such a measure could be to ensure scientific collection of resources in danger of extinction. When safeguarding of materials happened through gene banks, the undertaking had as provision to preserve the valuable characteristics of PGR for use in scientific research and plant breeding, and also required them to be fully evaluated and documented (FAO, 1983; Moore & Tymowski, 2005). What was perhaps seen as the most influential provision delineated the availability of PGR. Adhering governments and institutions agreed on a policy to allow access to PGR under their control and to authorize their exports when for the purpose of scientific research, breeding, or conservation. Under this provision clarified in article 5, samples were made available free of charge, on the basis of mutual exchange or on mutually agreed terms (FAO, 1983). This facilitated access was subject to an obliged payment of a percentage of the commercialization profit towards further work on the objectives of the undertaking, unless when products did not restrict further research and subsequent commercialization, then payment was voluntary (Lettington, 2001).

In general terms, the IUPGR provided a space for international cooperation, both in strengthening the capabilities of developing countries in all the areas subject to PGR, as well as encouraging international activities in the preservation, evaluation, documentation, exchange, and financing of PGR (Moore & Tymowski, 2005). The international arrangements called for by the IUPGR would have taken place under the direction of FAO and an International Board for Plant Genetic Resources so as to have a reliant global system for PGR. The system would have included a network of national, regional and international centers that would have base collections held in gene banks under the jurisdiction of FAO and be managed for the benefits of the international community, wherein members could have voluntarily placed their collection in the network (Moore & Tymowski, 2005).

As mentioned in the section hereabove, actors' interests were various surrounding this issue of PGR management. On the one side, developing countries that mostly had abundant PGRFA wish to maintain control over them, while, on the other side, developed countries that mostly have invested capital in breeding and engineering PGR wish to maintain control over the refined products they made (Rose, 2004). There is quite some irony in the fact that each party seeks to restrict foreign access to its own holdings, whilst each desire unhindered free access to others' holdings in PGRFA (Rose, 2004). Quickly enough, countries from the global south were disillusioned with the concept of common heritage, as they faced a system in which they maintained open access over GR, yet property rights for products based on these very resources were being enclosed. This scheme of not compensating origin communities for their

participation was first unfair ethically and secondly lead to less biodiversity being effectively cared for and conserved (Cooper, Engels, Frison, 1994). As a result, developing countries questioned this model of unrestricted access and increasingly looked for bilateral contracts with users of PGR, with the hopes to see improvements in shared benefits.

## 3. Status of dependent variables

Stewardship/Ownership

Undeniably, back in 1983 when the agreement was passed, the stewardship approach in governing agrobiodiversity manifested itself through every aspect possible. For more detailed information on the agreement's fulfilment of the following attributes, please refer to Appendix 1, section 1.

*Table 7: Measure of the IUPGR's Stewardship degree.*

| **Attributes of Stewardship approach** | **IUPGR** |
|---|---|
| PGR belong to the public domain and are protected from appropriation/ vision based in 'common heritage of mankind' | 1 |
| PGR are available and shared for common good | 1 |
| Free and unencumbered access to PGR for farmers, breeders, scientists | 1 |
| 'Protection through sharing' management system | 1 |
| Recognize contribution of farmers and traditional knowledge holders as stewards of PGR | 1 |
| Recognize collective contribution in PGR and collective responsibility in conserving it | 1 |

*Table 8: Measure of the IUPGR's Ownership degree.*

| **Attributes of Ownership approach** | **IUPGR** |
|---|---|
| Establishment of clear ownership rights to PGR/ vision based on 'national sovereignty over GR' | 0 |
| Assert control over legally recognized resource to generate profit from trade or sale | 0 |
| Reliant on access and benefit sharing legislation and/or intellectual property rights | 1 |
| Recognize the value of extracting agrobiodiversity and its commercialization | 0 |
| Concern of misappropriation solved by PIC & MAT, IPRs, and access legislations | 0 |
| Actors can exclude each other from access and use of PGR | 0 |
| Opposes the concept of open science | 0 |

Regulatory/Market-based

The IUPGR encompassed most characteristics of a market-based policy instrument, by building constraints and policies and depending on a financial mechanism to support its objectives, for more detailed information, please refer to Appendix 1, section 2.

*Table 9: Measure of the IUPGR's Regulatory degree.*

| **Attributes of Regulatory instrument** | **IUPGR** |
|---|---|
| Imposing constraints and policies | 1 |
| Creating barriers to business relations | 1 |
| Government of institution commands reduction of externalities & controls the compliance with performance or technological standards | 0 |

*Table 10: Measure of the IUPGR's Market-based degree.*

| Attributes of Market-based instrument | IUPGR |
|---|---|
| Expanding opportunities for market in biodiversity | 0 |
| Reducing transaction costs | 0 |
| Changing the context of existing markets | 1 |
| Fair but competitive market place | 0 |
| Facilitate business practices and relations | 0 |
| Aims at addressing previous market failures | 0 |

## 4. Effectiveness of regime

The agreement's establishment at international level was a great milestone for regulation of PGR. On the day of its adoption, the International Undertaking counted 113 adhering states. An important point made by the IUPGR is the recognition of famers' rights. Farmers' rights, as expressed through the two annexes added in 1989, are ensuring famers and farming communities all over the world some actions for the protection and conservation of PGRFA, as well as a space to participate fully in the improved use of PGRFA through breeding and scientific methods (FAO, 1994). These rights have been granted mostly to traditional farmers in developing countries as a reward for their past contribution to developing and conserving PGRFA (Rose, 2004). However, the responsibility for administrating these farmers' rights is according to the original text 'vested in the International Community' and is also to be implemented by it, through a potential international fund for PGRFA (FAO, 1994). A clear example of its lack of success is the reality in which no international fund for PGRFA conservation and management has been set up outside of the existing FAO efforts (Rose, 2004). Rose (2004) goes on explaining that even if the International Fund would have been created, benefits of the major implementation mechanisms for farmers' rights would have solely been those ensuring their participation in improved use of PGRFA, due to the fact that monetary compensations making their way to the international fund would actually go to PGRFA conservation efforts, not to farmers. This annex recognizing farmers' rights pertains low capacity for change and has proven to be merely rhetorical, as rights are evoked but not protected by any feasible legal mechanism. Overall, the agreement did not receive the importance it should have earned from society. Unreconciled international interest, as mentioned by Rose (2004), have hindered the implementation of the agreement, supplemented by vague objectives, a non-binding nature, and severe lack of enforcement mechanism by the governing infrastructure, the undertaking has mostly been ignored by its adherents.

In order to assess the regime's implementation at national level, it would be necessary to conduct a comprehensive analysis of the national legislations and policies of each signatory country, as no reports has been conducted on the implementation of the IUPGR nor has any formal institution created an informative space to keep track of the agreement's development. Such an analysis would require a considerable amount of time, resources, and specific expertise, I hence used for the sake of this research project the comprehensive review of the State of the World's Plant Genetic Resource made publicly available in 1998.

The report concluded that about 40% of all countries had national programs and effective coordination mechanisms for sustainable utilization and conservation of PGR (Andersen, 2003). Indeed, when computing statistics of the three aggregated forms of national programs possible, 49 out of the 111 adhering countries reported having implemented it, cumulating to a rather satisfactory 44,14% (FAO, 1998, 455-462). Under appendix 1, national legislation, programs, and activities for PGRFA are listed by country through information provided by Country Reports and WIEWS. Within the list of countries that adhered to the IUPGR, national

programs for PGR could be under the status, of development; without a formal program but with functional national committee or other mechanism to coordinate PGRFA activities; with a formal program comprising sectoral institutions and a mechanism to coordinate national PGRFA activities; or with a formal program comprising a central institute coordinating national PGRFA activities and carrying out some activities (FAO, 1998, 456). Countries with national programmes under development are Portugal, Egypt, Angola, South Africa, and Rwanda. Countries without formal programmes but with functional national committee coordinating PGRFA activities are Switzerland, UK, Morocco, Tunisia, Cote d'Ivoire, Togo, Congo, Gabon, Zambia, Zimbabwe, Sudan, Philippines, and Costa Rica. Countries with formal programmes comprising sectoral institutions and a mechanism to coordinate PGRFA activities are Austria, France, Germany, Sweden, Cech Republic, Israel, Turkey, Yemen, Cameroon, Kenya, Australia, Honduras, and Cuba. Countries with formal programmes comprising a central institution coordinating and carrying out PGRFA activities are Denmark, Finland, Greece, Iceland, The Netherlands, Norway, Spain, Bulgaria, Hungary, Poland, Romania, Syrian Arab Republic, Iran, Iraq, Ghana, Malawi, Mozambique, Tanzania, Ethiopia, India, Republic of Korea, Democratic People's Republic of Korea, and New Zealand (FAO, 1998).

According again to this FAO (1998) report, 111 countries adhered to the International Undertaking, and 34 countries had a formal program comprising a central institute coordinating national PGRFA activities and carrying out some activities, which is the highest level of national programs possible. But interestingly, only 23 countries were both adhering to the International Undertaking and had these program in place nationally. This means that around 30% of countries that have implemented these national programs could have done it independently of the IUPGR provisions. Another important circumstance to keep in mind is that of the report's results being established in 1998, the CBD was thus already in place and could also have been a factor in countries implementing these national programs. A cause-to-effect relationship between the International Undertaking and these programs being implemented nationally therefore cannot be established, but this short analysis does provide an overall picture of how countries have reacted to the creation of the IUPGR and/or the mix of international policies on PGRFA before the 2000's.

There were three main tasks under the responsibility of the International Undertaking. The exploration of varieties of crops, their wild relatives, and undomesticated food plants, in countries that were adhering to it. The preservation, evaluation, and documentation of plant genetic resources in their natural habitats in and out of centers of diversity, as well as in gene banks and in living collections. And the insurance of open access to genetic material preserved through the International Undertaking's system (FAO, 1983). Responsibilities to attain them were also assigned, as all these tasks were to be carried out by not only the states adhering to the agreement, but also by multilateral actors such as FAO and the institutions of CGIAR (Andersen, 2001). Along with this expression of shared responsibility, a set of crucial steps required to achieves these tasks have been identified in the agreement's tekst (FAO, 1983). Starting with the establishment of national committees or other coordinating mechanisms to facilitate participation and cooperation between actors of the International Undertaking. Next on the list is the elaboration of national policies and strategies for PGR that are in accordance with national development plans, and take into account the need for both in situ and ex situ conservation as well as utilization of GR. And following with the need for a clear legal basis surrounding national programs, and lastly a growing concern for capacity building and sustainable funding (Andersen, 2003). Acknowledging these as the main objectives, what can be done is investigating, at both international and national levels, what the IUPGR has achieved or failed to achieve within the timeframe of its essence in the political landscape.

The greatest achievement of the agreement at the international level is the establishment of the International Network of Ex Situ Collections under the auspices of FAO (FAO, 1983, Article 7). Andersen (2003) mentions that the cornerstone of this network was created when 12 centers of CGIAR with gene banks agreed to place their germplasm under the MLS system; close to 450.000 accessions of plant varieties and the subsequent information about them had been made available to adherents of the International Undertaking. The greatest perk of this system was not the actual availability of these varieties, in the sense that they had been available under similar terms for years, but rather that these resources were now being controlled. The management under the auspice of a multilateral organization set a clear end to the insecurity regarding their long-term access (Andersen, 2016b). By 1998, these accessions represented between 20 to 50 percent of all genetic material held in gene banks, according to the State of the World's PGRFA report (FAO, 1998, 280). Also established under the actions of the IUPGR, the System-Wide Information Network for Genetic Resources (SINGER) is an instrument working along the MLS as a database holding information on the collections in the gene banks such as identity, source, characteristics, and transfer (Andersen, 2003; FAO, 1983, Article 7). Another great success is the establishment of the World Information and Early Warning System on Plant Genetic Resources for Food and Agriculture (WIEWS) that was created to foster information exchange between FAO member states. Within WIEWS, a global network of correspondents for each country was established, along with a complete repository of documents, and an early warning system on genetic erosion (Andersen, 2003). Lasty, the adoption by FAO in 1993 of the International Code of Conduct for Plant Germplasm Collecting and Transfer is also considered as a huge realization of the International Undertaking as it paved the way forward on better moral and professional standards regarding the collection and transfer of crop genetic resources (Andersen, 2003). Its main objectives were to prevent genetic erosion, assist in accessing PGRFA, and protect the rights of countries and local communities.

Even though the IUPGR had realized many of its set objectives, as delineated by the multiple successful actions expressed hereabove, there were still some matters that have proven fruitless. The agreement took the stand of acknowledging farmers' rights, with a clear recognition for the past and present contribution of farmers and rural communities in the creation, innovation, and conservation of crop genetic diversity (FAO, 1994). It subsequently acknowledged that a rewards scheme for farmers should exist, in the same manner that one for plant breeders has been established (Shand, 1993). Even though under such considerations it could seem straightforward to implement, the creation of a compensation mechanism for farmers ended up as an empty promise as no communities ever received anything in return for their provision of PGR (International Undertaking on Plant Genetic Resources: The Final Stretch, 2001). Equivalently, a concept of **International Fund for PGRFA** was envisaged by member of FAO in order to provide practical expression to the idea of farmers' rights. This fund was intended to compensate those that made available PGRFA germplasm to the world community by providing the technology, information, and funding necessary to keep conserving and utilizing these resources (FAO, 1994). The rationale behind it being that provided with the right technical and financial means, developing nations could develop a greater capacity to benefit from their genetic resources. Unfortunately, within the time frame allocated to the IUPGR, this fund never left the paper (Shand, 1993).

Then as well, at the national level the impact of the IUPGR was harder to praise states Andersen (2003). A comprehensive review of the situation on PGRFA was made available by FAO in 1998. This State of the World's Plant Genetic Resource for Food and Agriculture report highlighted that around 40% of all countries did have national programs in place along with

effective coordination mechanisms for PGRFA (FAO, 1998, 223). Yet, these where mainly focused on ex situ conservation and burdened by poor institutional linkage to utilization efforts. Indeed, out of all states that submitted a country report, only 27 claimed to include in situ conservation efforts in their national program, and subsequently only 26 reported that utilization had parts to play in national programs (FAO, 1998, 202). Only 4 countries benefited from programs which covered both in situ conservation and linkage to utilization, proving the partial success of ex situ conversation but highlighting the colossal gap in coupling these efforts with in situ conservation and sustainable utilization activities (FAO, 1998).

# Case 2: Convention on Biological Diversity & The Nagoya Protocol

## 1. Presentation & Purpose

The Convention on Biological Diversity is a multilateral environmental agreement that was signed by the UN government leaders in 1992, at the UN Conference on Environment and Development, the Rio Earth Summit. As the International Undertaking was a voluntary agreement, the CBD became the first legally binding agreement to deal with the conservation, sustainable use, and management of biodiversity worldwide (Andersen, 2016b). There are nowadays 196 parties to this convention, with the United States being the only United Nation member state that has not ratified the Convention (CBD, s.a.). The main reason therefore is the strong reservation that big industries have towards provision related to IPRs, states Gepts (2004). The Convention was fashioned as an international response to the recognition that since biological diversity is a recognized global asset of value to present and future generations, the threat to its loss needs to be a preeminent worry (CBD, 1992). In discussing the terms of the Convention, countries from the South used their leverage as main provider of PGR to make sure that this agreement would turn out differently than instances from the past. They set up negotiation terms for the access to their resources by industrialized countries, requesting a technology transfer and a share of the benefits arising from biodiversity commercialization (Roa-Rodríguez & Van Dooren, 2008). The discussions that led to the adoption of the CBD are often referred to in literature as the grand bargain. Indeed, it has been a debate going on for years about finding a balance between the needs and requests of the developed and developing countries. These years have led to growing resentment and feelings of inequality which put obstacles in the way of decision-makers to trust each other and lay down common grounds for future agreements.

The CBD was founded on the ground principle of national sovereignty over genetic resources, which recognizes that states have the ultimate authority over access and use as represented in their national legislation (CBD, 1992). Tsioumani (2004) explains how this principle was created as a means to correct the asymmetry that resulted from farmers' varieties being seen as prior art and kept available in the public domain while breeders' lines were subject to private property protection. By subjecting all components of biodiversity to the legislations of their countries of origin, the CBD aspired to set flat the balance regarding what and how resources could be exchanged. The ambition of the CBD is to promote in a threefold manner, the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits from the use of GR (CBD, 1992). Leskien, (2021) clarifies that the CBD incentivizes the sustainable use of genetic resources by confirming the rights of states to regulate their access and sanctioning their rights to a fair and equitable share of benefits arising

from their usage. The rationale behind this access and benefit-sharing formulation is to promote the conservation of biodiversity by making it profitable.

The Nagoya Protocol on access and benefit-sharing (NP) is a supplementary agreement that has been adopted under the CBD. The protocol entered into force in 2014 and is today ratified by 135 parties. This protocol was welcomed for its legal clarification on state sovereignty over their genetic resources (CBD, 2011). Indeed, this multilateral environmental agreement provides legal clarity and transparency for both providers and users of GR by reformulating the original ABS rules stipulated in the CBD. Its importance resides in the fact that GR and alongside traditional knowledge (TK) is granted access solely through obtaining prior informed consent and under mutually agreed terms, and with the understanding that benefits need to be equitably shared between owner and developer (CBD, 2011).

The real novel element brought up through the CBD and its Nagoya Protocol is the practice that parties now are under the legal obligation to get permission to access and use some other country's PGR, and this before collecting the resource as well as based on mutually agreed terms with the provider (CBD, 2011). These mutually agreed terms for the exchange of resources mostly include a clause on shared benefits in the case of commercialization of a product created with the provided resource. This new way of conducting trade, as a highly transactional approach reliant on contracts between users and providers of genetic resource and traditional knowledge, was seen by developing countries as a sort of insurance that things would be different this time.

## 2. Mechanisms in place

Under the CBD, states have the rights to exploit their resources according to their own environmental policies, while having the responsibility to ensure that activities done under their jurisdiction coincide with the objectives of the CBD, and do not cause damage to the environment of other areas outside their jurisdiction (CBD, 1992, Art 3). The approach adopted by the CBD for achieving its goal of halting biodiversity loss was to instruct members to come up with their own national strategies reflecting the 3 main objectives, and to the extent that was possible, to integrate the sustainable use and conservation of biodiversity into the existing relevant sectoral programs and policies that the country had in place (CBD, 1992, Art 6). For this sake, calls for identification and monitoring of components of biodiversity requiring urgent conservation efforts as well as showing highest potential for sustainable use were made. Activities having negative effects on biodiversity needed also to be monitored and minimized. In-situ and complementary ex-situ conservation measures were promoted. The CBD also encouraged countries to consider integrating its three objectives within national decision-making, to support local communities in taking remedial actions in degraded areas, or to prone cooperation between governmental authorities and private sector in developing sustainable solutions. All of these measures are to be made in accordance with a country's particular conditions and capabilities, with no pre-established projections. Article 26 states that a reporting mechanism was provided, in which contracting parties presented to the conference of the parties (COP) a report on the measures taken to achieve the conventions' objectives and their relative effectiveness (CBD, 1992).

The CBD stipulates that in exchange for germplasm provision, technology and share of benefits arising from PGR utilization should be transferred back to country of origin, but this stipulation is required not obligated (Gepts, 2004). While the measures set by the CBD are legally binding, meaning that parties that have ratified the text are legally obligated to implement provisions for ABS and take measures to conserve and sustainably use biodiversity, the effectiveness of

the convention at addressing biodiversity loss relies heavily on political will. Indeed, the CBD itself doesn't have an enforcement mechanism to ensure compliance with its provisions (CBD, 1992). Instead, enforcement is left at the responsibility of individual countries which are expected to initiate domestic laws and actions to implement the CBD's provisions. In order to encourage individual countries in their efforts, the CBD has developed various tools to assist the implementation of national commitments. The Strategic Plan for Biodiversity 2011-2020 and their Aichi Targets, which provide a framework to set national targets and develop plans to achieve the objectives of the Convention is a clear illustration (CBD, 2010).

During the 10th conference of the parties held in 2010 in Nagoya, Japan, biodiversity goals for the next decade were set. An exemplary UN members full house signed the Strategic Plan for Biodiversity 2011-2020. Through this text, the 196 nations agreed to meet 20 biodiversity targets called Aichi, so as to live in harmony with nature by 2050 (CBD, 2010). This plan has been conducted as a ten-year framework to guide countries and stakeholders' actions in saving biodiversity. Likewise the CBD, the parties that adopted the Aichi targets were expected to come up with their own national strategies for protecting biodiversity in accordance with the agreement's goals (CBD, 2010). The 2011-2020 strategic plan promoted among others, the reviewal of existing national biodiversity strategies and action plans (NBSAPs); the development of national targets accounting for individual capacities and priorities in the view of contributing to global efforts; the adoption of NBSAPs as policy instrument; as well as the monitoring and reviewing of NBSAPs and national targets using self-decided indicators (CBD, 2010).

A couple of years following the adoption of the Aichi Targets, a supplement agreement to the CBD was born out of the need to reach an understanding between biodiversity-rich communities and the rapidly growing biotechnology research sector in times of heavy bioprospecting and biopiracy accusations. The regulations of the Nagoya protocol consist of 3 elements. First, parties to the protocol may regulate access to the GR coming from their territories. If so, these are called provider countries. Second, provider countries may require that the benefits arising from the use of the GR lent be fairly and equitably shared with them. The two first elements are together known as ABS rules. Typically, the access component to GR requires a permit to be acquired from the provider country. Regarding benefit-sharing, there is often a request that a local research institution be involved in the R&D, as well as a requirement that if R&D on the GR leads to a commercialized outcome, a share of the profits realized be given back to the origin country. Third, all contracting parties must monitor the use of GR on their territories so as to ensure that ABS rules from the country wherein GR originated are followed (CBD, 2011). The NP not only established a legal framework for ABS, but also various other obligations for member states that are depicted in article 17, such as the requirement to establish checkpoints for monitoring compliance with the protocol, or to establish a national focal point to facilitate implementation of the protocol within countries' processes (CBD, 2011). A global multilateral benefit-sharing mechanism has been considered. Article 10 of the Protocol states that in cases of transboundary situations or when it is not possible to obtain PIC, the need for such benefit sharing mechanisms needs to be considered by parties. The benefits that are shared by users of GR and TK through this mechanism will be used to support conservation efforts globally. A commitment to collaborate with indigenous and local communities when applicable is included in the protocol, as well as regards to take into consideration these communities' customary laws and procedures with respect to traditional knowledge associated with genetic materials. Following the same line of thoughts, the protocol demands to refrain from restricting the customary uses and exchanges of GR and TK within and among these local and indigenous communities. The NP is a legally binding

treaty with an enforcement mechanism that includes a compliance procedure. This compliance procedure involves a review of the breaches to the protocol by a committee of experts in relevant fields. The protocol being enforced through public authorities and private entities, non-compliance can be penalized by fines, court proceedings, or other penalties (CBD, 2011).

## 3. Status of dependent variables

Stewardship/ownership

The CBD and the NP affirmed a clear ownership perspective to the governance of agrobiodiversity. For more detailed information on how the two agreements fit the following attributes, please refer to Appendix 2, section 1.

*Table 11: Measure of the CBD & NP's Stewardship degree.*

| **Attributes of Stewardship approach** | **CBD & NP** |
|---|---|
| PGR belong to the public domain and are protected from appropriation/ vision based in 'common heritage of mankind' | 0 |
| PGR are available and shared for common good | 0 |
| Free and unencumbered access to PGR for farmers, breeders, scientists | 0 |
| 'Protection through sharing' management system | 0 |
| Recognize contribution of farmers and traditional knowledge holders as stewards of PGR | 0 |
| Recognize collective contribution in PGR and collective responsibility in conserving it | 0 |

*Table 12: Measure of the CBD & NP's Ownership degree.*

| **Attributes of Ownership approach** | **CBD & NP** |
|---|---|
| Establishment of clear ownership rights to PGR/ vision based on 'national sovereignty over GR' | 1 |
| Assert control over legally recognized resource to generate profit from trade or sale | 1 |
| Reliant on access and benefit sharing legislation and/or intellectual property rights | 1 |
| Recognize the value of extracting agrobiodiversity and its commercialization | 1 |
| Concern of misappropriation solved by PIC & MAT, IPRs, and access legislations | 1 |
| Actors can exclude each other from access and use of PGR | 1 |
| Opposes the concept of open science | 1 |

Regulatory/Market-based

The CBD and NP were designed as market-based policy instruments both on the basis of, and reliant on, a market for biodiversity. For more detailed information on these agreements' fulfilment of the following attributes, please refer to Appendix 2, section 2.

*Table 13: Measure of the CBD & NP's Regulatory degree.*

| **Attributes of Regulatory instrument** | **CBD & NP** |
|---|---|
| Imposing constraints and policies | 0 |
| Creating barriers to business relations | 0 |
| Government of institution commands reduction of externalities & controls the compliance with performance or technological standards | 0 |

*Table 14: Measure of the CBD & NP's Market-based degree.*

| **Attributes of Market-based instrument** | **CBD & NP** |
|---|---|
| Expanding opportunities for market in biodiversity | 1 |
| Reducing transaction costs | 0 |
| Changing the context of existing markets | 1 |
| Fair but competitive market place | 1 |
| Facilitate business practices and relations | 1 |
| Aims at addressing previous market failures | 1 |

## 4. Effectiveness of regime

The CBD is established at the international level. Ratified by 196 parties, the CBD is one of the most widely ratified international agreement in history (CBD, s.a). The Convention also played an important role in spurring international cooperation around the topic of biodiversity conservation and the sustainable use of nature's components. As for the implementation of the Nagoya Protocol internationally, the responses from states and actors of the society have been more nuanced. Canada and the United States of America, as two important states in term of genetic resources, have not taken part in the NP so as to avoid the cumbersome liability for access of GR (Kariyawasam & Tsai, 2018). Similarly, in the context of the EU, actors from pharmaceutical companies and industry associations declared being against the ratification of the Nagoya Protocol because of the administrative burdens that it imposed leading to a more complex landscape for the broad research sector. Naturally, other actors welcomed the ratification of the NP, the Institute for European Environmental Policy as well as many of the countries from the Global South claimed that the Nagoya Protocol would generate many benefits for the whole of society (Kariyawasam & Tsai, 2018).

Concerning the implementation of the CBD at national level, as for the IUPGR an analysis of the different national legislations and policies of each country could be used. The 1998 FAO report on the State of the World's PGRFA is once again a good source of information. Nevertheless, in an effort to inform the wider society about the national policies that signatory countries have implemented as a result of the Nagoya Protocol, an Access and Benefit-Sharing Clearing House (ABSCH) website has been set up by the CBD, which will likely provide more up-to-date information.

According to FAO's 1998 report on the State of the World's PGRFA, 134 countries ratified the Convention on Biological Diversity at that time. And within these, a total of 27 countries had a formal program comprising a central institute coordinating national PGRFA activities and carrying out some activities (FAO, 1998). In the same matter as with the International Undertaking, this report being established in 1998, both the IUPGR and the CBD were in place and could be a factor in countries implementing these national programs, a straightforward cause-to-effect relationship between the programs being implemented nationally hence cannot be established to solely one of the policies. To extend the analysis further, valuable information could be found on the ABSCH database. In order to assess the implementation nationally of the NP, an analysis tool for the interim national report conducted by the CBD was put into place on the website of the clearing house. The summary statistics showed that 86% of countries parties to the NP reported having taken legislative, administrative, or policy measures on ABS (ABSCH, s.a.). A notable 96% have designated a national focal point as provided under article 13, while competent national authorities as provided by the same article have only

been designated by 69% (ABSCH, s.a.). Similarly, 66% of countries have taken legislative, administrative, and policy measures to implemented provisions that ensure that benefits from the utilization of GR are shared with providing parties, another 61% of countries have stated ensuring these benefits when GR was held by indigenous and local communities, as provided by article 5.2, and 61% also stated ensuring these benefits to be shared when utilization comes from TK (ABSCH, s.a.). The outcome of the CBD's encouragement in developing and implementing biodiversity strategies and action plans nationally is rather favorable. The CBD also included various mechanisms to support its implementation at national level by creating the Global Environmental Facility, the CBD Clearing House Mechanism, and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. While ample progress for the national implementation of the CBD's provisions have been realized, still sizeable challenges, such as insufficient funding for activities, inadequate institutional capacity, lack of political will, and conflict between biodiversity conservation and development priorities, remain and continuous efforts from all parties need to be actioned to render this Convention institutionally efficient.

Under the CBD and the NP, it is in the interest of developing countries to implement a better monitoring and compliance mechanism for addressing their lack of capacity to control the use of provided materials. After negotiations, four articles of the NP deal with compliance issues (CBD, 2011). Nevertheless, they are weak and don't formulate any measures that the users need to establish to address compliance, only require that user countries implement 'appropriate' measure to deal with issues of non-compliance (Richerzhagen, 2014). Information from the 2017 interim national report shows that between 81% and 85% of countries parties to the NP indicated having national measures to address situations of non-compliance as provided under article 15.2 and 16.2 (ABSCH, s.a.; CBD 2011). Additionally, 70% of countries claimed having taken measures to address non-compliance situations (ABSCH, s.a.). The Convention also mentions a dispute settlement mechanism that ensures enforcement of the right of access and other obligations set forth by this agreement (Correa, 1995).

The framing of the CBD and the NP's provision allow parties to determine their own obligations for ABS under domestic rules. Expressively, some states have adopted very broad measures which also include DSI into the definition of GR, while others opted for a tighter definition of GR to trigger ABS. The Andean Community ABS regime covering the GR of 4 diversity-rich countries opted for the wide inclusion of all biological material to be accorded ABS' benefits (Akpoviri et al., 2023). Brazil, another country that has high biological resources, implemented ABS legislation, and used the term genetic information so as to include as much material as possible. India's ABS measures guarantee benefit-sharing from the broad range of GR and DSI components, similar regulations apply to Malaysia and China. South Africa and Kenya's ABS rules also include DSI within the trigger of benefit-sharing. On the other hand, countries like Japan or the Commonwealth of Australia do not consider DSI as falling within the scope of their GR and hence re excluded from ABS legislation (Akpoviri et al., 2023). The payoff from inconsistencies in implementation of the NP legislation is one of confusion both for users and providers of GR. The Nagoya Protocol has become one of the most challenging regulatory tools facing the practice of biological control (Mason et al., 2023). Due to the heavy bureaucracy that needs to be negotiated ahead, the various processes of PIC and MAT, the benefit package to be negotiated with the provider country, and the different collection and exports permits that need to be granted, long delays and higher costs to access GR are putting up barriers to the effective sharing of PGR and hence diminishing the potential for benefit-sharing emerging from their utilization along the way (Mason et al., 2023).

Acknowledging the main objectives of the CBD and its NP, I have investigated the information the ABSCH database has stored, and further used the analyzer tool of the interim national report conducted in 2018 also available on the clearing house website. The analyzer option provided information, under question 16 of the report, about how many permits or other equivalent instruments have been made available through the ABSCH mechanisms since the entry into force of the NP (ABSCH, s.a.). India indicated having 75, Samoa 8, Tajikistan 12, Kenya stated having 70, Uganda claimed having issued 40 but are not yet uploaded to database, Malawi 15, Peru has issued 87 permits yet not publicly due to procedural issues, Zambia 4, Bulgaria 1, Mexico 3, Saint Kitts and Nevis 2, Cuba 9, Malta 1, and Spain 4 (ABSCH, s.a.). The aggregated total seems to add up to 263 permits issued, nevertheless, this number must be understood cautiously as countries are self-reporting on them, as well as viewing different situations in implementing the regulations under the NP, building capacities for data management at different speed, and seeing public to private sharing of information being regulated differently though national laws. Many countries stated that they are ongoing capacity building for data management, that information had not yet been uploaded into the database even though implementation at national level has started, that national information sharing centers were so recent that they hadn't had the opportunity to provide data, or CNA are still being set up hence not able to issue permits yet (ABSCH, s.a.). It is a factor that came up relatively often, the practical difficulties for developing countries at implementing the provisions from the CBD and the NP relative to ABS. The weak language of the protocol is not aiding countries in their processes of implementing or amending national legislations to meet the objectives of the two agreements (Kariyawasam & Tsai, 2018). Some countries also claimed that contracts were under negotiations, that users were requesting information relevant to permits, or that permits had been issued through national authorities but not made public through the clearing house mechanism. Others, such as the Seychelles and Nigeria, declared that permits had emerged before the entry into force of the NP, but no more since (ABSCH, s.a.). Kariyawasam & Tsai (2018) claimed that the NP would have the potential to be effective with a strict adherence and implementation from its member parties. Nevertheless, many developing countries lack the capacity and political power for this implementation process to be rapid and efficient, hence the Nagoya Protocol's successful implementation for regulating access and benefit-sharing at national level was limited. The same report treated, on question 18, of the benefits being perceived by the countries that entered into a contract since the entry into force of the NP. 28% of countries reported having received benefits from the utilization of genetic resources, while 16% from the utilization of TK associated with GR (ABSCH, s.a.). Another indicator that was reported regarded weather these benefits were monetary or non-monetary. 17% of countries stated having received monetary benefits, and 39% non-monetary benefits (ABSCH, s.a.).

What has been providing interesting insights under the IUPGR, and that I believe could be the case in this instance too, is investigating, at both international and national levels, what the CBD and the NP agreements have achieved or failed to achieve up until now in the societal and political scene. Looking at the effects of the CBD internationally, one can opt for the 2011-2020 National Biodiversity Strategies as a natural starting point. Also called Aichi Targets, these strategies were mostly sketched out, yet very few got implemented at all. The main criticism regarding the targets put in place where that they did not hold countries to specific actions and included vague language (CBD, 2010; Dickie, 2022). In September of 2020 a UN report shed light on the deplorable failure that these measures were. Governments had collectively failed to meet even 1 of the 20 targets (Chandrasekhar, 2022). The assessment could outline 6 of the targets where partial progress had been made (Chandrasekhar, 2022). Nonetheless, even though no single country met all 20 targets, significant progress was made

at national level in several countries according to executive secretary of the CBD (Dickie, 2022). Some of the main reasons for the missed achievement of the Aichi targets are described by scholarly articles in this way. Lack of clearly defined metrics to gauge progress. The targets were aspirational, which at first glance seems promising as these allow for people to act on a wide range of possibilities, but these don't allow to define the success or failure of a target as they aren't measurable (Dickie, 2022). Insufficient incorporation of Aichi goals into nation laws. Out of all national strategies elaborated, only 22% would have been rigorous enough to meet the targets. Four out of the total 20 targets have not been represented in any national plan at all (Huisman, 2021). Lack of monitoring and reporting around the progress or success of targets. Countries failed to update one another on either their advances or their challenges towards goals (Dickie, 2022). Some countries did not have any indicators or evaluation plan in place to monitor progress (Huisman, 2021). Lack of financing aid for developing countries to meet the goals. The Global Environmental Facility who is responsible for the finance of international biodiversity protection collected from 29 countries a feeble 5$ billion compared to the huge 711$ billion funding gap estimated by a 2019 conservation institute assessment (Dickie, 2022). Lack of governmental concerns beyond environmental ministries is another reason for the lack of achievement, CBD's executive secretary warns that it's not a matter to be left to ministries of environment alone, a need for the whole government to be implicated exist (Dickie, 2022). However, not only negative outcomes came from these findings. As a response to this failure the CBD urged countries to apply actions consistent with the 2030 Agenda for Sustainable development and The Paris Agreement. As subsequent step, during the COP14 parties agreed to develop the Post-2020 Global Biodiversity Framework which builds on the past Aichi Targets (Kretchmer, 2020). Morgera & Tsioumani (2010) also pointed out that since the target had been missed, member states could recognize the urgent need of empowering indigenous peoples and local communities to contribute effectively to the implementation of the CBD in a true partnership with States and private entities.

When focusing on the effect at national level, the picture is nuanced, with some great successes but also various missed targets. Within the countries that have ratified the Nagoya protocol, success stories of enhanced legal certainty have allowed to use in a more sustainable way genetic resources for biological, pharmaceutical, and nutraceutical purposes, as well as improving use and representation of traditional knowledge and medicines. Elizabeth Maruma Mrema, executive secretary of the CBD claimed in December 2022 that the implementation of the Protocol is still being perfected by member states, but outlinied that out of the 138 Parties 132 had national ABS measures, which shows valuable signs of progress (Kantai et al., 2022). She also applauded Japan for its leadership surrounding the objectives of the NP, highlighting the Japan Biodiversity Fund that has provided USD 60 million in funding since 2010 (Kantai et al., 2022). On the other hand, Tvedt (2006) also outlined how years of experience with a CBD agreement relying on PIC and MAT for ABS have shown that this approach was not sufficient to fulfill the agreement's objectives. Presently, 30 years have passed since the CBD's entry into force, supplementary protocols have been issued, conferences and meetings of the parties have been held, scientific research have been conducted (Tvedt, 2006), and still the miscellaneous matter of how to create a legal situation that will ensure a fair and equitable benefit sharing from the utilization of genetic resources lays on the global negotiation table.

# Case 3: The International Treaty on Plant Genetic Resources for Food and Agriculture

## 1. Presentation & Purpose

The ITPGRFA is an international agreement adopted to address specifically issues in agricultural genetic resources for food and agriculture. It entered into force in 2004 and is contractual to 150 parties that are countries and intergovernmental organizations. The ITPGRFA is a revision of the IUPGR as a harmonization with the CBD's provisions, and with the objective to resolve matters around ex situ collections not dealt with under the CBD as well as the question of farmers' rights. As major difference within the treaty is this cooperation based multilateral agreement which runs counter to the use of country-to-country bilateral mechanism deployed by the CBD (Gepts, 2004).

The aim of the ITPGRFA, also called or Plant Treaty or International Treaty, is to support the conservation, sustainable use and management of plant genetic resources for food and agriculture, and a fair sharing of benefits derived from their uses, in the interest of the general agriculture sector and world food security (FAO, 2004). Various provisions for the exploration, conservation, and sustainable use of PGRFA were set out, as well as measures for ex situ conservation of plant and wild crop varieties. The treaty ensures through a global system that farmers, plant breeders, and scientists can access easily the raw genetic material necessary to develop new varieties, that are both high yielding and resilient to climate change (FAO, 2004). Indeed, the treaty has been created with the recognition that farmers made colossal contributions to the diversity of crops worldwide, both in conserving and developing further PGRFA. For that reason, farmers and traditional knowledge holders were also promised help with on-farm management and conservation action of PGRFA under the umbrella processes assuring farmers' rights (FAO, 2004).

At the 27$^{th}$ session of the FAO Conference, a request for an update of the International Undertaking was first made. The request was accorded in 1993, and the lengthy negotiations on what would become in 2001 the ITPGRFA started (Andersen, 2016b). These rounds of negotiations have been heated. PGRFA required different considerations, due primarily to their nature of being the sole basis of farming and thus the backbone of food security worldwide. Domestication was directly dependent on the access that famers had on these PGRFA, making it clear that provisions on restricted access would be a deal-breaker in any agreements to be decided on. The perception that clashed with the CBD's perspective was that to ensure access, PGRFA should remain in the public domain and not be subject to exclusive IPRs. Hence a different solution for benefit sharing than the ABS one under the CBD had to be developed (Andersen, 2016b). This novel solution encompassed a quite radical switch of focus, from putting importance on the user and conserver of the resource rather than on its provider. A many-sided rationale supported this shift. For starters, due to their development from borders to borders and over the centuries, crops are difficult to pin under the sole identity of one origin country. Next, following a system that exclusively rewards the current provider of germplasm would be unfair to all those contributors around the globe who helped maintain and further develop the varieties that will benefit present and future generations. At last, with the context of interdependence that countries face nowadays, a strict and complicated system of transfer between providers and recipients would only delay access to these resources. In spite of these explicit arguments and after years of experience, the negotiations for this third instance of biodiversity-related agreement were chaotic. All actors did agree on the need for accessibility to PGRFA. Yet, the same workings hindered consensus. Andersen (2016b) sheds lights on the different parties' inquiry. Developing countries advocated for the prohibition of IPRs under the

new agreement and emphasized the need for truly fair and equitable benefit sharing processes. These demands come from the outlook that developed countries have been reaping a larger share of the financial benefits from ABS on top of the royalties imposed on their marketed products protected by IPRs arising from germplasm originated in developing countries. Unsurprisingly, the majority of the developed countries advocated for open access to PGRFA under the new treaty and minimal to no restrictions on IPRs. There were some industrialized countries, like Norway, which tried to balance out the need and demands from both sides, mediating the negotiations and contributing to developing an agreed-on text offer (Andersen, 2016b). Nonetheless, reaching a consensus proved to be an impossible outcome, and the agreement had to be put up for a vote. The agreed-on treaty was the first legally binding agreement dealing exclusively with PGRFA (FAO, 2004).

## 2. Mechanisms in place

Whereas the international treaty covers all PGRFA, its multilateral system doesn't. Indeed, the multilateral system at its core allows parties, governments acting as 'legal persons', to access a gene pool of the world's major crops, these are 64 seed species that together account for about 80% of the food delivered from plants (Pandey & Ghosh, 2022). These 35 food crops and 29 forage plants are thus in the public domain but under the management and control of the contracting parties (FAO, 2004; Andersen, 2016b). This increased ease of access was provided with the recognition that PGR for food production requires different considerations than other purposes, and that uninterrupted flow of germplasm is needed in research and innovation to return agricultural benefits (Wynberg et al., 2021). A set of simplified rules was created for accessing GR and sharing results of research and breeding. Under the MLS, all transfers of genetic material are subject to the modality of a standard material transfer agreement (SMTA) so as to speed up the process of exchanging PGRFA by canceling out negotiations and lowering transaction costs (Andersen, 2016b). Access is provided free of charge, along with all relevant information on the material shared. And a provision on IPRs being prohibited on materials accessed through the MLS in the form received has been stipulated in order to maintain these 64 varieties in the public domain (FAO, 2004). A precondition to joining the treaty is agreeing to share genetic diversity and related information about crops stored in public gene banks available to all members through the multilateral system. Plant samples are provided by governments, international institutions, and legal or natural persons. There is thus no inclusion of resources that are subject to the rights of individuals and legal entities under national laws, only resources that governments can directly manage and control have been included in the agreement (Smyth, 2020). If there is a wish to add resources outside of this legal system, annex I of the multilateral system serves as path to follow so as to not ignore possible useful contribution (FAO, 2004). Another distinct characteristic of the mechanism is that of benefits being shared with the custodians of genetic resources rather than their providers. It is a major difference between the workings of the CBD, wherein the benefits flow back to countries providing access to germplasm, while flowing to the benefit-sharing mechanisms under the treaty. Article 13 states that these benefits are then redistributed to developing countries' farmers and countries in economic transition who conserve and sustainably use PGRFA (FAO, 2004).

The main attraction of the multilateral system put in place by the ITPGRFA is to benefit from a multiplier effect. In exchange for sharing the PGR of the listed species available on one's territory, parties get facilitated access to the whole pool of PGRFA from all other member states with minimal transaction costs (Halewood et al., 2013). The recipients of the facilitated access agree to pay into a multinational fund called the Global Crop Diversity Trust a share of the benefits arising from commercialization of PGR accessed through the mechanism (Gepts,

2004; FAO, 2004). As a matter of fact, the benefit sharing mechanism under the treaty is twofold. If a product receiving protection by a patent is developed with the use of materials coming from the MLS, a fixed share from the sales of the product will have to be paid out to the benefit-sharing mechanism, as stated out in the SMTA. While a product that is not protected by a patent, and thus still available for further R&D, will lead to a voluntary payment to the mechanisms (FAO, 2004). The idea behind such a work process is to incentivize researchers and breeders to keep materials from the MLS into to public domain to ensure long-term open availability. To compensate for the facts that patents on PGRFA are limited, and that crop breeding is a slow practice that might give rise to payments only in who knowns what amount of time, other forms of benefit-sharing are being brought up. The case of Norway makes up for a great example, the country voluntarily decided to allocate 0,1% of total seed sales annually to the benefit-sharing mechanisms of the treaty (Andersen, 2016b). Similar actions by other countries and multinational companies would have to power to substantially improve the capacity of the mechanism.

## 3. Status of dependent variables

Stewardship/Ownership

The ITPGRFA is mostly managed under a stewardship perspective of agrobiodiversity governance but does enclose inclines towards the ownership approach too. For more detailed information on the ITPGRFA features fitting the following attributes, please refer to Appendix 3, section 1.

*Table 15: Measure of the ITPGRFA's Stewardship degree.*

| **Attributes of Stewardship approach** | **ITPGRFA** |
|---|---|
| PGR belong to the public domain and are protected from appropriation/ vision based in 'common heritage of mankind' | 1 |
| PGR are available and shared for common good | 0 |
| Free and unencumbered access to PGR for farmers, breeders, scientists | 1 |
| 'Protection through sharing' management system | 0 |
| Recognize contribution of farmers and traditional knowledge holders as stewards of PGR | 1 |
| Recognize collective contribution in PGR and collective responsibility in conserving it | 1 |

*Table 16: Measure of the ITPGRFA's Ownership degree.*

| **Attributes of Ownership approach** | **ITPGRFA** |
|---|---|
| Establishment of clear ownership rights to PGR/ vision based on 'national sovereignty over GR' | 0 |
| Assert control over legally recognized resource to generate profit from trade or sale | 0 |
| Reliant on access and benefit sharing legislation and/or intellectual property rights | 1 |
| Recognize the value of extracting agrobiodiversity and its commercialization | 1 |
| Concern of misappropriation solved by PIC & MAT, IPRs, and access legislations | 0 |
| Actors can exclude each other from access and use of PGR | 0 |
| Opposes the concept of open science | 0 |

Regulatory/Market-based
The ITPGRFA encompasses most of the characteristics of a market-based policy instrument, yet a striking regulatory feature can also be attributed to this agreement's design, for more detailed information, please refer to Appendix 3, section 2.

*Table 17: Measure of the ITPGRFA's Regulatory degree.*

| **Attributes of Regulatory instrument** | **ITPGRFA** |
|---|---|
| Imposing constraints and policies | 0 |
| Creating barriers to business relations | 0 |
| Government of institution commands reduction of externalities & controls the compliance with performance or technological standards | 1 |

*Table 18: Measure of the ITPGRFA's Market-base degree.*

| **Attributes of Market-based instrument** | **ITPGRFA** |
|---|---|
| Expanding opportunities for market in biodiversity | 1 |
| Reducing transaction costs | 1 |
| Changing the context of existing markets | 1 |
| Fair but competitive market place | 0 |
| Facilitate business practices and relations | 1 |
| Aims at addressing previous market failures | 1 |

## 4. Effectiveness of regime

The ITPGRFA is a regime established at international level, with 150 parties including a member organization, it has been welcomed by the society as a document integrating both visions of the IUPGR and the CBD. As for the implementation of the ITPGRFA at national level, many of the information related to country's implementational and compliance procedures are stored on the Treaty's website under the direction of FAO. The Compliance Committee of the ITPGRFA prepares a comprehensive report analysizing the national reports of each member country prior to sessions of the Governing Body. The latest version dates back to September 2022. The committee received 79 national reports from parties to the treaty which amounts to 53% (FAO, 2022b). It is to be noted that the implementation and compliance procedures by member countries are increasing each year. Indeed, the analysis reveals that since the last report 26 more members have submitted their national reports for the first time (FAO, 2022b). Nevertheless, as noted by Brink and Hintum (2019), compliance with the ITPGRFA must be improved, out of the 145 member countries only 54 sent a national report on their implementation of the treaty, while 94 out of the 120 member countries to the Nagoya Protocol provided their national report as of November 2019. The actual interesting information for the purpose of assessing national implementation of the regime, however, lays in what the answers of countries to the questions inside of this report are. The reader should keep in mind that the statistics listed here after are taking into consideration only the 79 countries that have reported results out of the 150 that are member parties to the ITPGRFA. An influential 80% of the respondents reported having laws, regulations, procedures or policies in place in their country that implement the treaty, while only 19% reported not having these (FAO, 2022b). Further detailing this claim, almost every country, 97%, stated having legislations not exclusively implementing the ITPGRFA, but rather considering other measures to be taken for biodiversity and environmental protection, biosafety, plant variety protection, and marketing of seeds (FAO, 2022b). Nonetheless, 52% reported that their national legislations would need to be adjusted to ensure conformity with the treaty's obligations, from

these a vast majority stemmed from the Africa and GRULAC regions (FAO, 2022b). Whereas the other 48% who claimed not having to make such changes to meet conformity with the treaty's obligations were in majority reporting from European and the Near East regions (FAO, 2022b). From these statistical numbers, it could be affirmed that the implementation at national level of the International Treaty is going steadily well. More than that, I would like to call attention to the fact that a remarkable 82% of countries reported that the conservation, exploration, collection, characterization, evaluation, documentation, and sustainable use of PGRFA have been integrated in their country's agricultural and rural development programs and policies (FAO, 2022b), which could be seen as a huge progress made towards the goal of the international treaty. Lastly, that 86% of parties have cooperated with other member parties, mainly with the aim to strengthen the capacity of developing and economically transitioning countries in the conservation and sustainable use of PGRFA or to enhance international activities such as the documentation, evaluation, genetic enhancement of PGRFA and appropriate information technology towards the goals of MLS for ABS of the treaty (FAO, 2022b).

When looking at defined goals for outcome and impacts of the Treaty, and if the responsibilities to attain them have been assigned, one can see that most provisions leave lots of room for national framework development and capacity building (FAO, 2004). A probing example is the one of discussion surrounding farmers' rights. Since this matter is one of the most controversial, when signing the treaty, participants agreed to recognize the enormous contribution of farmers to the heritage of PGR, but the decision was left to countries on how to actually implement this provision within their national system. Some of the measures that could be taken to protect and promote farmers' rights are among others the protection of traditional knowledge, the equitable participation in shares of benefits arising from PGR uses, and the participation in decision-making relative to PGRFA (Andersen, 2003). Nevertheless, governments remain free to choose the measures that they deem appropriate, according to their needs and priorities (FAO, 2004; Andersen, 2016b). From the national reports of 2022, 74% of the reporting countries claimed to have taken national measures to protect and promote farmers' rights, and within these countries the measure that was taken the most (46 positive vote out of 58) is one protecting the traditional knowledge relevant to PGRFA, whereas the right to equitably participate in sharing benefits arising from utilization of PGRFA was the least reported (38 out of 58) taken measure (FAO, 2022b). Another feature of the text that could be interesting is the provision on financial resources setting out that no funding obligations on contracting parties exist, but solely provisions on the development of a funding strategy have been made (FAO, 2004). This might be another point in the treaty to become a bottleneck stated Andersen (2003). However, it is a crucial matter the one of funds to be made available for implementation, as it has been a major constraint of environmental agreements for years. A quick thought on the rationale behind this commonly seen issue is that it might be a fundamental problem with the basic system, that it was maybe wrongly designed. Taking the perspective that GR is a commodity to be commercialized and hence making as only profit generation method possible the retailing of its commercial value, instead of recognizing nature and GR as a public good. A solution for the leveraging of funds that does not ground itself in this commercialization of nature could be taking after Norway's model of seed sell and tax payed to the benefit-sharing fund.

FAO acting on behalf of the governing body of the treaty and its MLS is the third-party monitoring compliance with SMTAs, and has the right to initiate dispute settlements in cases of noncompliance, and reports to the governing body (FAO, 2004). To help with the high numbers of transactions to monitor, a list has been set up with mediation and arbitration experts

from several regions in cases where the third-part beneficiary requires backup (Andersen, 2016b.). The dispute settlement procedure can be initiated by any of the three parties involved. A first trial at amicable negotiations will be had. In the case needed, neutral party mediation acts as the second step. As last resort arbitration will take place wherein parties have to rely on an appropriate international body to carry out the arbitration process or a legally binding settlement will be established by the international chamber of commerce (Andersen, 2016b).

Once again, acknowledging the main objectives of the ITPGRFA, I have investigated what information the FAO website of the treaty had stored, the 2022 report of the compliance committee, while also making use of the many scholarly articles available on the topic of ABS from the ITPGRFA.

According to Andersen (2016b) and Pandey and Ghosh (2022), the facilitated access to PGRFA under the international treaty is a great success, but the benefit-sharing mechanism is still weak and requires further development, which is itself stated in the original text of the treaty in article 13.2 and 13.6 (FAO, 2004). Indeed, Brink and Hintum (2019) affirm that the ITPGRFA has been more effective than the CBD at facilitating access to PGR even though not all resources are under the MLS and not all within are easily available. The treaty's multilateral system works in the way that benefits arising from use of genetic resources of one country doesn't go directly to the country in which it was accessed, like in the case of bilateral agreements. Instead, through the multilateral system, benefits and voluntary donations are directed to a trust fund for benefit-sharing, and then dispensed to support capacity building activities, conservation, and sustainable use projects in different countries under the direction of the ITPGRFA's governing body (Pandey & Ghosh, 2022; Halewood et al., 2013). Benefits get shared through actions made in accordance with the benefit-sharing mechanism and the jurisdiction ruling over it. The very first disbursement was announced at the third session of the treaty's governing body in 2009. After gathering inflows for 5 years, 11 projects in developing countries were chosen to receive support totaling to USD 500.000 for their contribution to the treaty's objectives (Andersen, 2016b).

To assess how well the system under the treaty has been functioning I used data from a report on the flow of germplasm in the Multilateral System that is being prepared by the Secretary General prior to each session. When aggregating the international collections of the CGIAR and other institutions recognized by article 15, the total amount of materials available under the MLS was 2.343.549 as recorded in 2022 (ITPGRFA, s.a.). PGRFA holders notified that 1.103.814 accessions were available through the MLS in July of 2022 (ITPGRFA, s.a.). These numbers having a consequent meaning on their own are being reinforced by the confirmation of a tremendous development from the Treaty's MLS. Back in 2014, 693.752 accessions of material under annex 1 listings were held in these gene banks as part of the MLS (Moore & Hawtin, 2014). In an effort to speed up PGRFA exchanges further, it has been a common custom of gene banks to establish Web-based systems facilitating the process of getting in an SMTA with the simple click of a box online (Andersen, 2016b). Additionally, the Data Store recorded, in Mai 2023, up to 99.450 SMTAs originating from 59 countries and distributed throughout 185 countries that were in majority contracting parties but also non-parties to the international treaty on PGRFA (ITPGRFA, 2023). A bright demonstration of the Treaty's concrete development, as the number of SMTAs was reaching 75.000 in July 2019 (Brink & Hintum, 2019). Detailed information from Brink & Hintum (2019) notified that 5.4 million samples had been distributed out of which 5.2 million were Annex I crops. Wynberg et al. (2021) express disappointment when addressing the contributions to the benefit-sharing funds under the Treaty. Nevertheless, it is important to note that demonstrations of its effectiveness

do exist, and are even, if one could say, showcasing some of the best impacts out of all the PGRFA-related agreements in place towards solving the issue of unfair ABS from PGR. First, FAO noted in 2019 that voluntary payments to the fund of the ITPGRFA have reached one million farmers across 45 developing countries (Wynberg et al., 2021). Secondly, the Treaty's benefit-sharing fund has received in 2018 its first ever user-based payment amounting to USD 119,083 from Nunhems Netherlands, a Dutch plant breeding company. This payment equals to 0.77% of seed sales of ten commercialized vegetable varieties that were made available through the Treaty's MLS (FAO, 2018). And lastly, a decision of Groupement National Interprofessionnel des Semences et Plants, a French seed sector group, to make annual voluntary contributions to the fund has been made (Wynberg et al., 2021).

In the same manner that is has been providing interesting insights under the IUPGR, the CBD and the NP, I will evaluate at both international and national levels, what the ITPGRFA has achieved or failed to do so up until now in the societal and political scene. Focusing on the international level, Regine Andersen in her book on agrobiodiversity governance (2018) mentioned that international regimes on PGRFA in the period between 1992 and 2004 have been largely negative to the management of these resources in developing countries. But that the prospect of the ITPGRFA in 2001 already signaled more positive management possibilities. An accomplishment worthy of notifying in this section is the establishment along with the ITPGRFA of a Global Crop Diversity Trust to raise funds from individual, corporate, and governments donors so as to build up capacity to continue funding key crop collection actions. This fund has been recognized as an important element of the funding strategy behind the International Treaty. In April 2010, six years after its creation, the trust amounted to USD 142.000.925 paid and a bigger pledged sum (Andersen, 2016b). From the point of view of the CGIAR, the Treaty is also working greatly. Between 2007 and 2009, CGIAR centers distributed 1.15 million PGRFA samples, the vast majority to developing or economically transitioning countries. And of these distributed sample, 18% were material from gene banks, while 82% was mainly improved materials issued from breeding programs (Moore & Hawtin, 2014).

At the national level, even though there were encouraging signs, the Treaty and its MLS showed indications that operationalization was not at its full potential. Many actors, from developing countries as well as private sector were reluctant to engage fully, a list of important countries refused to be parties to the Treaty, and those that has taken part still had not taken any actions to implement the provisions of the agreement or would simply no respond to request for materials under the MLS (Moore & Hawtin, 2014). A study realized in 2013 by Bjørnstad et al. was directed at testing the performance of this GR facilitated access for parties to the ITPGRFA. The results from requesting seeds from 121 contracting parties were 44 countries delivering on the request, 55 not responding, and 23 producing contracts but failing to provide the requested seeds (Brink & Hintum, 2019). A concluding realization borrowed from Moore & Hawtin (2014) holds that one of the early problems to the Treaty's implementation nationally was to review the existing laws and determine the need for novel legislations.

# Case 4: The Kunming-Montreal Global Biodiversity Framework

## 1. Presentation & Purpose

The year 2020 played a crucial role for biodiversity as the Strategic Plan for Biodiversity and its Aichi Targets came to expiration. The Post-2020 Global Biodiversity Framework (GBF) was meant to take over from these measures. Since 2019, the discussions around its design and obligations have been underway, including meetings and workshops involving actors at regional, national, and international levels. The aim of developing this post-2020 framework is to speak into existence a set of actions to transform our society's relationship with its surrounding biodiversity, and to ultimately learn to live in harmony with nature. The framework would guide stakeholders' actions, such as governments, society, civil society, businesses, and communities, through 2030, to achieve the objectives set out by the CBD, its protocols, agreements, instruments, and processes (CBD, 2021).

On December 18th of 2022, following from a late-night plenary session, COP15 president presented the parties with a package of 6 decisions for a successful outcome on GBF that included monitoring, mechanisms for planning, reporting, and reviewing, capacity building and development, technical and scientific cooperation, resource mobilization, and DSI (IISD, Earth Negotiation Bulletin, 2022). A meeting of delegation addressed throughout the whole day these non-papers, until a compromise package of the 6 decisions got adopted. All but the representative of the Republic of Congo reached agreement, and the president of COP announced that the 6 documents would be approved as a package (IISD, Earth Negotiation Bulletin, 2022). The conclusion of this UN biodiversity conference is the KMGBF, a historic package addressing the dangerous loss of biodiversity, the need to restore natural ecosystems, to protect rights of indigenous people and local communities, as well as to guide biodiversity policy through 2030 (CBD, 2022c). The agreement was approved by 188 nations; 186 out of the 196 UN member states, and additionally the USA and the Vatican who are not part of the CBD (CBD, 2022b).

This framework was established with the intention to confront the five key elements building up the nature crisis that is currently ongoing; land- and sea- use changes, over exploitation of species, climate change, pollution, and invasive species (CBD, 2022b,c). Within the global biodiversity framework, a set of four overarching long-term goals to be achieved by 2050 have been pronounced (CBD, 2022b; IISD Earth Negotiation Bulletin, 2022). The first goal focuses on conservation of ecosystems, species, and genetic diversity. The second involves using and managing biodiversity sustainably to ensure that nature's contributions to humans are valued, maintained, and enhanced. The third focuses on sharing the monetary and non-monetary benefits from the use of genetic resources, associated TK, and DSI of GR in a fair and equitable way, in accordance with internationally agreed ABS instruments. Finally, the fourth emphasizes the importance of providing adequate means to implement the KMGBF to all parties, particularly developing countries and small island developing states. This recognizes the fact that these countries may have fewer resources and capabilities to implement the framework effectively and ensure that they are not left behind in the efforts to protect global biodiversity (CBD, 2022c). In addition to the four long-term global goals outlined above, the framework also includes a set of 23 targets to be met by 2030 (CBD, 2022c; Earth Negotiation Bulletin, 2022). These are categorized to fit within the four goals. Target 1 to 8 aims at reducing threats to biodiversity, target 9 to 13 focuses on meeting people's needs through sustainable use and benefit-sharing, and target 14 to 23 express the tools and solutions possible for implementation and mainstreaming.

## 2. Mechanisms in place

The main interest of this study lays in the multilateral mechanism for benefit-sharing from the use of DSI on GR that has been decided to be included in the KMGBF (CBD, 2022c). The COP also decided to establish a time-bound process to further develop and operationalize the mechanism, that will find its deadline at the sixteenth meeting of the Conference of the Parties. This limited time to figure out a solution will hopefully spur more initiatives from the side of the parties as opposed to an instance where no decision would have been taken in order to finalize the process before agreeing on the framework. To this end, the COP established an ad hoc open-ended working group on benefit-sharing from the use of digital sequence information on genetic resources to develop potential solution for the multilateral mechanism, and to make recommendations to the Conference of the Parties at its sixteenth meeting (CBD, 2022c). Additionally, it is important to note that The KMGBF is not a legally binding agreement, but signatory parties commit to developing their national biodiversity standards, and to show improvement towards meeting the targets set by the framework. Another point to note is that the GBF also accords full recognition to the rights and roles of Indigenous peoples and local communities (CBD, 2022c). It is reported that indigenous peoples make up only five percent of the global population, but that they safeguard 80 percent of the world's remaining biodiversity. It was hence vital that agreement recognised their rights and protected them.

Financial means were at the core of the discussions, notably about the budget that would be allocated from developed countries towards developing countries to address biodiversity loss. It is therefore a major achievement that negotiators managed to forge an agreement to try and mobilisatize at least $200bn a year in nature financing by 2030. The Global Environmental facility has set a trust fund, called the GBF Fund, aimed at supporting the efficient implementation of GBF (CBD, 2022a), and this independent of the benefit sharing coming from ABS.

The use of DSI is an important issue in the global effort to protect biodiversity, and the COP parties have recognized the need to share the benefits of its use fairly and equitably (CBD, 2022c). To achieve this, they have encouraged the deposition of more DSI with information on origin and other metadata in public databases, while also recognizing that tracing and tracking is not always practical (CBD, 2022c). Also recognizing that a multilateral approach to benefit-sharing has been identified having the highest potential for agreed-criteria solution, with exceptions. To this end, a list of terms on how the solution should be looking in the future was drawn, and the COP has opened for discussion as part of the GBF a multilateral mechanism for BS, including a global fund. (CBD, 2022c).

Early criticism surrounding the agreement's design and key elements have been brough up, stating that the draft agreement was not transformative enough to tackle the biodiversity crisis at hand or that it might simply reproduce the mistakes of its predecessors. The presidency's text has been pointed out to be on the lowest level of ambition for many goals and targets, representing the common pace of business as usual instead of the urgency of the nature crisis. It is also feared that the framework is undermined by a slow implementation process from nations, or that the needed financing activities are not realized.

## 3. Status of dependent variables

Stewardship/ownership

Building on the same arguments as for the CBD, the KMGBF encompasses a vision of governance of agrobiodiversity based on national sovereignty over GR, grounded on the establishment of ownership rights and concerned by the misappropriation of a protected good,

as well as reliant on ABS, out of other options also, for profit generation. Nevertheless, the multilateral system for ABS proves that parties agreed on the collective responsibility of conserving and using PGR.

*Table 19: Measure of the KMGBF's Stewardship degree.*

| **Attributes of Stewardship approach** | **KMGBF** |
|---|---|
| PGR belong to the public domain and are protected from appropriation/ vision based in 'common heritage of mankind' | 0 |
| PGR are available and shared for common good | 0 |
| Free and unencumbered access to PGR for farmers, breeders, scientists | 0 |
| 'Protection through sharing' management system | 0 |
| Recognize contribution of farmers and traditional knowledge holders as stewards of PGR | 1 |
| Recognize collective contribution in PGR and collective responsibility in conserving it | 1 |

*Table 20: Measure of the KMGBF's Ownership degree.*

| **Attributes of Ownership approach** | **KMGBF** |
|---|---|
| Establishment of clear ownership rights to PGR/ vision based on 'national sovereignty over GR' | 1 |
| Assert control over legally recognized resource to generate profit from trade or sale | 0 |
| Reliant on access and benefit sharing legislation and/or intellectual property rights | 1 |
| Recognize the value of extracting agrobiodiversity and its commercialization | 0 |
| Concern of misappropriation solved by PIC & MAT, IPRs, and access legislations | 1 |
| Actors can exclude each other from access and use of PGR | 0 |
| Opposes the concept of open science | 0 |

Market-based/regulatory

The KMGBF is a set of six decision papers agreed-on as a policy package. Within this package, the most influential part resides in the actual framework that received the name of the agreement, a list of goals and targets to guide actors' actions and behaviors during the next decade. The parties designed these goals and targets so that policymakers could then implement, within each country's capabilities, the right practices into national legislations to reach a global common objective. The nature of this framework is hence clearly regulatory as its sole purpose is to impose regulations and/or constraints, as well as to create policies.

*Table 21: Measure of the KMGBF's Regulatory degree.*

| **Attributes of Regulatory instrument** | **KMGBF** |
|---|---|
| Imposing constraints and policies | 1 |
| Creating barriers to business relations | 0 |
| Government of institution commands reduction of externalities & controls the compliance with performance or technological standards | 1 |

*Table 22: Measure of the KMGBF's Market-based degree.*

| **Attributes of Market-based instrument** | **KMGBF** |
|---|---|

| | |
|---|---|
| Expanding opportunities for market in biodiversity | 0 |
| Reducing transaction costs | 0 |
| Changing the context of existing markets | 0 |
| Fair but competitive market place | 0 |
| Facilitate business practices and relations | 0 |
| Aims at addressing previous market failures | 0 |

## 4. Effectiveness of regime

At the end of December 2022, 196 nations have signed on the historic KMGBF, an inclusive and transformative agenda for managing biodiversity within the next decade. Nevertheless, following the 3.5 years of negotiations needed to get to this framework being internationally agreed-on, it is fair to say that efforts from all sides of the table will be required before claiming either international or national implementation as a success. In a commentary dissecting the scope of the KMGBF and its potential for transforming international policy, marine and sustainability scientist David Obura along with the Earth Commission provide their insights. A positive argument states that the text promotes all the necessary elements for the agreement to be a success in halting biodiversity loss and in achieving sustainability for all (Obura, 2023). Yet that to achieve such success, countries signatory to the framework will need to fully adopt its provisions, put money on the table "not as aid or charity but as unpaid dues for unjust historic appropriation of biodiversity", and attach strings to the agreement so as to see real transformation (Obura, 2023). The global community must transform itself steering away from the "imperialist-colonial-capitalist model of extraction and capital accumulation" in exchange for fair and equitable societal prospects. The authors go on articulating that the GBF actors must fully finance its implementation and working processes through adopting sustainability-oriented principles that internalize biodiversity impacts into the costs of doing business in the sector so as to close the tap of externalities. And most indispensably, historic trends need to be accounted for, Global North Global South relationships need to be put on an equitable footing, and rights of indigenous people and local communities need to ensured (Obura, 2023).

The KMGBF is not yet established at national level, with the exception of one EU country. The framework requires parties to use National Biodiversity Strategies and Action Plans (NBSAPs) to translate its targets into national targets, and implement them with a planning, monitoring, reporting and reviewing mechanism to guide and evaluate progress (CBD, 2022c). Parties have been asked to report their national targets in a standardized format before COP16 (CBD, 2023c), hence national implementation would be difficult to assess before these documents become available. Howbeit, Spain operating an almost instantaneous response, has already submitted its post-COP15 NBSAP. Despite this early submission, other member states' reports will probably take more time to revised, but still some of the features that the framework has put into place can help provide a sense of how well national implementation might go. Parties have been encouraged to integrate biodiversity into all sectors and political levels, yet no specific measures to aid or evaluate these national implementations has been adopted (Zinngrebe, s.a.). The text also calls for governments to encourage other societal actors to participate in implementation of the framework. Zinngrebe (s.a.) also mentions that a very soft evaluation process is installed, and that specific and binding requirements will be needed to help, guide, or incentivize implementation on the national level. Now, meetings of various groups will be happening up until COP16 to finalize indicators and prepare strong commitments for implementation.

Additionally, the KMGBF is supported by a monitoring framework, wherein countries must monitor and report on progress indicators every five years (CBD, 2022c). These headlight

indicators must have data and metadata publicly available, follow a method that is peer-reviewed or validated for national use, able to show trends, and align with existing agreement or process. The period 2011-2020 is used as the reference period for the monitoring of progression towards the goals and targets established by the framework. Nevertheless, Stokstad (2022) expresses that the agreement is scientifically strong but legally weak. Showcasing that the GBF misses multiple key points of an effective regulatory international agreements, like reciprocal responsibilities, a system for the resolution of disputes, uncompromisable goals, and noncompliance penalties.

Despite the 4 goals and 23 targets specifically designed for its 2030 mission and 2050 vision, the KMGBF ultimately aims at achieving the same three main objectives as the CBD, the conservation of biodiversity, the sustainable use of its components and a fair and equitable share of benefits from genetic resources. It is to be noted that in addition and as a separate entity to the three others, a goal of its own was depicted for "providing adequate means to implement the KMGBF to all parties, particularly developing countries and small island developing states" (CBD, 2022c). The creation of this additional goal on the side of the fair and equitable sharing one could reflect a realization that the funding based solely on the market mechanism of ABS is not likely to lead to sufficient funding. This realization might have grounds in the ongoing discussions surrounding challenges for sharing the benefits from the use of DSI. Ideas on alternative funding mechanisms are rising in international fora discussions, possibilities of setting up access fees, membership costs, or another one is the development of annual subscriptions as under consideration in the ITPGRFA (Wynberg et al., 2021). Anyhow, the decision to opt for a multilateral system for ABS under the KMGBF is a step closer to managing agrobiodiversity components with a commons-based spirit and is reinforced by the addition of goal D which could pertain a sign that the decisionmakers aim for the possibility of de-coupling access to GR from benefit-sharing and to place monetary mechanisms outside of the usual financing flows.

As could be predicted acknowledging the timeline this study project has been following, at the time of the writing of this analysis section, not even a clear output of the framework has been produced, the prospect of finding any relevant information on outcomes from the KMGBF is close to minimal. Efforts to contribute to a preliminary analysis of the framework's effectiveness have been done by reviewing news article of quality outlining credible outlook and consequences of the KMGBF, pinpointing scholarly reports on advances up to this date, such as the one by D. Obura, and uncovering relevant journal articles published by field experts like Scholz et al. (2022) laying out arguments on what the further developments for the framework must look like for positive outcomes and impacts. According to Robuchon et al. (2023) the inclusion of a wide definition of genetic resources adopted by Kunming–Montreal GBF represents a significant improvement compared to the CBD strategic plan 2011–2020. As the resources under the KMGBF also capture the nonmarket values of biodiversity there is hope for achieving transformative change. The reflection of a right-based and human centric approach to biodiversity actions is another promising feature of the framework. On the other side, the consensus-based approach meant to ease parties to accepting commitments is sometimes criticized for softening the ambitions of the international accord, along with the non-participation of the United States, and the lack of sanction for parties failing to achieve targets and goals (Döring, 2023), major concerns about the KMGBF reinterring the failures of the Aichi Targets have emerged.

On the international stage, a huge accomplishment of the KMGBF can already be observed at this early stage. The multiple advances in knowledge, technology and databases that can be

linked to the extraordinary mobilization of the scientific community in both academia and NGOs for bringing a much-needed load of information to the attention of policymakers in advance of the Kunming-Montreal GBF negotiation cessions has to be praised. Scientific communities have self-organized the creation of groups in order to support and provide insights on draft propositions for the framework, and at proposing or developing the right indicators for its monitoring system (Robuchon et al., 2023).

# Chapter 5: Discussion

DSI is an overall term including genetic information, bioinformation, natural information, genetic sequence data, nucleotide data and genetic resources in silico (Smyth et al. 2020). The complexity resides in the fact that each institution uses its own concept. Indeed, a clear and harmonized definition of the term has not been agreed upon. The term DSI has been introduced by the CBD and the NP, but other big organizations have tried to refine the terminology to a definition without success. The term being used by different disciplines, themselves still evolving, has led to an impasse in agreeing on what is referred to and what should be included or not under the umbrella term of DSI. Smyth et al. (2020) clarify that from a technical perspective, DSI is the representation of gene function and position, as well as protein expression. This gives away information on a plant's gene's location, role, and structure. From a legal context perspective, DSI also includes the research into sequencing the plant's genome, the actual genomic data, and the application potential of the sequenced genome.

This chapter is discussing the current state of affairs surrounding the topic of DSI, and its direct link with sovereign rights under different agreements, as well as its repercussion on benefit sharing. A realization made possible from the wise words of Aubry et al. (2022) first needs to be shed light on. The description by the convention on biological diversity and other international fora, as well as news reporters and scholar quality media outlets, of DSI as a "new" or "emerging" issue draws the most illuminating picture on the lag that exist between scientific progress and political practices. As early as 1999, the challenges of digitalization were already recognized as authors praised the collection and storage of GR in the form of DNA sequences to be more attractive than in the material form as seeds (Pistorius & van Wijk, 1999). Hence, it becomes clear that it was not the actual rise of digitalization of bioinformation that pushed the issue of DSI at the forefront of political debates, but rather the fear of a new type of digital appropriation of genetic resource threatening this notion of individual ownership and state sovereignty so cherished by the CBD and other governmental decision-makers.

This realization also serves as the "eureka" moment surrounding the model that this study project has been following. Whereas access and benefit sharing issues are related to "normal" physical genetic resources and have been under the spotlight due to their strong link with the highly disputed matter of intellectual property rights. Under these circumstances, the most interesting feature to consider as a researcher is the divergence between PGR-related agreements and legislations following a stewardship approach, which advocates for a complete disinterest in IPRs, as opposed to the ownership approach that is fundamentally established and economically reliant on IPRs. Alternatively, digital sequences information are related to "new" immaterial genetic resources and are currently framed up for their link to the life sciences broad sector and the agrobiodiversity market. From this standpoint, an interesting factor to study this same divergence between PGR-related agreement and legislations is on the actual instrument's design showcasing regulatory characteristics, which constraint market opportunities and to which stakeholder are usually reluctant, or the antipodal market-based features broadening opportunities for market expansion, and generally welcomed by commercial actors. Nonetheless, under the comprehension that this "new" data is in reality not veritably new but rather used as a way of exposing a "novel" treat, the one of misappropriation of biological information, hence the one that was actually linked with the first component of the model, it becomes of scholarly interests to study both variables as interdependent. In my personal understanding, the ongoing political debate is inherently a story of stirring up the old IPR pot with a new DSI spoon.

# I. The advantages and benefits of DSI

Secretariat of the Commission on genetic resources for food and agriculture, Dan Leskien (2021) provides multiple insights on how DSI plays an essential role in a variety of research areas. DSI allows for efficient storage and management of large amounts of genetic data. In the field of gene discovery, it contributes to the understanding of molecular basis of life and evolution. DSI is used to identify new genes and variations, or to manipulate sets of genes to understand the mechanisms behind biological processes and provide new solutions. Another common usage is to compare the genomes of different organisms, giving insights into evolution of species and their adaptation to different environments. In agriculture, DSI can be used to identify origins of product or genetic variations that are beneficial for crop breeding. Development of new biotechnology products, such as genetically modified organisms and synthetic biology are also affiliated with DSI. DSI has proved significant for a lot of countries which rely on access to and exchanges of DSI to deal with health, food security, and climate change challenges. As demonstrated through these many illustrations, within the fields of agricultural or life sciences research, scientists use sequences data as a main part of their creation processes, and openness as well as public availability to databases is a basic requirement for them to continue their lines of work. Policies that have the potential to limit the access to this resource, which bears large financial and individual costs, and are often used towards research for the public good, hence created concerns or even resentment from the scientific community point out Rohden and Scholz (2022). Finally, and what is being demonstrated in many international fora is the potential of DSI to become a critical tool in the conservation of biodiversity. Ranging from the simple in-situ conservation purpose of monitoring genetic adaptation of species to natural habitats, to the specific aid provided in ex-situ conservation by maintaining genetic diversity of species in captivity with the intention of reintroduction. DSI also promotes the identification of endangered species along with the monitoring of population trends and assessment of genetic diversity, all which help at identifying species in need of conservation efforts. Conservation strategies like identifying preferred habitats along with their most suitable management and protection practices, as well as new technologies such as genetic engineering, owed to DSI development are seeing day to assist in solving biodiversity loss (Leskien, 2021).

Von Wettberg and Khoury (2022) wrote an article on the importance and challenges regarding ABS of biodiversity data by collecting various scholarly evidence and viewpoints on the DSI issues. Major themes emerged from this, one being that the rapid development of synthetic biology and the subsequent exchanges of biodiversity data have provided the society with enormous benefits, as exposed through this above standing paragraph. An idea that is reinforced by perhaps the most influential example of DSI use from past years being the development and sharing of the SARS-CoV-2 sequences. Nevertheless, many examples point out that the distribution of both uses of DSI and products derived from DSI are inequaly distributed around the world, and so are benefits arising from their commercialization. Which is an even heavier burden to bear when knowing that, as clarified by Scholz et al. (2022), besides their relevance for research and innovation, DSI further holds great potential for commercial applications which could be a new means of creating economic development for the countries that hold most of the world's biodiversity.

# II. The challenges associated with DSI and the importance of its management

DSI has revolutionized the access and use of biological resources as data. Open access to data being the backbone of research, DSI have created an enormous freedom for the scientific

community. However, political decisions, mostly undergone by institutions of the CBD, could compromise the working terrain of researchers and developers. National measures adopted by parties pursuing the CBD's objectives may create obstacles to the access and use of GR (Silvestri & Mason, 2023). Moreover, coming from the recognition that DSI holds a great amount of economic value through transaction and commercialization of GR-based products, there are concerns growing from the fact that these benefits are not distributed equitably from a global perspective (Scholz et al., 2022).

The CBD recognized that states have sovereign rights to regulate access to their genetic resources and had subsequently created a mechanism requiring users to obtain PIC under MAT in the hopes to ensure that a greater deal of the profits derived from the use of GR would be shared back to the providing country (CBD, 1992). Subsequently, the Nagoya Protocol was created to bring more legal clarity to the framework surrounding ABS from GR (CBD, 2011), yet it hasn't solved the growing issue of digital biopiracy or bioprospecting, neither does the protocol state weather DSI fits into its scope or not. Indeed, Scholz et al. (2022) noted that this bilateral system of access and benefit-sharing has proved inefficient. The digitalization of biological information and advances in genomic technologies and synthetic biology enabled scientist to gather DSI information and to make them available worldwide with the click of a few buttons (Rohden & Scholz, 2022). Indeed, DSI was held in online open-access database, through such a system of access no permits or contracts were needed by users of GR, hence no benefit sharing from commercialization was either finding their way back to origin countries as it would be the case for physical genetic resources (Smyth et al., 2020). This system undermining the fundamental provisions of the NP is perceived to be a loophole against fair and equitable ABS (Scholz et al., 2022; Rohden & Scholz, 2022).

Lastly, the intentions of the CBD and the NP in nations implementing ABS measures has come short of achieving the desired outcome both for biodiversity conservation, and for capacity-building in developing countries (Silvestri & Mason, 2023). The mechanisms in place for ABS, overcomplicating the access to GR for non-commercial research, or burdening import and export of GR with restrictive legislation, have thus negatively impacted research on biodiversity and conservation projects, state Silvestri and Mason (2023).

# III. The role and impact of DSI across multiple fora

DSI is under discussion in multiple international instruments and political forums. These have different and sometimes even competing interest, the search for their balance is creating a complex web of interactions. Under the framework of the CBD and the NP, an important player in the DSI debate due to their predominance for taking the matter of ABS under their umbrella, the topic of DSI is "reviving long lasting debates on what is or should be understood to be included within the concept of genetic resources" (Silvestri & Mason, 2023). The authors go on explaining that in the case DSI is excluded from CBD's scope, origin countries providing GR for research would not benefit back from their material once their information has been digitalized and stored in a database. On the opposite, in the case DSI is included within the CBD, difficulties in tracking and tracing the origin of the genetic material from which DSI was taken, complexities in monitoring the use of DSI and in determining the DSI have actually contributed to the final product's realization and to what level benefits need to be shared (Silvestri & Mason, 2023).

Discussions on the way to govern over DSI have been ongoing under the CBD and the NP since 2016, parties have recognized the need for a coordinated and non-duplicative solution (Silvestri & Mason, 2023). Under the ITPGRFA discussion started in 2017, but unfruitful

negotiations led to a decision to wait for DSI development under the CBD (Brink & Van Hintum, 2022). Nevertheless, Rohden and Scholz (2022) state that both the ITPGRFA and WHO "have the potential to set up rules for specific subset of DSI that are crucial for humanity beyond the scope of environmental protection and economic endeavors". The landscape of the negotiations under the CBD is one of tensions between parties prioritizing open access to DSI who claims its importance for meeting the UN SDG, and those parties that prioritize the fair and equitable sharing of benefits arising from DSI uses (Rohden & Scholz, 2022).

## 1. Under the CBD

Rohden and Scholz (2022) noted that an uncommon procedure for the controversial issue of DSI was made at the COP14, because a total of four rather than one study on DSI was commissioned. A signal of the disagreement among parties joined by the complexity of finding a solution to the matter. Another aspect of divergence from the norm resided in the 2020 findings from the Ad Hoc Technical Expert Group (AHTEG), experts commonly used to solve controversial issues, not being discussed in the Subsidiary Board on Scientific, Technical and Technological Advice, which usually discusses technical issues and prepares documents to be discussed during the COPs, but rather directly within the Open Ended Working Group (OEWG) for the preparation of the post-2020 GBF (Rohden & Scholz, 2022). This decision to push the DSI topic straight to the OEWG tied it inherently to the GBF and created a situation of all-or-nothing for parties that depended on its resolutions (IISD Earth Negotiation Bulletin, 2022).

Under the CBD, the authority over access to GR resides within national governments, and is thus subject to national legislation. Still, the CBD promotes the creation of facilitated access to GR among contracting parties, and indubitably PIC and MAT needs to be honored, along with actions to respect benefit-sharing terms (CDB, 1992, Art 15). Article 16 sheds light to the convention's recognition that access to and transfer of biotechnology are essential elements for attaining its objectives. However, parties also recognized that patents and other intellectual property rights could have different influences, and thus national laws and international regulations have to be taken into account so as to honor such rights. While article 17 clearly states that parties need to facilitate exchange of publicly available information that could be of importance for conservation or sustainable use of biodiversity. Alike, Article 19 articulates that parties need to take measures to provide possible participation in biotechnological research activities to other contracting parties, with a special focus on developing countries who mostly provide the GR basis for such research. Expressing furthermore that parties must take all practicable measures to promote a fair and equitable access, especially for developing countries, to both the results and the benefits arising from biotechnologies arising from GR (CBD, 1992). Under article 23, the NP encourages collaboration and cooperation among parties regarding technical and scientific research, this includes facilitated access by, and transfer of biotechnology to, specifically least developed countries. This with the final aim of strengthening the base for attaining the Convention and its protocol's objectives (CBD, 2011).

## 2. Under the ITPGRFA

DSI could have a substantial impact on the rights recognized by the ITPGRFA, and its benefits sharing regime. The DSI of important crops is already in the public domain due to the openness of databases – meaning that there is no traceability of origin, as much as it not being under the direct control of anyone (Smyth et al., 2020). Yet, benefits arising out of varieties developed using DSI are themselves traceable and should find their way towards the Benefit-Sharing

Fund, according to Pratibha Brahmi, principal scientist at ICAR's National Bureau of Plant Genetic Resources (Pandey & Ghosh, 2022). According to the submission of views and information on digital sequence information (ITPGRFA, s.a.b), there are 4 areas where DSI is of importance: the multilateral system of ABS; the global information system; cooperation with the CBD, and the multi-year program of work of the Governing body. However, with the aim to coordinate efforts with the CBD, the governing body of the plant treaty requested to promote coherence and mutual supportiveness regarding the issue of DSI. In this way, the decision lays in the hand of the CBD's COP in a future meeting (FAO, 2022a).

At the end of the 9th session of the governing body meeting no decisions have been taken other than the one to defer MLS, ABS, and DSI final resolution at the Treaty's 11th GB meeting tree years ahead (Varshney, 2022). The lack of consensus was most felt regarding the DSI issue, with some members willing to wait and see the results of the COP15, while others wanted to forge their own decisions that would be more in line with food and agricultural sector's needs. Some of the strongest opinions, as states by Varshney (2022) came from India who stated that the ITPGRFA being ahead in DSI discussion should be independent of the CBD's decision, and from North America (Not part of CBD) along with The International Seed Federation also both opposed to delegating this decision to the CBD. Meanwhile, Africa asked to urge CBD to consider a multilateral benefit sharing mechanism for DSI, an issue that they had raised at the CBD meeting too, making it a precondition for them to adhere to a potential GBF. Lastly, the Third World Network stated that there was a 'coordinated attempt to dismantle" ABS frameworks while DSI uses are growing worldwide (Varshney, 2022).

# IV. The way forward for DSI

The perfect outcome would be to settle a framework for the use of DSI that ensures open access to data, encourages the continued use and innovation in the field of bioinformation and leverages its powers for capacity-building internationally, enables fair and equitable benefit-sharing, and finally strengthens biodiversity conservation and protection worldwide (Scholz et al., 2022). For the scientific community, acting as the primary user of DSI, and for the managers of associated physical resource such as gene banks or botanical gardens, the outcome of a multilateral, universal, and fully open framework for DSI, with features borrowed from the MLS under the ITPGRFA, is the best way forth (Rohden & Scholz, 2022; Von Wettberg & Khoury, 2022). Monetary mechanisms could be placed outside of the access model, upstream of DSI generation, downstream of DSI use, or even completely outside of DSI life cycle (Scholz et al., 2022), and benefits could be directed towards a collective fund that distributes back to communities for conservation and sustainable uses, as in the ITPRGFA (Aubry et al., 2022).

Even though DSI has not officially been regulated under any agreement, by December 2020, 15 countries had created national legislations on DSI, and another 18 countries indicated being either in or planning to enter the process of creating them (Rohden & Scholz, 2022). The authors also specified that these new regulations, not being attached to the DSI-regulating fora, could get users into legal uncertainty, nevertheless most of the rules regard commercial uses and are triggered upon commercialization or patent application, mostly leaving DSI open for scientific noncommercial purposes. In a nutshell, national legislations around DSI are being created at the same time that a DSI framework under the CBD is being constructed. Compared to the status quo, any form of regulation will complicate collaborations and access to DSI for international research, still, having a patchwork of various rules coming from each country is less desirable than having internationally standardized rules for DSI and benefit sharing. Additionally, in a perfect situation, other international fora such as the ITPGRFA, WHO,

UNCLOS, and WIPO would coordinate actions to limit compliance and bureaucratic headaches for users.

By the end of December 2022, parties to the CBD agreed on a set of decisions for the KMGBF, which included provisions on DSI. Target 13 clearly states that the monetary and non-monetary benefits from use of GR and DSI should be increased by 2050 (CBD, 2022c). Yet, early cristicism are rising on the fact that the weaknesses of the current systems have not been addressed by the new measures, leaving people hoping for improvements while moving further on a dysfunctional path (SeedToday, 2023). For benefit-sharing from the use of DSI, a multilateral mechanism including a global fund, and a process to further develop and operationalize it has been established. This decision leaves some doubt on the effectiveness of such a mechanism when noting that it comes on top of another bilateral systems this time regarding genetic resources themselves, and that furthermore national measures may exist and need to be attended to simultaneously. Garlish Von Essen, Euroseeds Secretary General states that it is regrettable that instead of revisiting a nonfunctioning system that is in place since 1993, parties decided to add yet another layer of regulation for benefit sharing of GR (SeedToday, 2023).

Bart Van Vooren (2023) explains how this decision on a global mechanism on DSI happened. At the start of the COP15 the non-paper drafted by the OEWG stated that DSI was not in the scope of the CBD. Yet, during the negotiations, and under hard pressure from the African group, this notion was canceled and replaced by one stating that views on the matter were divergent (IISD Earth Negotiation Bulletin, 2022). Following from this, a need to find a solution on how to treat DSI matters grew bigger and bigger. Two options were on the table: A – on establishing a process for decision, and B – on taking a decision and coming up with a process. Until the high-level segment held during the last couple of days at COP15, no transparency on which option would prevail was to be peeked at (Van Vooren, 2023). The final decision leaned towards option B, with a mechanism established immediately in Montreal, and the details taken care of during the next couple of years with as deadline COP16 (CBD, 2022c). This choice is of high matter; a process would have more chance to drag out in time and eventually fail, while the option of decision now and forthcoming details creates pressure for parties to find a solution within the allocated timeframe, and eventually lead to success states Van Vooren (2023). Another feature that the author aimed to point out was the few deletions that were made between the 17th of December's text and the final version of the agreements (Van Vooren, 2023).

- The use of DSI on "biodiversity" will not trigger payments to the global fund, instead a narrower term, i.e. use of DSI on "genetic resources" was used in paragraph 16 to define what information would fit the multilateral mechanism (Van Vooren, 2023).
- The reference to "without prejudice to national laws" was moved to another paragraph where it strikes out less (Van Vooren, 2023).
- The text refers to a global fund, not a "multilateral" one anymore, to underscore the transnational, above-country importance of it (Van Vooren, 2023).
- Annex III, which contained details on this multilateral mechanism, was deleted in its entity. This above-stated Annex III that has been completely deleted from the final text did contain some enlightening information regarding the matter. First stating that a contribution to the fund could be expected from developed countries, as a 1% of net revenue from commercialized product that result from utilization of GR, TK, or DSI, to be contributed to the multilateral fund (Van Vooren, 2023).

Additionally, the question regarding the clear definition of DSI is still without answer (CBD, 2022c). Despite wide requests from the industry sector to come up with clarity regarding what

to expect from this mechanism, there is still no progress in defining this umbrella term under the global agreement. Van Vooren (2023) hints at two preamble texts that tried to tackle this heavy task, the 2022 note from the OEWG on recommendation adopted by the group on the post-2022 GBF, and the 2020 report from the AHTEG on DSI from GR. The outcome of this choice will be of importance to both public and private research entities. Van Vooren (2023) again suggest that a request for a wider definition would be pushed for, since an enormous amount of 15 billion USD per year need to be generated from DSI uses (CBD, 2022c). The other crucial question, which also did not receive any satisfactory answer before the closing call of the COP15 meeting regards how much and when users of DSI are supposed to pay. "Triggering points for benefit sharing" and "contributions to the fund" remain as issues to be further considered, meaning that discission will be ongoing until at least COP16 (Van Vooren, 2023).

# Chapter 6: Conclusions

This chapter serves as a conclusion to the project of conducting a thorough analysis of the past and current systems ruling over PGR's management, through the use of four in-depth case studies and focusing especially on the fair and equitable sharing of benefits from the utilization of GR, to discuss their institutional effectiveness, as well as exploring the link that DSI created between them, and uncovering the challenges and opportunities for international biodiversity regimes that arise from DSI. The first part will detail the denouement of each separate case study and how the agreement's relationship to the two sets of independent variables, perspective on agrobiodiversity governance and environmental policy instrument design, have influenced its output, outcome, and if relevant the broader international and national impacts it has generated. The hypotheses assembled under the theoretical framework have helped at shaping the direction of the analysis, and the case studies framed a wider and more nuanced argument around biodiversity regimes' relationship with management perspectives and instrument design. Following that I will address the limitations of this study's methodological approach and moving forward I will also make suggestion for further research.

## I. Overview of results

The analysis of the four case studies intended to clarify whether an international biodiversity regime's status as regulatory or market-based and pertaining a stewardship or ownership approach would correlate to its institutional effectiveness. Based on theories of regime effectiveness and a board range of scholarly literature on agrobiodiversity governance and international environmental agreements, I hypothesized regimes envisioning a stewardship approach and a regulatory status would see higher level of institutional effectiveness than their ownership envisioned market-based counterparts. This expectation was based on the two-fold argument that international environmental regimes often suffer from lousy definitions of targets and goals to achieve, clear responsibility division among members, and lack of enforcement and sanction mechanisms in case of negligence, as well as from decision-makers designing biodiversity-related agreements without acknowledging need for historical accountability nor current need to global equity principles.

*Table 23: Overview of Regimes' Institutional Effectiveness Scores.*

| **Institutional Effectiveness Indicator** | **IUPGR** | **CBD & NP** | **ITPGRFA** | **KMGBF** |
|---|---|---|---|---|
| Established at international level (Agreement is adopted) | 1 | 1 | 1 | 1 |
| Implemented at national level (National policies & legislations) | 1 | 1 | 1 | / |
| Monitoring/Enforcing system | 0 | 1 | 1 | 1 |
| Countries compliance (Submit national reports, strengthen existing rules) | 1 | 1 | 1 | / |
| Access component of ABS is followed (Permits and contracts have emerged) | 1 | 1 | 1 | / |
| Benefit-sharing component of ABS is followed (Non-monetary returns have emerged) | 0 | 1 | 1 | / |
| Benefit-sharing component of ABS is followed (Monetary returns have emerged) | 0 | 0 | 1 | / |
| Other positive effects internationally | 1 | 0 | 1 | 1 |

| | | | | |
|---|---|---|---|---|
| Other positive effects nationally | 0 | 1 | 0 | / |
| **Total** | **5/9** | **7/9** | **8/9** | **3/3** |

*Table 24: Overview of Regimes' Stewardship, Ownership, Regulatory, Market-based degrees and Institutional Effectiveness Scores.*

| **Regime** | **Agrobiodiversity Governance approach** | **Policy Instrument choice** | **Institutional Effectiveness score** |
|---|---|---|---|
| International Undertaking on Plant Genetic Resources | Stewardship (6/6)<br>Ownership (1/7) | Regulatory (2/3)<br>Market-based (1/6) | 5 |
| Convention on Biological Diversity & Nagoya Protocol | Ownership (7/7) | Market-based (5/6) | 7 |
| International Treaty on Plant Genetic Resources for Food and Agriculture | Stewardship (4/6)<br>Ownership (2/7) | Market-based (5/6)<br>Regulatory (1/3) | 8 |
| Kunming-Montréal Global Biodiversity Framework | Ownership (3/7)<br>Stewardship (2/6) | Regulatory (2/3) | 3 |

The case study data does not indicate through the chosen indicators a clear regime institutional effectiveness connection with a regulatory status and a stewardship approach, as envisioned by the base hypothesis I constructed. The most pronounced difference outlined by the results of this case study is that the two agreements designed as market-based instruments scored high effectiveness levels. Nevertheless, the two regulatory agreements might have generated better results if allocated the same development time as the two market-enabling ones. Indeed, it must be taken into account in inferring from these results that, on the one hand, the IUPGR has been shortcutted by the adoption of the ITPGRFA before having time to perhaps spawn long-term impacts, and on the other hand, the KMGBF has been set up under investigation for this project long before being implemented at national level, hence was not able to initiate any ABS or international impacts. Furthermore, the case study results do not outline such a pronounced link for the agrobiodiversity governance pathway variable, as the highest institutional effectiveness score is associated with a mild stewardship approach, the next best institutional effectiveness score with a strong ownership approach, then with the opposite strong stewardship approach, and lastly with a mild ownership approach. Yet once again, the argument concerning the KMGBF is hard to utilize. As the agreement ticked every indicator that it was in capacity to fulfill, it could be characterized as scoring high on the institutional effectiveness level, hence proving a plausible connection between ownership pathway and effectiveness. If this was the case, I would suggest as a rationale that the whole concept of access and benefit sharing is fundamentally based on an ownership understanding of exchange and usage of biological resources. The sole need for an ABS mechanism comes from the grounds of risks from misappropriation and enlargement of excludability of a commonly used scarce and rivalrous good. This would also be why, from this case study analysis, the outlook of a stewardship approach to increase institutional effectiveness based on the fulfilment of ABS indicators are not apparent. Yet, even with a system not designed for its frame of reference, namely a

stewardship approach rooting for a public and open MLS of access to PGR, the ITPGRFA scored the highest institutional level out of all four cases, one can thus only imagine how highly this agreement's achievements would be recognized in a system that would fit its intentions, away from GR access coupled with monetary benefit-sharing obligations. The last agreed-on instrument for governing PGR, the KMGBF, is showcasing a decision to opt for a multilateral system of ABS. This decision seems to be borrowed from or inspired by the system under the ITPGRFA, which might be a signal that decision makers have acknowledged these positive outcomes and impacts, and are on the right track to fulfill, with the help of this new tool, their long-awaited objectives.

# II. Methodological considerations

The first consideration is to determine whether the dichotomous distinction between stewardship and ownership approach has been valuable for this research. The complete break away from a millennia-long history of stewardship approach towards agrobiodiversity management that the CBD created, followed by the choice of displaying a clearly opposite vision to PGR management pathways under FAO's and the CBD's instruments, provides a rational of how interesting this distinction is for analyzing both past agreements' development and for producing and upgrading future ones. Additionally, the prominent shift from the CBD's and NP's preference for linear bilateral agreements towards an approach that resembles the tools under the auspices of FAO's instruments, a more open and public system of multilateral transfers, renders the distinction even more interesting to investigate. The same consideration between market-based and regulatory instrument can be investigated. As stated before, regimes generally include provisions that exhibit characteristics of both classifications. Under this study design, with the aim of answering the set of research questions formulated specially for this research purpose, and taking into account the set of effectiveness indicators chosen, the distinction in classifying the four selected regimes according to market-based or regulatory has proved insightful. However, no strict relationship can be inferred from the higher effectiveness provided through the two market-based instruments results drawn, as the two regulatory agreements encountered lack of time to develop impacts. Nevertheless, I believe the distinction worthy of scholarly consideration, especially in a case where the relationship with and/or effect of big multinational seed industries such as Bayer, DuPont, Monsanto, or Syngenta were under the spotlight.

On the methods used for assessing effectiveness, the literature being so broad on the matter and diverse results being found on each indicator dependent on the definition of effectiveness, the object to be evaluated, or the standards against which the evaluation is done (Young, 2011), the process to select a set of indicators to use in my research project has been challenging. Many authors make a point of stating that evaluating the effectiveness of environmental regimes is always a challenge (Young, 2011; Frantzi, 2008; Miles et al., 2002). There exist two major difficulties. On the one side, it is an arduous task to anticipate the hypothetical situation of no-regime, or to speculate about a plausible collective optimum, so as to have grounds for comparison. Miles et al. (2002) also depicts a challenge relative to operationalization of scoring regime's effectiveness, with the major difficulty in attributing an effectiveness score to a regime being to determine a point of reference, whether it be the collective optima or the no-regime counterfactual. I followed a straightforward analysis system, wherein I coded each indicator through a dichotomous system with a score of 0 showing absence in indicator and 1 showing indicator presence, which provides a rather black or white result and workable conclusions. Nevertheless, such a scoring system does not take into account variety within indicators and fails to consider relative achievement at meeting a target. By executing in-depth case studies, I made use of this method and in addition presented more nuanced ways of

indicating progress towards meeting the goals of the indicators, hence the results are also more subtle and cannot be liked to unequivocal recommendations nor generalizations. Indeed, the other common obstacle is to distinguish the causal impact of the regimes from the other factors affecting human behavior and/or the environment. Being able to separate the regimes' success signals from the noises associated with other factors in the context is laborious, and in lots of cases the establishment of a causal relationship between the regime and the changes seen in the initial situation are the target of authors' preconceived opinion criticisms (Miles et al., 2002). It is a common challenge impeding research in regime effectiveness of political institutions the one of multicausality (Wolf, 2010). I also believe it is of importance to clarify that in the realm of the abundant international environmental agreements, different opinions on the effectiveness of regimes can be more apparent than real, meaning that divergence in the definition of success and procedures chosen to evaluate effectiveness will fuel a greater disagreement than the actual contrast in opinions on the performance of the regime studied (Young, 2011).

In drawing conclusions from the analysis, it is also notable that the selection of regimes was not without flaws. I opted for a chronological storytelling and wanted to make a point of showing the historical evolution of governing agreements around PGR, I therefor selected the International Undertaking as a natural starting point. Nevertheless, I recognize that the lack of information on the output, outcome, and impacts that the agreement had, due partly to its early date of creation and party to its complete replacement by the International Treaty on PGRFA, created a feeble element for conducting comparative analysis with the cases of the CBD, the NP and the ITPGRFA being very well-documented. This same rationale applied to the last case that I selected, the KMGBF became a formal concept during the time of writing this study. It has both been a source of further development and certainly spurred some great ideas, still the decision to include it within the cases to analyze had its consequences, as little was known about the actual mechanisms that the framework would be including, what actions would be carried nationally, or what results on ABS it would perform. Hence, concerning the determination of its institutional effectiveness, much of the indicators could not be addressed, presumably lowering the quality of the comparison between cases.

Despite these drawbacks, this research project provides a valuable attempt to understand the past and current dynamics around the governance of agrobiodiversity, focusing on the fair and equitable achievement of benefit sharing, in the context of the rise of digital sequences information. This project can surely benefit from being expended on in future research when decisions will have been implemented nationally and outcomes or even impacts will have been produced.

# III. Recommendations for future research

While the connection of a regime to the perspective on agrobiodiversity governance and its policy instrument design seem to be important considerations for regime institutional effectiveness, these relationships cannot singlehandedly determine the success of a regime's output, outcome, and impact, but rather need to be considered alongside a host of other ones and contextual features. The results of the case studies suggest that the use of market-based instruments, in the context of biodiversity governance regimes, lead to high levels of institutional effectiveness. Future research should investigate this plausible causal link in other environmental or ethical governance regimes. As reinforced by the rise of DSI management being put on the international agreement's table, the participation of the life science sector and its industries has the potential to influence outputs, outcomes, and impacts of biodiversity regimes, hence directing future biodiversity-agreement decision makers to opt for market-based policy instruments appears to be the most promising route, and scholars should continue

pursuing research within this topic. While this study drew on the four major cases in PGR governance, issues closely related, such as the one of Farmer's rights or intellectual property rights, would support the further study of additional cases such as the UPOV act or the TRIPS agreement, which might have an influence on regime effectiveness too and generate evidence to the acceptance or rejection of this study's conclusions for the boarder biodiversity regime. Another prospect could be to study cases of national environmental governance, which could allow a more thorough understanding of how institutions and actors respond to biodiversity-related legislations. And finally, I believe that future research surrounding the field of agrobiodiversity should focus on unraveling the great potential that multilateral and commons-based systems could have in achieving the three common objectives of PGR-related agreements in the digital era.

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# Appendices

## Appendix 1

### Section 1:

Detailed information on the IUPGR's attributes towards a stewardship or ownership approach to agrobiodiversity governance.

Under the IUPGR, plant genetic resources belonged to the public domain, providing a fully open access, and were protected from appropriation. Access to its components was free and unrestricted for actors who would utilize them for the greater common good. Founding principles recognized the enormous contribution of farmers and traditional knowledge holders as stewards of plant genetic resources through the years. The major system in place for managing and conserving these resources was one prone to sharing. All of which resonated with the fundamental optique of collective contribution to, and collective responsibility towards, governing plant genetic resources worldwide. Nonetheless, the mechanism in place for benefit sharing under the IUPGR could be partially criticized for promoting ownership notions through using IPRs as basis for profit generation. However, the text article doesn't precisely mention IPRs, making the whole system ambiguous and at the mercy of different interpretation that might create misunderstandings and loopholes for users.

### Section 2:

Detailed information on the IUPGR's attributes towards a regulatory of market-based policy instrument type.

By enforcing free access to PGR, and awarding PGR to the public domain, the IUPGR imposes constraints and builds policies for the governance of agrobiodiversity. It might seem counterintuitive at first glance, because the general vision that we have on regulatory instruments is one that changes the context of an unrestricted towards a restricted space. Yet the notion still holds true when applied conversely. Through modifying the space wherein exchanges of PGR were subordinate to either forced free access or unregulated appropriation towards a controlled space under which the common heritage of mankind principle thrives, IUPGR showcases as an evident regulatory instrument of environmental policy. What is more, barriers to business as usual and subsequent commercial relations are being built, as well as control mechanisms that have to be put into place so as to monitor compliance with the standards set by the undertaking's regulations. Lettington (2001) in his article confronting the IUPGR with the TRIPS and CBD agreements, highlights that the IUPGR depends on a financial mechanism rather than on market manipulations to support its objectives and avoid asymmetries in access.

## Appendix 2

### Section 1:

Detailed information on the CBD and NP's attributes towards a stewardship or ownership approach to agrobiodiversity governance.

The adoption of the CBD affirmed a major shift into the era of PGR ownership. Countries could assert sovereign rights over their biological resources to control them as a regular commodity that could be traded for profit generation (Wynberg et al., 2021; Tsioumani, 2004). Additionally, ABS provisions, the main instruments praised for their ability to achieve the third

objective of the Convention clearly imply IPRs as the preferred way of creating means for benefit-sharing. The major provision relevant to the discussion on farmers' rights, described under article 8, provides that parties shall recognize the works of IPLC, and encourages the equitable sharing of benefits arising from the utilization of these resources solely for PGR used for commercial purposes or deemed worthy of IPR. ABS provisions creating the need for bilateral contracts recognizing value in extracting agrobiodiversity and commercializing the resulting products, under the CBD and its NP, show an appraisal of the privatization and commercialization of nature. Measures taken to ensure that materials are accessed with PIC & MAT deal with the common concern of misappropriation, a concern solely existing in a system that opposes shared resources for the common good. The essence of the system is one where actors individually own valued goods, in a market that allows actors to exclude each other from accessing and using the goods at hand, and essentially these goods need to have the peculiarity of being traded and sold for profit generation.

### Section 2:

Detailed information on the CBD and NP's attributes towards a regulatory or market-based policy instrument type.

The CBD created a direct link between the conservation of biodiversity and the economic goals of using biological resources for commercial purposes.The CBD was developed in a manner that layed the ideological basis for commercial transactions on biological component because it anticipated a spurring market for biodiversity. Indeed, the CBD both reflected and encouraged existing expectations that there would soon be a substantial market for biodiversity, the benefits from which would flow to developing countries (Tsioumani, 2004; Richerzhagen, 2014). Next to that, sovereign rights over genetic resources pertaining the major principle of the CBD and its NP, are as mentioned above an effective method for limiting the North/South asymmetries where manufactured products are valued and the raw materials that create them are discounted (Lettington, 2001), and for addressing the market failure that leads to biodiversity decline and the unfair distribution of benefits arising from uses of genetic resources. The market for biodiversity produces positive externalities in the form of food security or input for R&D, but as any externalities, actors in the market do not take these into account, hence investment in keeping these goods are lower than what they should be to actually sustain the resource as it is being used under the current market state.

## Appendix 3

### Section 1:

Detailed information on the ITPGRFA's attributes towards a stewardship or ownership approach to agrobiodiversity governance.

The shift back towards a more commons-based multilateral system for PGRFA was seen by many in the field as an important step back from the ownership approach claimed by the CBD (Andersen, 2016b; Wynberg, 2021). The terms of access to RG under this MLS are provided free of charge, alongside all information relevant to the good use of the resource, and in an arena reproducing the virtue of the public domain wherein protection from appropriation is provided. Contracting parties recognize the contribution of farmers and TK holders throughout the world in conserving and making available the resources that constitute the basis for our food security system nowadays, without regards to these resources having profit-making values or not. When utilizing material issued from the multilateral system, Andersen (2003) explains, users can't seek any form of intellectual property protection on the accessed germplasm in the

form it is received. However, this provision has been up for discussions as the wording leaves space for interpretation of how much of the material actually has to be modified to no longer be seen as 'in the initial form received'. On top of that controversy, the twofold benefit-sharing mechanisms under the treaty could be depicted as being reliant on commercialization from PGR for profit generation and promoting the value of extracting agrobiodiversity. The regulation stating that a payment must be flowing to the benefit-sharing mechanism in the case that a product receives patent protection lays the treaty's economic basis on utilizing IPRs to redirect monetary benefits to the fund. The means collected will be used in conservation and capacity building activities for PGRFA especially in developing countries, which could have the trait of acting for common good, nevertheless, these uses show the incline of the International Treaty towards an ownership approach in governing agrobiodiversity.

## Section 2:

Detailed information on the ITPGRFA's attributes towards a regulatory or market-based policy instrument type.

The adoption in 2006 of a standard material transfer agreement for all exchanges among and between parties of the ITPGRFA lowers critically the transaction costs on trade and is clearly as tool facilitating business practices and relations (Andersen, 2016b). The creation of an arena for exchange, as the one that the MLS represent, could be seen as the rise of a novel kind of institution that might have the potential to fix the market failures around biodiversity. Under the conditions of the MLS, transaction costs are low and there are no information asymmetries. Positive externalities are taken into account in the transactions as all actors within the system get to benefit from them and are thus no longer viewed as externalities. Property rights are well defined as the resources under the system belong to the public domain and are protected from appropriation. Time lags and administrative complexity have also been reduced to almost nothing thanks to the development of SMTAs. Looking at the market structure, in normal conditions, provider countries tend to be in a weaker position as users have a wide array of options to pick from. The current biodiversity market state is dominated by a small number of large-scale buyers. To reach fair and equitable benefit sharing, actors should be on an equal footing in negotiations, and there should not be other alternatives for identical resources available under feeble regulations weakening the bargain position of one of the actors in the deal. The market structure depicted under the MLS of the treaty offers multiple qualities that address these issues.

Despite the range of arguments pointing towards the treaty to be a market-enabling policy instrument, it is important to note that FAO, acting as the institution in charge, commanded a reduction of the externality, in this case being the inequitable access to PGRFA and sharing of benefits arising from it utilization, and subsequently controls the compliance of actors with performance and/or technological standards, here through a required compliance procedure reporting on national measures taken towards obligations of the treaty to be send to the compliance committee. This command-and-control behavior of an institution is a clear regulatory instrument attribute.

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