1. A Short History of Agrobiodiversity Loss and Conservation

Farmers have collected and conserved seeds for exchange and future sowing for as long as agriculture has existed. Centralised seed collections conserving seeds of different origins for the purposes of research, breeding, and profit-making, are the forerunners of today's seed banks and their history dates back to the European explorerism of the colonial era. Historians of colonial botany have shown that prospecting for botanical resources all around the world – seeds, plants, as well as knowledge about their cultivation –, introducing them into botanical gardens at home, and transplanting them to plantations in colonial satellite states was an important part of colonial empire-making (see Crosby 1972; Brockway 2002, 2011; Philip 2004; Schiebinger 2004; Schiebinger/Swan 2005; Subramaniam 2024). With the rise of genetics in the early twentieth century, the practices and purposes of collecting, introducing, and conserving seeds and plants fundamentally changed. An often-cited key figure in this development was the Russian botanist and plant geneticist Nikolai I. Vavilov (1887–1943). In the 1920s and 1930s, Vavilov headed over 40 plant exploration and collection expeditions around the world, in the course of which he assembled the largest seed collection of his day and developed his pioneering theory on the "centers of origin of cultivated plants" (Vavilov [1926] 1992a). These centres were areas particularly rich in plant diversity, which Vavilov identified as the genetic places of origin of today's domesticated crops. Most of them were located in what would today be called the Global South.[1]

1 According to Vavilov's "genetic geography" (Kloppenburg [1988] 2004: 175; Flitner 2003), all seven centres of origin he had identified by 1940 lie in what he referred to as the South (see Vavilov 1992b). Jack Harlan (1988: 357) remarks that with six of them located north of the equator, the distinction of North and South must be understood politically, corresponding roughly to what used to be called developed and develop-

Inspired by Vavilov and in the wake of the proliferation of the science of (plant) genetics, more scientists, especially in Germany and the United States soon followed his lead in collecting and conserving the world's "plant resources", as Vavilov referred to them.[2] Insofar as this endeavour was guided by a vision of geneticised agricultural modernisation and hence oriented towards research and breeding, the collecting missions in the first half of the twentieth century came with the establishment of large repositories to store and conserve the collections for the medium term. Thus arose the first seed banks of the kind known today, which were instituted as key elements of a scientified and soon to be commercialised agriculture (see also Fowler 1994: 58–63).

The arc of the history of international agrobiodiversity conservation efforts I recount in this chapter begins in the aftermath of these developments, in the mid-twentieth century, when the loss of biodiversity in agriculture first became a matter of international concern. It ends with the establishment of the Svalbard Global Seed Vault in 2008. Subsequent developments of relevance to the story of the Seed Vault are discussed where they are relevant throughout the chapters that follow. At the starting point of the story I tell here, therefore, seed banks already existed as an integral part of agricultural research and practice. This is a significant factor in how *ex situ* conservation became the core strategy in internationally concerted efforts to conserve agricultural biodiversity. The number of scholars who have paid systematic attention to the history of seed banking is relatively small, although there has been a surge of interest in recent years (see Kloppenburg 1988, [1988] 2004; Flitner 1995; Flitner/Görg/Heins 1998; Flitner/Heins 2002; Flitner 2003; Saraiva 2013; Fenzi/Bonneuil 2016; Peres 2016; Fullilove 2017; Bonneuil 2019; Curry 2017a, 2019a, 2022a, 2022b). These accounts develop intriguing analyses of the history of seed banking as a manifestation and motor of biopolitical empire- and nation-making, modernisa-

ing countries. In what follows, I use the terms "Global South" and "Global North" as they are commonly used today. Countries of the Global South are referred to as 'developing countries' only in the case of direct or indirect quotes from historical accounts discussed. Putting the term in scare quotes serves to mark it as an expression of the Eurocentric developmentalist discourse that I do not mean to reproduce (for a critical account, see Kothari et al. 2019).

2 For detailed accounts of Vavilov's story, work, and impact, see Flitner (2003), Saraiva (2013), Bonneuil (2019), and Curry (2022a).

tion, and globalisation through scientification, geneticisation, securitisation, and other socio-historical developments.[3]

The short history of international agrobiodiversity conservation developed in this chapter builds on these historical accounts; however, it does not offer a detailed reconstruction of their analytical arguments. The aim of what follows is not to provide a comprehensive analysis of all technoscientific, political, economic, social-ecological, and other developments of relative historical importance to agrobiodiversity loss and conservation in general. Rather, it is to trace the specific historical developments leading towards the establishment of the Svalbard Global Seed Vault as the first international backup seed repository for the long-term conservation of the world's agrobiodiversity. To do so, next to historical accounts, I assemble a number of sources from within the world of agrobiodiversity conservation which illuminate the controversies, cooperations, and institutionalisations that were crucial in paving the way for the creation of the Svalbard Global Seed Vault. This tracing of the history of the world of agrobiodiversity conservation through its own accounts provides an initial (historical) mapping.[4]

Section 1.1 begins by elaborating how the development-policy-driven technoscientific modernisation of agriculture in the aftermath of World War II engendered a large-scale loss of agricultural biodiversity, which was officially recognised as a global ecological problem in the mid-1960s. Section 1.2 traces the discussion of "genetic erosion", as this problem was termed, in the international agro-political arena created by the United Nations at that time. It elucidates the historical context in which the conservation of plant seeds in genebanks became the international conservation strategy of choice in the 1970s. In the 1980s, the collection and centralised conservation of the plant genetic "heritage of mankind" became the subject of a highly politicised controversy around access and sovereignty rights between the resource-rich countries of the Global South and the emerging agro-industry of the "gene-

3 I provide a short overview of these accounts in chapter 2.1 and unfold their arguments in greater detail where they are directly relevant to my own arguments.

4 An important source for developments up until 1990 is Cary Fowler and Pat R. Mooney's book *Shattering: Food, Politics, and the Loss of Genetic Diversity* (1990). These authors were two of the first activists who red-flagged the large-scale loss and destruction of plant (genetic) diversity, and both of them have remained active within the field to this day. While Mooney spent his entire career in the civil society sector, Fowler was active in a number of the international institutions introduced in this chapter and eventually became the founder of the Svalbard Global Seed Vault.

poor" Global North. Section 1.3 discusses how this politicised climate influenced the negotiations of the first International Undertaking on Plant Genetic Resources (1983) in the United Nations' Food and Agriculture Organization (FAO) and derailed a first attempt to establish an international seed storage facility in the Arctic. With the UN Convention on Biological Diversity (1992), the landscape of global conservation efforts changed. Section 1.4 elucidates how new commitments, combined with a lack of attention to the agricultural sector's specific needs, engendered new forms of cooperation. These resulted in the first legally binding International Treaty on Plant Genetic Resources for Food and Agriculture (2001), which finally paved the way for the establishment of the Svalbard Global Seed Vault in 2008. Section 1.5 introduces the Seed Vault in organisational and technical terms.

1.1 The "Green Revolution": Agricultural Modernisation and the Making of Agrobiodiversity Loss as a Global Ecological Problem

In the wake of World War II, countries all around the world were faced with severe hunger crises and concomitant societal upheavals. In 1941, the US government under Franklin D. Roosevelt launched an international agricultural development programme to fight hunger in the Global South, especially in Central and South America and Asia. The programme that came to be known as the "Green Revolution" (see e.g. Baranski 2022) was designed by Vice President Henry A. Wallace, a former long-time minister of agriculture and founder of the Hi-Bred Corn Company, one of the large corporations in the US seed industry. Funding primarily came from the Rockefeller Foundation. The pivotal elements of this development initiative were newly established international agricultural research centres (IARCs) oriented towards increasing agricultural production and thus feeding people as fast and directly as possible. The first IARC was established in Mexico as part of the "Mexican Agricultural Program" (Fowler/Mooney 1990: 56–57; Flitner 1995: 131–132; Curry 2017b).[5] A core component of the Green Revolution strategy to increase agricultural production

5 In 1966, this research and plant breeding centre became the International Maize and Wheat Improvement Center (CIMMYT), which still exists today as one of fifteen IARCs worldwide under the auspices of the Consultative Group on International Agricultural Research (CGIAR).

with the help of the IARCs was the breeding of so-called "high-yielding varieties" (Fowler/Mooney 1990: 55) of a region's most important crop plants. These "miracle" (Gan 2017) crop breeds were "high-yield, quick-growth crops with harvest times dramatically accelerated by new inputs that included chemical fertilizers, insecticides, and mechanical equipment, as well as new infrastructure that included irrigation networks, agricultural extension agencies, and rural village banking" (Gan 2017: 62). Insofar as their 'miracle' traits were the result of a high responsiveness to chemicals and irrigation, critics also refer to them as "high-response varieties" (Fowler/Mooney 1990: 54–60; Shiva et al. 2002).[6]

Apart from chemicals and infrastructure, a prerequisite for breeding new varieties is a stock of existing varieties whose desired traits can be harnessed for crop improvement. Therefore, part of the IARCs' everyday business was to collect the greatest possible diversity of locally adapted crop varieties from farmers' fields, which are also called "traditional varieties" or "landraces" (FAO 2019: 11).[7] A corollary of the extensive introduction of 'improved' varieties that would eventually prove to be fatal was the decline of genetic diversity in the field. For the time being, however, the "erosion of landraces was perceived as a side effect of the desired genetic modernization and homogenization of agriculture" (Fenzi/Bonneuil 2016: 75), that is, as a necessary and therefore inevitable consequence of the rationalisation of industrial production. Inasmuch as it made large-scale agricultural production more efficient and served to centralise control of agricultural goods such as seeds, this modernisation was also in the interest of free global trade – a professed goal of US-American and international (agricultural) politics at that time. In 1943, President

6 According to Fowler and Mooney, these developments in crop breeding marked the beginning of a more extensive and lasting "connection between seeds and chemicals" (1990: 130; see below). In 1970, the American agronomist Norman Borlaug, a key figure in most histories of the Green Revolution, received the Nobel Peace Prize for his development of semi-dwarf wheat varieties at CIMMYT. A different challenge to the story of "miracle varieties" than that dismantling them as highly responsive to chemicals can be found in Baranski (2022). She points out that in India, state-supported establishment of irrigation infrastructure actually resulted in "a higher annual growth rate in food crop yields *before* the introduction of new seeds" (Baranski 2022: 7, emph. in orig.).

7 Gan (2019) insightfully discusses the racialised genealogies, implications, and performativity of the taxonomic distinction between "'modern' or 'elite' seeds and genetically modified or 'improved hybrids'; 'traditional' or 'native' landraces; 'weedy' relatives; and 'wild' ancestors" (Gan 2019: 2).

Roosevelt convened an international conference in Hot Springs, Virginia (USA), with the goal of reducing international trade restrictions and advance multilateral cooperation in food and agricultural issues among the Allies and future member states of the United Nations (UN). This conference created a commission that became the FAO in 1945 (Fenzi/Bonneuil 2016: 75; Flitner 1995: 133–134). The FAO remains one of the most important organisations in global agricultural politics to this day.

The Green Revolution strategy strongly shaped international agricultural politics in the UN environment in the aftermath of World War II and must be situated in the historical and socio-political context of that time. While the professed humanitarian impetus of the Green Revolution was to avert hunger crises, critics argue that the Green Revolution strategy also served the US Government as part of its strategy to contain the perceived danger of "Red Revolutions" (Fowler/Mooney 1990: 56; Heins/Flitner 1998: 20), that is, of a proliferation of communism. In Mexico, where the programme was first implemented, extensive agrarian reforms had disempowered large landholders in previous years and peasant farmers were striving for further land reforms. In South and Southeast Asia, where there was also a struggle between the capitalist West and the communist East, it was increasingly recognised that "these problems stemmed from rural discontent, and rural discontent stemmed from hunger" (Fowler/Mooney 1990: 56), for which there could be no military solutions.

In the eyes of Western agronomists, the small-scale and subsistence-oriented farming system predominating in these regions was both economically inefficient and unable to implement improvements they considered necessary to quickly increase agricultural production. Rather than supporting farmers and land reforms, therefore, the Green Revolution development strategy pursued a top-down approach that consisted in strengthening governments and national agricultural institutions as well as in bringing in agronomic "experts" from the industrialised world. At the same time, efforts were made to transform "potentially volatile peasants into cooperative capitalist farmers" (Curry 2017b: 2). This was achieved by, among other things, discursively constructing "far-away communists capitalizing on the poverty of the countryside [...] as the main enemies of global progress towards peace and prosperity" (Flitner/Heins 2002: 328). This shows that the ideas about agricultural development that scientists and agronomic experts from 'developed countries' imported into the 'developing world' through the Green Revolution are deeply rooted "in contemporary theories of economic development and [...] bound closely to US geopolitical concerns and strategies for national security in the midst of the Cold

War" (Curry 2017b: 2). The breeding and introduction of 'improved' high-yielding crops in the 'developing world', then, not only served to fight hunger but was a developmentalist bio- and geopolitical instrument to establish Western and capitalist hegemony after World War II (Flitner/Heins 2002: 320).

Although agricultural and food production indeed increased in the context of the Green Revolution, according to Fowler and Mooney, hunger persisted and even increased in many of the areas where the new high-yielding varieties were grown. They explain this discrepancy as follows:

> "From the beginning they did not grow as well for the poor farmers as for the richer ones. Achieving high yields required fertilizer and irrigation. Fertilizer and irrigation nourished weeds as well as crops, creating the need for herbicides. And pests found the uniformity of new varieties appetizing, which necessitated the use of insecticides as well. Farmers lacking access to capital to buy these items were simply left in the dust." (Fowler/Mooney 1990: 58)

For Fowler and Mooney, it follows that one of the problems with the Green Revolution was that "it offered a technological solution to a social and political problem" (ibid.). What is more, this solution was developed in a world that essentially differed from the worlds in which it was implemented. In consequence, "[f]or many a Third World farmer, it was not just a new way of farming that had to be learned, but a whole new world view that had to be assimilated" (Fowler/Mooney 1990: 75). Instead of supporting existing self-provisioning food systems by integrating local farming systems into the production process and providing produce to the hungry through effective distribution, the developmentalism of the Green Revolution created dependencies that ultimately strengthened the industrial sector in the 'developed' world (see Fowler/Mooney 1990: 130).

It becomes discernible that the Green Revolution, as Marci Baranski argues, "was not a linear transfer of technology but rather a result of coinciding sociopolitical forces including the Cold War, technological optimism, the rising status of plant breeders, new institutions in international aid and development, and changing agricultural policies" (2022: 11). Or, as Fowler and Mooney put it, it was not "something as clean as the 'modernization of agriculture' or as simple as the importation of new varieties" (1990: 76). Following these critical accounts, I understand the Green Revolution as a performative manifestation of a particular approach to doing agriculture. This approach was historically and socio-politically situated in the technologically and science-driven post-war "development project" (McMichael 2019) that the Western world began to cultivate in the mid-twentieth century to consolidate the global capitalist economy. The euphemistic promises of 'improvement' and 'revolution' discursively obfuscate the imperialist underpinnings of a developmentalism purporting to be in the interest of humanity at large. They obscure that what was homogenised through the breeding and large-scale introduction of 'improved' varieties were not only seeds and agricultural products but also the agri-cultures practiced in different parts of the world.

In the world of crop plants, the homogenisation and interspersion of agricultural products and production with chemicals resulted in the destruction of habitats as well as in the replacement of traditional landraces with "modern 'cash crop' varieties" (Fowler/Mooney 1990: 76). According to Fowler and Mooney, the devastations and the threat to crop diversity that come with this development are hard to overestimate:

> "The genetic diversity being lost today is the foundation of future plant breeding, of future plant evolution. If enough diversity is lost, the ability of crops to adapt and evolve will have been destroyed. We will not have to wait for the last wheat plant to shrivel up and die before wheat can be considered extinct. It will become extinct when it loses the ability to evolve, and when neither its genetic defenses nor our chemicals are able to protect it. And this day might come quietly even as millions of acres of wheat blanket the earth." (Fowler/Mooney 1990: 89)

The following section discusses the social-ecological crises provoked by this progressively advancing extinction – or erosion, as it was eventually termed – as well as the rise of seed banking as a countervailing measure embodying the promise of stabilising modern agriculture.

1.2 Genebanks Against Genetic Erosion: The Proliferation of *ex situ* Conservation

With the FAO, the first intergovernmental organisation dedicated to globally coordinated agricultural and food policy entered the political arena in 1945. In its early years, the FAO's efforts were concentrated on plant exploration, breeding, and the introduction of new varieties. The FAO conference of 1959 was the first to acknowledge the potential ecological threat arising from the homogenisation of crop cultivation and the ensuing de-cultivation of diversity in the field (Flitner 1995: 150).[8] As a consequence, a Panel of Experts in Plant Exploration and Introduction (hereafter: Panel of Experts) mandated to advise the FAO on the matter was created in 1965.[9] These experts, who represented different scientific and agro-political institutions and organisations, met regularly over the following decade to develop international guidelines for the collection, conservation and exchange of seeds (Esquinas-Alcázar/Hilmi/López Noriega 2012: 136). Based on the work of the Panel of Experts, in 1967 the FAO co-organised a Technical Conference on the Exploitation, Utilization and Conservation of Plant Genetic Resources together with the International Biological Programme (IBP).[10] It was during this conference that the increasing loss of genetic diversity in agricultural plants was first recognised and defined as a global ecological problem under the newly coined term "genetic erosion" (Frankel et al. [1969]

8 The biannually convened FAO conference is "the highest decision-making body in the organisation, where all member countries are represented" (Esquinas-Alcázar/Hilmi/López Noriega 2012: 136).

9 The members of this panel of experts were Otto H. Frankel, former director of the Australian Commonwealth Scientific and Industrial Research Organization and head of the working group on plant genetic resources of the International Biological Programme (IBP); Erna Bennett, a representative of the FAO and director of its Crop Ecology and Genetic Resources Unit from 1967 to 1982; Jack Harlan, a plant geneticist from the University of Illinois; Jack Hawkes, a potato-specialist from the University of Birmingham; John L. Creech from the New Crops Research Branch in Beltsville; and Hermann Kuckuck, plant geneticist and Professor of Applied Genetics at the University of Hannover until 1969 (see Flitner 1995: 152; Peres 2016: 100).

10 The IBP was a research initiative started in 1964 on behalf of the International Council of Scientific Unions and UNESCO. It countered the FAO's resource-oriented approach to plant genetic resources with an information technology-informed ecosystemic perspective. According to Fenzi and Bonneuil, "[t]he IBP promised expertise toward the optimal tuning of natural productivity cycles of the biosphere, to achieve a static state accommodating short-term economic demand, as well as maintaining processes that renew natural resources in the long term" (2016: 76). However, further research in the wake of the 1967 FAO/IBP Technical Conference identified the dissemination of modern cultivated varieties as the main cause of genetic erosion, which strengthened plant genetic resources conservation rather than crop ecology, as I elaborate below (see also ibid.). Joanna Radin (2013) intriguingly discusses the biopolitics of the IBP, focusing on a bio-anthropological and genetical subproject exploring human adaptability to changing conditions of life.

1970; Frankel/Bennett 1970).[11] While it poignantly captures the extent of the problem, the notion of genetic erosion also implies a passivity that obfuscates the ways in which it arises from specific agricultural modernisation practices (see also Fowler/Mooney 1990: 54–89; Fenzi/Bonneuil 2016: 74–76).

Another term that took root at this time was the notion of "genetic resources", which became the primary reference for the diversity of plant material targeted in conservation activities. Historians have pointed out that the term encapsulates the (molecular-)genetic focus predominant in plant science since Vavilovian times (Fenzi/Bonneuil 2016: 73–74; Peres 2016: 101–102; see also Alpsancar 2016: 52).[12] In addition, it explicitly denotes the economically oriented system of agriculture and its resourcist approach to nature that fuels the problem of genetic erosion, that is to say, the loss or destruction of plant (genetic) diversity (Flitner 1995: 152–153). What is more, according to Michael Flitner, the terminology further indicates an emerging consciousness of humanity's dependence on finite natural resources and global interdependence: "The view of plant diversity as a *resource*, which, like soil, is threatened by *erosion*, was a harbinger of the discourse on the 'limits to growth' that emerged not long after this, and fits into conceptions of the biosphere emerging at that time" (Flitner 1995: 154, author's translation, emph. in orig.).

With the proliferation of the term genetic resources, Flitner (1995: 155) argues, the FAO also dropped the discursive distinction between plant exploration and plant introduction, thus shifting the focus away from the divergent origin and flow of genetic resources. As a result of the growing awareness of globally advancing genetic erosion, collections of plant genetic diversity went from serving primarily as resources for breeding new improved varieties to becoming crucial components for managing the undesired consequences of the Green Revolution (Curry 2017b: 1–3). The FAO/IBP conference of 1967 sought to replace the purpose-oriented approach to collecting and conserving plant genetic diversity as a stock of resources for breeding with a generalist and long-term conservation approach so as to secure the largest possible diversity of en-

11 According to Flitner (1995: 152–153), it can be assumed that the term was coined by the Panel of Experts, who prepared and evaluated the conference and wrote the report that makes extensive use of it.

12 Bonneuil (2019) unfolds "a deeper history of 'genetic resources' as a category, i.e., the emergence of a genocentric and resource-centric ontology of the planet's biological diversity" (2019: 1).

dangered landraces.[13] In the wake of this conference a "genetic resources movement" took shape (Kloppenburg [1988] 2004: 163; Pistorius 1997). Over the following years, there were heated debates within this movement about the best approach to plant genetic diversity conservation.

Proponents of *in situ* conservation strategies campaigned for conserving diversity through cultivation in the field, arguing that plants evolve in and through a complex and dynamic relationship with their (constantly changing) environments. In the Panel of Experts, *in situ* conservation was strongly defended only by FAO representative Erna Bennett.[14] Most other panellists, with Otto H. Frankel leading the way, were sceptical about *in situ* conservation strategies on financial, technical, and social grounds. Frankel expressed doubt about whether farmers in the Global South would continue to cultivate landraces despite the availability of higher-yielding varieties, about the suitability of the *in situ* approach for long-term conservation efforts that would be able to halt and prevent further genetic erosion, and about the compatibility of "*in situ* conservation […] with the contemporary modernisation of agriculture" (Peres 2016: 100).

Ex situ conservation in seed banks, in contrast, received broad support in the FAO and the genetic resources movement more generally for at least two reasons: first, the expectation that this conservation strategy could make available for the long term a diversity of plant genetic resources that was economically unappealing for cultivation in the present; and second, the widely shared conviction that the high productivity and efficiency of industrial and monocultural production made the continuation of modern agriculture non-negotiable.[15] *Ex situ* conservation in seed banks was therefore adopted by the FAO as

13 Flitner (1995: 155–156) notes that while the guiding principles and strategies developed at the 1967 FAO/IBP conference did inform conservation activities through the 1970s and 80s, in very few cases were seed collections actually generalist rather than mission-oriented.

14 Despite the difficulties of making a career as a woman at that time, Bennett was a key figure in the plant genetic resources movement. After attracting attention with two influential publications that introduced the "genecological" position and the concept of "genetic conservation" in 1964 and 1965, she joined the FAO in 1967, prepared the FAO/IBP technical conference that same year, and co-edited the proceedings together with Otto H. Frankel (Frankel/Bennett 1970). In 1982, she was forced to leave the FAO due to political differences, and went on to comment on later developments from outside UN bodies (Hanelt/Knüpffer/Hammer 2012; see also Pistorius 1997).

15 Pistorius (1997: 24–27) further explains that the two approaches are rooted in diverging views of how plants adapt to changing environmental conditions. While *in situ* conser-

the core strategy to save and preserve plant genetic diversity (Fenzi/Bonneuil 2016: 75; Flitner 1995: 152–157).

According to historians Marianna Fenzi and Christophe Bonneuil (2016: 77), the preference for *ex situ* conservation is indicative of an agricultural regime defined by theories of modernisation, in the context of which breeding is a logical, effective, and pragmatic development of agriculture. Volker Heins and Michael Flitner (1998: 21–22) attribute the strong support for the *ex situ* approach in the FAO to three main factors. First, gene-oriented breeding was economically interesting because it allowed for creating varieties with short production cycles. Second, political upheavals in the Global South evoked fears in the Global North that the end of the current extractive colonial botany was imminent, and that this would complicate access to the abundance of plant genetic diversity mostly prevalent in the 'developing countries'. Third, the development of technologies of cold storage had advanced in a way that made long-term independence from field cultivation seem possible.

To realise the vision of a global-scale and long-term *ex situ* conservation solution for the world's endangered plant genetic diversity, the 1967 FAO/IBP Technical Conference devised a recommendation to create or designate an international seed storage facility available to every country in the world (Curry 2017b: 5; Flitner 1995: 156). However, the capacity of the FAO and the IBP to put this recommendation into action was hindered by a lack of funding and cooperation on the part of other institutions engaged in international agricultural policy and development (Curry 2017b: 12). As a consequence, the FAO incrementally lost its leadership role in the field of international conservation efforts throughout the 1960s and 70s.

Instead, financially strong actors such as the Rockefeller and Ford foundations, which were much more economically oriented than the FAO, gained a foothold. They preferred to work with the international plant research and breeding centres (the IARCs) that had been established as part of the Green Revolution and strengthen their approaches (Flitner/Heins 2002: 328). As a result, the reality of conservation activities became much narrower than envisioned at the FAO/IBP conference insofar as they became oriented towards the interests of breeders much more than towards "advancing food security through the conservation of a broad range of crops and the distribution of this

vation is based on a "genecological" approach that focuses on the interaction of polygenes with their environment, *ex situ* conservation supports controlled adaptation of single genes to changing environments through breeding.

work and the resources necessary to support it to a range of national and international actors" (Curry 2017b: 16). Importantly, these institutions did not consider breeders as "stakeholders with their own interests" so much as "operating for the general interest, transforming a common heritage of resources into collective food output" (Fenzi/Bonneuil 2016: 75). In line with this, their agronomists considered replacing landraces with improved varieties as a logical component of the modernisation of agriculture and therefore saw genetic erosion as "an inevitable part of economic and social development" (ibid.).

Around the same time, the public – beginning in the Global South and soon also in the Global North – got a bitter taste of the fatal consequences of the economic and social 'developments' that followed in the wake of the Green Revolution. With the homogenised cultivation of the newly bred improved crop varieties came a uniformity in crops that increased genetic, ecological, and economical vulnerability as well as the severity of the crises that would eventually result from them. By the 1970s, almost half of wheat production in the Global North relied on wheat varieties bred at the Mexican International Maize and Wheat Improvement Center (CIMMYT) (Fowler/Mooney 1990: 69). A game changer in agricultural practice and politics was the global spread of the fungal plant pathogen *cochliobulus heterostrophus*, which causes southern corn leaf blight and ruined maize cultivation around the globe beginning in the 1960s. In 1970, it arrived in the US, where it destroyed fifteen per cent of the corn yield, over ninety per cent of which consisted of varieties particularly vulnerable to this pathogen, and caused enormous costs for both farmers and consumers (Fowler/Mooney 1990: ix; Kloppenburg [1988] 2004: 163).[16]

Ironically, Norman Borlaug received the Nobel Peace Prize for his breeding of high-yielding semi-dwarf wheat varieties at the Mexican CIMMYT the same year and the World Bank suggested the creation of a broader financial network for the IARCs. The realisation of this proposal resulted in the creation of the Consultative Group on International Agricultural Research (CGIAR) in 1971, which connected the four IARCs hitherto established in Mexico, Columbia, Nigeria, and the Philippines as well as two newly founded IARCs in Peru and

16 A study by the US National Academy of Sciences published two years later and titled "Genetic Vulnerability of Major Crops" called attention to the genetic uniformity and resulting high vulnerability of US agriculture, which depended on only a handful of genetic varieties of their major crops (see Fowler/Mooney 1990: 83).

the Ivory Coast under its roof.[17] The most important difference between the CGIAR and the FAO as a UN organisation was and is that political control of the latter lies with all member states whereas the CGIAR is politically controlled by its donor countries – most of which are located in the Global North (Flitner 1995, 168). In 1972, the CGIAR convened a conference in Beltsville, Maryland (USA), to discuss the recent devastations caused by the southern corn leaf blight. Erna Bennett, who represented the FAO on the Panel of Experts and was the key proponent of *in situ* conservation in the genetic resources movement, was not invited. In lieu of the creation of one central world genebank, as previously suggested by the FAO, the Beltsville conference recommended the creation of a network of nine major genebanks. However, the technical committee of the CGIAR rejected this proposal and instead opted for the creation of a subsidiary network to the CGIAR to take on the responsibility for developing countermeasures against genetic erosion on a global scale (Flitner 1995: 169–171).

In 1974, the CGIAR created an International Board of Plant Genetic Resources (IBPGR), which was tasked with coordinating a rescue programme for plant genetic resources (PGR) based on the CGIAR's policy on genetic resources presented in Beltsville. This policy focused on exploring potentially agronomically useful wild and cultivated plant species and conserving them *ex situ* for future use. Financial support, personnel, and premises were supposed to be provided largely by the FAO in the form of its Crop Ecology Unit. While the United Nations Environment Programme (UNEP)[18] was included in the supervisory board, control over the IBPGR remained mostly in the hands of the CGIAR with its insufficient democratic structure (Flitner 1995: 172). Based on expert knowledge and recommendations, the IBPGR drew up a list that prioritised crops for conservation according to their level of endangerment, representation in existing collections, and social and economic importance, as well as breeders' needs (see Fowler/Mooney 1990: 79–80). Notwithstanding the fact that this list was certainly biased towards the needs of industrialised countries, Fowler and

17 Today, there are 15 CGIAR centres in total. For more information see https://www.cgiar.org/research/research-centers/ (last accessed July 18, 2025).

18 The UNEP was founded during the first UN Conference on the Human Environment (UNCHE) in Stockholm, Sweden, in 1972. It was supposed to become the responsible actor for genetic resources among the UN organisations. However, the CGIAR had already pushed the structural decision-making process to a point that left the UNEP with little to no influence (Flitner 1995, 171).

Mooney (1990: 79) concede that it was based on the best educated guesses at the time.

With the formation and collecting efforts of the IBPGR, the by then twelve research centres able to store genetic resources and make them available to plant breeders, and the vast financial resources flowing into the CGIAR, the latter superseded the FAO as leader of the global management of plant genetic resources (Fenzi/Bonneuil 2016: 77). Civil society actors criticised the creation and advent to power of the CGIAR as "a blunt move by these donors to wrest control of agricultural development from FAO and place it in the hands of a manageable scientific élite" (Mooney 1983: 66, quoted by Flitner 1995: 168). Flitner (1995: 167–169) comments critically that while this judgement may have been politically apposite, the lack of financial resources and determination within the FAO to assume the role that was then delegated to the IBPGR made it impossible for the FAO to arrive at a comparable result. What is more, he questions whether the agrarian developmental politics the FAO represented were really that different from the CGIAR's, in view of the fact that the corporate sector gained increasing influence in the FAO from the mid-1960s onwards (Flitner 1995: 172–173).

1.3 Conserving the "Heritage of Mankind"? Politicising the Loss and Conservation of Plant Genetic Resources

As the previous section has shown, the issue of genetic erosion was mainly discussed on a technical level throughout the 1960s and 70s. This was also indicated by the labelling of the FAO conferences in 1967, 1973 and 1981 as "technical conferences". Beginning with the FAO conference in 1979 and through the 1980s, discussions about the internationally concerted efforts to conserve endangered plant genetic diversity – including the discussion about establishing an international seed bank or seed bank network – became more politicised. During this time, non-governmental and civil society organisations entered the agro-political arenas in the UN and CGIAR environment, politicising what had up to then been intergovernmental and public-private debates about agrobiodiversity conservation in new ways. These organisations supported peasant farmers, mainly but not exclusively in the Global South, in fighting against technocratic and economistic developments that exacerbated global social inequalities and ecological problems.

At the forefront of these organisations was the Rural Advancement Foundation International (RAFI),[19] the first civil society organisation (CSO) "to draw attention to the socioeconomic and scientific issues related to the conservation and use of plant genetic resources, intellectual property and biotechnology" (ETC Group n.d.; see also Fenzi/Bonneuil 2016: 77). RAFI was founded by Fowler and Mooney, together with Hope Shand, in the 1970s with a focus on intellectual property and biotechnology issues in agrobiodiversity conservation.[20] In 1979, Mooney published a pathbreaking book titled *Seeds of the Earth: A Private or Public Resource?* which criticised the exploitative politics around plant genetic resources for food and agriculture (PGRFA) pursued by some of the 'developed countries', as well as the consolidation of transnational agro-industrial corporations into a growing agribusiness sector. As Flitner and Heins summarise, Mooney argued that these developments advanced the formation of two new major oppositional geopolitical blocs: "the 'North' represented by transnational corporations from the capitalist world, and the 'South' exemplified by traditional small-scale farmers being deprived of their livelihood resources" (Flitner/Heins 2002: 329–330). Mooney's arguments were influential for the ensuing controversies within the FAO and, in the long term, for the support of multilateral solutions that eventually emerged (see also Andersen 2008: 90; Fenzi/Bonneuil 2016: 77).

In the early 1980s, however, a North-South-polarisation took shape within the FAO that would last for years and have a considerable influence on how later international agreements on PGR conservation were negotiated. At the FAO conference in 1979, the Spanish delegation tabled the very first concrete proposal in the history of agrobiodiversity conservation for a centralised international genebank under the aegis of the FAO and an international agreement on plant genetic resources. The proposal was not turned into a draft resolution, though, due to concerns voiced by a coalition of 'developing countries', which shaped the subsequent discussions in the international agro-political arena. Based on the fact that "[p]lant genetic resources are found throughout the world, but the greatest diversity is in tropical and subtropical areas, where

19 RAFI was renamed Action Group on Erosion, Technology and Concentration (short: ETC Group) in 2001.

20 A well-known member of the founding board was Erna Bennett, who was still working for the FAO at that time. In the 1990s, the focus of RAFI's research, education, and social action extended to environmental concerns, biopiracy, and genetics/genomics as well as later to nanotechnology.

most developing countries are situated" (Esquinas-Alcázar/Hilmi/López Noriega 2012: 137), these countries were concerned about two issues in particular. For one thing, they questioned the legal circumstances established by a convention of the International Union for the Protection of New Varieties of Plants (UPOV) adopted in 1961, which granted intellectual property rights for crop breeds to breeders and protected these rights while not legally recognising the contribution of farmers cultivating the raw material for the breeding of new varieties. Secondly and as a consequence of this legal situation, there were concerns about whether resources collected in an international seed bank or seed bank network would be considered property of the country of origin, the country in which they would be stored, or humanity at large (Fenzi/Bonneuil 2016: 76).

As a result of these concerns about the Spanish proposal, in 1981 the Group of 77, a coalition of 'developing countries' within the FAO, presented a draft resolution conceptualised in cooperation with the state of Mexico and the Group of Latin America and the Caribbean (GRULAC) aiming to establish an international germplasm bank in Mexico.[21] After a heated debate about this proposal that lasted for several days, a working group was created and tasked with conducting feasibility studies and developing a revised, more consensual resolution. According to these studies, an international genebank or a genebank network were not technically feasible and a legally binding agreement not necessary, whereupon this second proposal was rejected at the FAO conference in 1983 (Esquinas-Alcázar/Hilmi/López Noriega 2012: 136–138). José Esquinas-Alcázar and colleagues argue that pinning the problem on technical feasibility actually served to obfuscate the lack of political will to follow up on the draft resolution, which became apparent in yet another proposal made by the Spanish delegation at the end of these discussions, namely to place their national genebank under FAO jurisdiction (see Esquinas-Alcázar/Hilmi/López Noriega 2012: 137).[22] Although this proposal, too, was rejected, the discussions within

21 The term "germplasm" refers to genetic resources maintained for breeding. While germplasm is contained in seeds, it is not equivalent to them. Therefore, facilities for *ex situ* conservation, research, and breeding, such as the IARCs under the umbrella of the CGIAR, are referred to as "genebanks" rather than "seed banks".

22 José "Pepe" Esquinas-Alcázar first started working for the FAO in 1978 and became secretary of the FAO's intergovernmental Commission on Plant Genetic Resources (CPGR) in 1983, a position that he occupied until his retirement in 2007. He further chaired the FAO Committee on Ethics for Food and Agriculture between 1999 and 2007, and was the first Secretary of the FAO's International Treaty on Plant Genetic Resources for Food and

the FAO had sown the seeds "for an international convention on plant genetic resources as well as a new 'international gene bank'" (Fowler/Mooney 1990: 187). A resolution to this effect was passed at the next FAO conference in 1981.

One of the driving forces behind the efforts to internationalise plant genetic resources conservation under FAO jurisdiction in a way that protected the interests of the Global South was a widespread critical attitude towards the IBPGR. Within the first ten years of its existence, the IBPGR had conducted 500 expeditions and collected 100,000 varieties, 90 per cent of which originated in the Global South, whereas only 15 per cent of these varieties were stored in the genebanks of the respective countries (Flitner 1995: 191).[23] Many therefore perceived it as an instrument used by the industrialised countries of the Global North to access the resources of the Global South, commodify them as privatised varieties, and thus take freely accessible 'raw material' off the market. It was in this context that the resource-rich countries of the Global South claimed national sovereignty and control over their plant genetic resources in an effort to strengthen the "centres of origin" rather than the "centres of agricultural modernization" (Flitner/Heins 2002: 327). However, without an international regulatory framework for the conservation, utilisation, and exchange of plant genetic resources, the discussion about sovereignty and property rights remained without effect.

By the end of 1983, an agreement was reached among the vast majority of the FAO's member states that gave rise to the first International Undertaking on Plant Genetic Resources (IUPGR; hereafter: IU for International Undertaking). This legally non-binding agreement, signed by over 100 of the FAO's member countries with the exception, among others, of the USA and Canada,

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Agriculture (ITPGRFA, short: Seed Treaty, see below) between 2004 and 2007. One of my interview partners referred to him as "the Don Quijote fighting all these mysterious windmills of conservation" (Alejandro Argumedo, Potato Park, 5 November 2020: l. 530–532).

23 The criticism of this practice ties in with a critical discourse on "biopiracy", that is, "the fraudulent acquisition of ownership over genetic materials" (Breen 2015: 42), which reaches back to the "Columbian Exchange" (Crosby 1972) and the colonial history of botanical gardens (Brockway 2002; Philip 2004). Biopiracy, according to Jack R. Kloppenburg (2000: 511), is one of "the contemporary naming[s] of the current manifestation of an activity with deep historical roots. Crop genetic resources and medicinal plants have long been freely taken from peasant farmers and indigenous peoples either forcibly or, more recently, with the justification that such materials are the 'common heritage of mankind'."

was supposed to advance international cooperation in agricultural politics and promote the exploration, conservation, evaluation and availability of plant genetic resources for scientific research and plant breeding. An intergovernmental Commission on Plant Genetic Resources (CPGR), referred to as "the Commission" within the biodiversity conservation community, was created to monitor and later renegotiate the IU (Esquinas-Alcázar/Hilmi/López Noriega 2012: 137–138; Flitner 1995: 191–193; Fowler/Mooney 1990: 188).[24] Defining the objective of the IU, article 1 of the approved text established "the universally accepted principle that plant genetic resources are a *heritage of mankind* and consequently should be available without restriction" (FAO 1983, emph. added). Article 2 states that this encompasses cultivated varieties, obsolete cultivars (i.e. varieties no longer cultivated), landraces, and wild relatives as well as "special genetic stocks (including elite and current breeders' lines and mutants)" (FAO 1983), all of which should be accessible without let or hindrance, according to article 5 (see also Esquinas-Alcázar/Hilmi/López Noriega 2012: 138).

While Fowler and Mooney celebrate the IU for establishing the first-ever intergovernmental body "capable of applying not only scientific but also social and political realities to the collection and exchange of genetic resources" (1990: 188) thanks to which "[t]he world's donors of germplasm finally have a voice" (ibid.), others expressed reservations. Some representatives of the industrialised countries and private seed industry of the Global North fiercely resisted the provisions of the IU, which they saw as destabilising plant breeders' rights and the protection of improved varieties as regulated by the UPOV convention (Flitner 1995: 194). Some representatives of the resource-rich countries of the Global South also had reservations about the IU and the CPGR, albeit for a different reason: the denomination of plant genetic resources as a "heritage of mankind" subverted the idea of national sovereignty they had long been fighting for (Flitner 1995: 194–195).[25]

24 The Commission was renamed as the Commission on Genetic Resources for Food and Agriculture (CGRFA) in 1995. Both the Commission and the IU were established without consensus and against the will of eight FAO member states from the Global North (Esquinas-Alcázar/Hilmi/López Noriega 2012: 137–138, 146n4; Flitner 1995: 192–193).

25 Flitner (1995: 195–196) points out that the attribute "common" in the more familiar formulation "common heritage of mankind" wasn't added until the 1989 resolution on farmers' rights. According to him, this can be traced back to doubts voiced on both sides of the controversy. He quotes Kloppenburg and Kleinman (who overlook the fact that the attribute "common" was not part of the original formulation in the IU) to point

Notwithstanding these reservations, the IU and the CPGR furthered international cooperation in the exploration, preservation, evaluation, and availability of plant genetic resources for plant breeding and scientific purposes. In the years that followed, the CPGR negotiated three resolutions that were annexed to the IU, all of which were major achievements from the viewpoint of the Global South. In 1989, the IU was amended by two annexes that recognised the rights of farmers as equal to those of plant breeders. While an instrument to protect breeders' rights had been established many years ago in the form of the UPOV convention, the revised IU constituted the first official international acknowledgment of "the enormous contribution that farmers of all regions have made to the conservation and development of plant genetic resources, which constitute the basis of plant production throughout the world" (FAO 1989).[26] In order to follow up this recognition with actions, the CPGR agreed to create an international fund to support farmers, the extent of which should be specified in consequence of a quantification of the receiving countries' needs. A third resolution, adopted in 1991, revisited "the concept of mankind's heritage, as applied in the International Undertaking on Plant Genetic Resources, [defining it as] subject to the sovereignty of the states over their plant genetic resources" (FAO 1991). This dispelled the abovementioned concerns about the IU in the Global South, and put the question of restrictions of access to these resources back on the table (see also Andersen 2003: 47–48).

In the late 1980s William Brown, chair of the US National Board for Plant Genetic Resources and an influential figure within the seed industry, invited the various rival agro-political parties to the Keystone Center in Colorado,

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out the irony of this controversy: "[I]n a world economic system based on private property, each side in the debate wants to define the other side's possession as common heritage. The advanced industrial nations of the North wish to retain free access to the developing world's storehouse of genetic diversity, while the South would like to have the proprietary varieties of the North's seed industry declared a similarly public good." (1988: 188; see also Flitner 1995: 196)

26 An ambiguity of this new acknowledgment of farmers' rights, as Flitner (1995: 198) briefly discusses, lies in the insufficient practical implementation of these resolutions. While they recognised and promised to support the work of peasant farmers, it remained unclear whether financial compensations paid to national institutions were cashed out to the farmers themselves, especially since the governments of many 'developing countries' were at the time pursuing a policy of agricultural modernisation incompatible with this international agreement. According to Flitner, as an intergovernmental arena, the FAO was ultimately unable to operate beyond the scopes of nation-states.

USA, a mediation centre for conflict resolution in contentious political matters founded in 1975. In the Keystone Dialogues, it brought international stakeholders together as individuals rather than representatives of their respective organisations for off-the-record discussions of controversial issues aimed at producing a consensual report. In three meetings between 1988 and 1991, the international agro-political community convened in this face-to-face and consensus-oriented negotiation space with a view to pacifying the heated controversies (Andersen 2008: 95; Fowler 1994: 196–204). According to Fowler, while questions around intellectual property rights remained largely unresolved, "important ground was broken in two areas – in defining the notion of genetic resources as 'common heritage' and in the emerging concept of 'farmers rights'" (1994: 199). This influenced the FAO resolutions developed during that time to amend the IU. Apart from concrete results, according to Fowler (1994: 200), what the Keystone Dialogues also accomplished was a more constructive and mutually respectful atmosphere among the representatives of the various interest groups from the seed industry to the non-governmental sector, which was even more important for future negotiations.

In the controversial climate characterising PGR politics in the 1980s and early 1990s, another initiative to establish an international PGR conservation facility took shape, this time in the Arctic. This is rarely mentioned in the history of internationally coordinated conservation efforts, presumably because, like previous attempts, it was unsuccessful. However, it is an important step to consider when tracing the history of the global efforts in PGR conservation. For one thing, it illustrates the entanglement of technical and political matters in biodiversity conservation, and for another, it laid the groundwork for the eventually successful establishment of the Svalbard Global Seed Vault in 2008. In 1988 and 1989, the IBPGR first investigated the possibility of establishing a facility in the Arctic permafrost for storing safety duplicates of the IARCs' seed collections. The idea was inspired by the Nordic Gene Bank for Agricultural and Horticultural Plants, which had been using an inoperative coalmine on the Arctic island of Spitsbergen in the Svalbard archipelago for secure storage of a backup of their collection since 1984.[27]

27 The Nordic countries include the states of Denmark, Finland, Iceland, Norway and Sweden, as well as the Faroe Islands and Greenland (both part of Denmark), the Åland Islands (an autonomous archipelago that belongs to Finland), and the Svalbard archipelago, which belongs to the sovereign territory of Norway. The Nordic countries have a long history of political and other kinds of collaboration, including cooperation

It was first and foremost the cost-effectiveness of storing seed collections inside a permafrost mountain, guaranteeing year-round sub-zero temperatures without the need for technical cooling, that aroused the IBPGR's interest in the region (IBPGR 1991: 10).[28] After conferring with experts from Norway about legal and technical feasibility, the IBPGR decided to pursue the project of establishing a security storage facility under the name Svalbard International Seedbank (SIS). After consultations between the IBPGR and the CPGR, the FAO joined the project in 1989.[29] A questionnaire was sent out to 750 international experts and institutes to determine the extent of interest in such a facility. While the IBPGR's annual report of 1990 states that "[p]ositive responses came from half the respondents [and] [a]pproval of the other half was mostly conditional on the clarification of minor issues" (IBPGR 1991: 10), Marte Qvenild

in agricultural issues. In 2007, the Nordic Genebank for Agricultural and Horticultural Plants merged with the Nordic Genebank Farm Animals and the Nordic Council for Forest Reproductive Material and became the Nordic Genetic Resource Center (NordGen), one of the three partners responsible for the Svalbard Global Seed Vault (see NordGen n.d. a).

28 A delineation of the proposal in the IBPGR's annual report of 1990 specifies an average temperature of -3.7 degrees Celsius inside Svalbard's permafrost mountains (IBPGR 1991: 10). Information on the average temperature in Svalbard and of the permafrost varies from source to source. This, at least in part, goes back to the fact that the Arctic is subject to increasingly severe climate changes (see e.g. Øseth 2011; AMAP 2012; Norwegian Polar Institute n.d.).

29 In the few publications about the project that go beyond merely mentioning it, the SIS initiative is depicted as a joint effort of the IBPGR and FAO (Qvenild 2008) or of the FAO and other "international experts" (Qvenild 2012: 304). While it was a joint project, it seems worth mentioning that the initiative came from the IBPGR and not the FAO. Qvenild (2005) elaborates this in her Master thesis, submitted to the Department of International Environment and Development Studies of the Norwegian University of Life Sciences, for which she conducted the study underlying the abovementioned articles. Qvenild offers a detailed description of the Nordic and international efforts to store seed collections in the Arctic permafrost, based on interviews with a range of experts from the field of plant genetic resources conservation including people involved in the first Svalbard initiative. She quotes a statement from the director of the IBPGR at the time, made in a report on the expert consultation on SIS held at the IBPGR headquarters in December 1990: "[…] IBPGR did not have the right intergovernmental status to conclude a worldwide agreement on security storage in permafrost and I approached FAO in the second half of 1989 to assess FAO's interest in joining in this effort. This proposal was presented in 1989 to the Working Group of the FAO Commission, which, in principle, accepted the proposal. From that point onwards, this has been a truly joint IBPGR/FAO effort." (Qvenild 2005: 38)

(2008: 113) quotes an unpublished FAO/IBPGR Report of the Expert Consultation on SIS from 1990 indicating a response rate of no more than 19 per cent, including a number of negative replies that questioned the relevance of such a facility (for a more detailed account see Qvenild 2005: 39). Despite the low response rate, the IBPGR and FAO pursued the project, prioritising technical over political feasibility issues. With the Norwegian government's assured financial support for the construction of the facility, the FAO and IBPGR agreed to cover the costs of operations and administration and to create an Endowment Fund of 15 million dollars to secure funding for the first 50 years (Qvenild 2008: 113).

The SIS project was ultimately abandoned. According to Qvenild (2005, 2008), financial and technical constraints prevented the realisation of the project, but political concerns were the main reasons that prompted potential donors to back out. During a time of polarised political discussions about access to PGR and property rights, "plac[ing] an 'international' storage bank in a developed country without legal clarity about the ownership of the material meant, in the eyes of NGOs and developing countries, giving the material away" (Qvenild 2008: 112). The proposal attempted to settle these doubts by promising that all deposits made to the SIS would remain property of the depositor and non-accessible to others without consent, while remaining always and unrestrictedly accessible to the depositor. In the absence of legally binding international regulations, however, the plant genetic material stored in the SIS ultimately would be subject to Norwegian legislation. Against the background of the historical experience that most plant genetic material collected in the Global South by the IBPGR and its precedent institutions had been placed in genebanks in or controlled by the Global North and used by the Western seed industry for the breeding of improved varieties protected through intellectual property rights without sharing the profits or granting free access to these varieties, the resource-rich countries from the Global South in particular distrusted the promises made about the SIS. This atmosphere of suspicion negatively impacted the commitment of previously supportive potential donors and increased already existing scepticism about a crucial technical issue: although the IBPGR's own *Genebank Standards* (1984) defined -18 degrees Celsius as the optimal temperature for long-term storage, there was at that time no technical concept that would have made it possible to cool the seeds down to a lower temperature than the -3.7 degrees Celsius of the permafrost.

The project was finally dropped in 1994 (Qvenild 2005: 47) after another obstacle had emerged with the Convention on Biological Diversity (CBD) in 1992. Although the CBD contributed to the consolidation of international agro-political cooperation in the medium term, as the following section outlines, in the first instance it created a restrictive and bureaucratically complex environment for the regulation of access to and exchange of PGRFA (Qvenild 2008: 114).

1.4 From the Convention on Biological Diversity to the International Seed Treaty: Consolidating International Cooperation

After the FAO had acknowledged the placement of plant genetic resources under national sovereignty through the revision of the IU in 1991, the UN ratified this development one year later in the CBD, the first binding international agreement on biological diversity (see Secretariat of the CBD [1992] 2011). A Working Group of Experts on Biological Diversity within the UNEP, established in 1988, had spent four years negotiating this agreement. The CBD was submitted for signature at the UN Conference on Environment and Development (UNCED) – the first Earth Summit – in Rio de Janeiro, Brazil, in June 1992 (Fenzi/Bonneuil 2016: 77). While the CBD is one of the most important developments in international politics around biodiversity conservation, it entailed a set of challenges for international cooperation regarding biodiversity for food and agriculture in particular. Agrobiodiversity, the term I use to refer to the latter throughout this book, cannot be equated with biodiversity in the broader sense, which the CBD targets, and comes with specific implications for conservation that require separate attention, as the negotiations and the final text of the CBD make unambiguously clear. In the following, I delineate the developments brought about by the CBD with a focus on its ultimate significance for the global system of agrobiodiversity conservation.

An important development the CBD consolidated was a discursive shift from "plant genetic resources" to "biodiversity" that had been underway since the Brundtland report *Our Common Future* (WCED 1987).[30] With the CBD,

30 The Brundtland Commission is the informal name for the World Commission on Environment and Development (WCED), derived from its chair, the former Norwegian Prime Minister Gro Harlem Brundtland. The UN created the WCED in 1983 as an independent body engaging with policy issues in the interplay of environment and devel-

"biological diversity" superseded the overtly utilitarian notion of genetic resources as the core reference for conservation efforts. Biological diversity and its short form biodiversity more broadly denote "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems" (Secretariat of the CBD [1992] 2011: 4, Art. 2). This understanding introduced a new ecological framing insofar as it replaced the compartmentalisation of species with an ecosystemic and processual understanding of biological diversity. The CBD also paved the way for discussions around "biocultural" diversity by linking biological diversity to local and Indigenous knowledges, innovations, and practices worthy of protection alongside biological materials (Secretariat of the CBD [1992] 2011: 8, Art. 8j; see also Fenzi/Bonneuil 2016: 78). All this attracted renewed attention to *in situ* conservation approaches even from previously predominantly *ex situ*-oriented actors. The IBPGR, as of 1991 active as the International Plant Genetic Resources Institute (IPGRI),[31] for instance, launched a global project on "Strengthening the Scientific Basis of In Situ Conservation of Agricultural Biodiversity On-Farm" in 1997 (see Jarvis/Hodgkin 1998).

Fenzi and Bonneuil (2016: 78) argue that the proliferation of the biodiversity paradigm with its connotations of ecological complexity, interdependence, and resilience did not, however, undo what they call a "resourcist cosmovision". While the conception of nature became discursively more holistic, advances in genetic technologies allowed for unprecedented forms of cross-species breeding, leveraging biological diversity as a reservoir of genetic resources (Fenzi/Bonneuil 2016: 78–80; see also Flitner 1995: 233).[32] Fenzi and Bonneuil

opment. It dissolved with the publication of the Brundtland Report, which famously established the principle of "sustainable development" informing UN policy on environment and development to this day (Gómez-Baggethun 2019; see also Flitner 1995: 231).

31 In 2006, the IPGRI, formerly IBPGR, was renamed again, this time as Bioversity International "in an apparent effort to stress the importance of biodiversity as the founding concept" (Fenzi/Bonneuil 2016: 78).

32 Pellegrini and Balatti (2016: 2760–2761) further discuss how the emergence of the biodiversity concept was also associated with the environmental movements emerging in the 1960s, which influenced public opinion and contributed to the proliferation of a 'new environmental paradigm' and 'ecocentric vision' of nature as something to be pro-

attribute this development to the dominant position of the biotechnology industry within the international political arena and trade regime. Although the FAO attempted to counteract the dominance of the "new CBD/WTO regime" through "a more mutualistic logic aimed at bringing together the positions of breeders, developing countries, and NGOs" (Fenzi/Bonneuil 2016: 80), it never really queried the resourcist approach to the natural world as a reservoir of *plant genetic resources for food and agriculture* – a term that gained a foothold with the developments in the 1990s (see FAO 1996a, 1997, 2001). The agricultural sector did not follow the CBD's discursive shift from plant genetic resources to biodiversity for many years to come, as is discernible from the denomination of the FAO's periodically compiled report on *The State of the World's Plant Genetic Resources for Food and Agriculture* (FAO 1997, 2010). It was only recently renamed as *The State of the World's Biodiversity for Food and Agriculture* (FAO 2019). The anthropologist Thom van Dooren (2009b: 105) argues that this conceptual divergence of the CBD with its focus on biodiversity and the agricultural sector's discourse on PGRFA indicates the clear interest of the latter in genetic material as bearer of certain genetic traits and their conservation for use.

Another discursive shift that the CBD effected, in contrast, did strongly affect the agricultural sector and made negotiations of further agreements necessary. The professed and primary objective of the CBD was to ensure "the *conservation* of biological diversity, the *sustainable use* of its components and the *fair and equitable sharing of the benefits* arising out of the utilization of genetic resources, including by appropriate *access to genetic resources* and by appropriate *transfer of relevant technologies*" (Secretariat of the CBD [1992] 2011: 4, Art. 1, emph. added). The Convention not only assigns the *responsibility* for fulfilling these objectives to nation-states, but also legally enshrines the *sovereign right* of nation-states to exploit the resources occurring within their territory in Article 3 of the CBD. Observers highlight that, by doing so, the CBD (following the 1991 FAO resolution amending the IU) paved the way for the "national appropriation of biological resources (particularly of genetic resources), shifting the notion of *heritage of mankind* to *heritage of nations*" (Pellegrini/Balatti 2016: 2757, emph. in orig.; see also Visser 2012: 267).

By thus meeting a long-standing demand voiced by countries in the Global South seeking to protect resources originating in their national territory against breeders' unrestricted access and intellectual property claims, the

tected from man, replacing the 'dominant social paradigm' and anthropocentric vision of nature as a resource by the end of the 1970s.

CBD contributed to an atmosphere of conciliatory cooperation among the contracting parties and other non-governmental actors involved (see Fenzi/Bonneuil 2016: 78). At the same time, it provisionally diminished the prospects of establishing a global safety duplication seed bank such as envisioned in the SIS proposal because the predominant matters of dispute were now questions of access and benefit sharing rather than long-term conservation (Qvenild 2008: 111). What is more, the CBD's provisions created administrative barriers for all regarding international exchange of PGRFA. To unfold these changes and the ensuing developments, I shall now take a step back to delineate the development of the CBD.

The first initiative to develop a convention on biodiversity within the framework of the UNEP came from the US State Department in 1987, at the peak of the FAO's controversy about rights over PGR. According to Flitner (1995: 239–240), a first draft proposed for discussion by the International Union for Conservation of Nature and Natural Resources (IUCN) in 1988 shows overlaps with the debates in the FAO, especially with respect to the facilitation of free access to PGR in exchange for financial compensation. He notes that the USA may have hoped to establish a framework that would be more in their interest than what seemed to be underway in the FAO. However, through the Group of 77, the 'developing countries' made a strong case for the preservation of the principle of national sovereignty over PGR, which was ultimately enshrined in the CBD, albeit in a narrower formulation under pressure from 'developed countries', first and foremost the USA.

The final text of the convention ensures "[national] authority to determine access to genetic resources" (Secretariat of the CBD [1992] 2011: 11, Art. 15.1) only with respect to "those [genetic resources] that are provided by Contracting Parties that are countries of origin of such resources or by the Parties that have acquired the genetic resources in accordance with this Convention" (Secretariat of the CBD [1992] 2011: 12, Art. 15.3). Consequently, plant genetic material already collected and banked in the IARCs' seed repositories, for instance, fell outside the jurisdiction of the CBD (Flitner 1995: 239–242). In addition, the stipulation that national sovereignty over collections of plant genetic resources is acknowledged if and when a country is the country of origin of the PGR in the respective collection (or has acquired them in accordance with the terms of the CBD) posed a particular difficulty for the agricultural sector:

> "For wild resources it is normally possible to identify more or less their point of origin, and also when there is more than one country of origin. However,

> domesticated resources have been developed gradually via exchanges between farmers and breeders over short and long distances for hundreds and thousands of years, in several cases since the beginnings of agriculture. Determining the countries of origin of these resources [...] is in most cases virtually impossible." (Andersen 2003: 45–46)

In today's transnationally and transregionally interdependent agricultural system, a bilateral principle of granting access and sharing benefits, as enforced by the CBD, thus did not facilitate but rather complicated the global exchange of PGRFA. A recognition of the need for further negotiations factoring in the particularities of PGRFA was therefore included in the CBD and delegated to the FAO and the CPGR (see also Manzella 2012: 151).

According to Esquinas-Alcázar et al. (2012: 141), the CBD's lack of awareness with regard to the specific needs of the agricultural sector arises from the underrepresentation of the latter in the negotiations of the convention. It was only at the Conference for the Adoption of the Agreed Text of the CBD held in Nairobi in May 1992, that a group of representatives of the agricultural sector issued a draft resolution on agricultural biodiversity. It was incorporated into the Nairobi Final Act as Resolution 3, "The Interrelationship Between the Convention on Biological Diversity and the Promotion of Sustainable Agriculture" (Secretariat of the CBD 2005: 406–408), and adopted by all signatories to the CBD along with it. This resolution recognised the need to bring the enduring debates on access to *ex situ* collections acquired in a manner nonconforming to the CBD to a favourable conclusion for all parties involved along with the debates on farmers' rights (Secretariat of the CBD 2005: 408). Furthermore, it recommended strengthening the Global System for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture that the FAO, IPGRI, and the CGIAR pursued (which consisted only of the IU at that time) through a global plan of action that should be based on an assessment of the state of the world's plant genetic resources (Secretariat of the CBD 2005: 407).

In the following years, the FAO conducted a global assessment project in more than 150 of its member countries and appointed Cary Fowler to lead it. It resulted in the first *State of the World's Plant Genetic Resources for Food and Agriculture* (FAO 1997). This report was unprecedented, as the political scientist Regine Andersen (2003: 49, 2008: 98–99) notes, both in its extensiveness, insofar as it covered not only biological but also technical and institutional aspects, and in the way it prompted conservationists and politicians to take action. In the same period of time, based on these assessments and also under the direction of Fowler, the FAO negotiated a Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture (FAO 1996a; hereafter: GPA for Global Plan of Action) that was adopted in 1996 at the fourth International Technical Conference on Plant Genetic Resources in Leipzig, Germany.[33] The Leipzig Declaration (FAO 1996b), which announced the results of the conference and adopted the GPA, emphasised the importance of conserving and sustainably using PGRFA as well as of sharing the benefits arising from their use. Both the GPA and the FAO's report on the state of the world's PGRFA were designed to be periodically updated in order to serve as a means for the CPGR to continuously "recommend priorities and to promote the rationalization and coordination of efforts" (FAO 1996a: 12). Their purpose was to help the FAO member states "monitor activities for the conservation and utilization of plant genetic resources, determine priorities, and oversee programmes in this area through the Commission" (FAO 1996b: 3).[34]

As for the pending regulatory issues around PGRFA raised in Resolution 3 of the Nairobi Final Act of the CBD, the FAO and the Conference of the Parties to the CBD (COP) agreed that they should be resolved in harmony with both the CBD and the IU. The FAO mandated the CPGR to oversee the revision of the IU (Visser 2012: 267). The endeavour was tricky insofar as it meant harmonising two fundamentally divergent principles: "The International Undertaking was born out of a need for *facilitating access* to genetic resources, whereas the CBD emphasised the need for *fair and equitable sharing of benefits* arising out of the use of genetic resources" (Andersen 2003: 45, emph. added). However, new international trade agreements developed in the following years increased the urgency of the need for a legally binding successor agreement to the merely voluntary IU – first and foremost the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) passed in 1994, which committed the contracting parties to ensure some form of protection for plant varieties and effectively strengthened

33 After the first Technical Conference on PGR, which was co-organised with the IBP in 1967, the FAO had convened a second and third Technical Conference on PGR in 1973 and 1981.

34 The FAO published a second edition of the State of the World's PGRFA in 2010 and a second GPA in response to it in 2011. In 2019, the third edition of the State of the World's PGRFA appeared, albeit with a terminological shift from PGR to biodiversity (see FAO 2019).

the UPOV absent of another "effective *sui generis* system" (Andersen 2003: 44). Thus arose "what seemed unimaginable just a little while ago – namely a united front of developed and developing countries, the seed industries and NGOs, working towards a common political objective" (Esquinas-Alcázar/Hilmi/López Noriega 2012: 142). Part of the envisioned agreement, next to strengthening the agricultural sector's position vis-à-vis the commercial and the environmental sector, was to ensure the long-term conservation of agrobiodiversity and make it fairly and equitably accessible for research and breeding, as spelled out in the GPA. In 1994, the by then twelve IARCs of the CGIAR that operated a genebank, altogether holding almost 450,000 samples, placed their collections under the patronage of the FAO, thus making them available to all FAO member countries for agricultural use, breeding, and research (Andersen 2003: 48).

In the very same year, formal negotiations began on what would become, over the following seven years, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA; hereafter: Seed Treaty; also referred to as the Plant Treaty or simply the Treaty within the agrobiodiversity conservation community).[35] According to Esquinas-Alcázar, who was a key figure in the negotiations on the Seed Treaty in the role of secretary of the CPGR (renamed as the Commission on Genetic Resources for Food and Agriculture (CGRFA) as of 1995), the debates of the newly united agricultural sector took place in a "highly constructive atmosphere" (Esquinas-Alcázar/Hilmi/López Noriega 2012: 142). Esquinas-Alcázar et al. further describe the climate in which the Treaty was ultimately adopted as one "of widespread euphoria" (2012: 143). External observers paint a much more reserved picture. Andersen, a long-term observer of the Seed Treaty and its emergence, notes that the negotiations were "extremely difficult, core provisions in the text were in brackets right up to the last bell, and it seemed impossible to unite all fronts on joint solutions" (2003: 50). According to a report by the ETC Group, Esquinas-Alcázar and Clive Stannard, who represented the CGRFA Secretariat in the negotiations, were often "the only two people in FAO who believed in the treaty" (ETC Group 2001: 3). After the Treaty was adopted, the report says, appreciation of the two "went well beyond courtesy to something akin to cult worship" (ibid.).

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35 Fowler, who had previously been working for the FAO in various capacities, represented the CGIAR in the negotiations on the Treaty.

The negotiations on the Seed Treaty lasted throughout three regular and six intermediate meetings of the CGRFA as well as several meetings of a specially founded contact group between 1994 and 2001 (Andersen 2003: 50; Visser 2012: 266). Unable to reach consensus, in November 2001 the FAO put the agreed text of the Treaty to a vote. With the USA and Japan abstaining from the vote, an overwhelming majority of 116 countries adopted the Treaty. 90 days after the first 40 countries had ratified, accepted, or approved it, as determined within the Treaty, it entered into force in June 2004 and became operative with the first session of its Governing Body in Madrid, Spain, in June 2006.[36] The Seed Treaty provides the "first legally binding agreement exclusively pertaining to plant genetic resources for food and agriculture" (Andersen 2003: 50) and implements the goals formulated in the GPA of 1996. Article 1 of the Treaty, which states its objectives, commits all signatories to ensuring "the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use" (FAO 2001: 2). What distinguishes the Seed Treaty from the CBD, at its core, is that the latter is enforced in and through bilateral arrangements, whereas the Treaty established a multilateral system (MLS) of access and benefit sharing. It facilitates easier access to and exchange of PGRFA only for the specific purpose of "utilization and conservation for research, breeding and training for food and agriculture" (FAO 2001: Art. 12.3(a)). Other purposes such as "chemical, pharmaceutical and/or other non-food/feed industrial uses" (Manzella 2012: 154) are not covered by the regulations of the MLS and require further bilateral negotiations between the contracting parties.

The MLS legally acts through a Standard Material Transfer Agreement (SMTA) between the requester and the provider of plant genetic material shared under the MLS. Through the SMTA, any transaction including PGRFA processed by an institution under the jurisdiction of a country that has signed the Treaty accepts and realises the conditions of the MLS (Manzella 2012: 151–152). Importantly, this only applies to a limited range of crop plants the parties involved in the negotiations of the Treaty agreed to share through the MLS, and these are listed in Annex 1 to the Treaty. Furthermore, the MLS only affects those PGRFA "'under the management and control' of the Contracting

36 When it first came into operation, a total number of 105 countries as well as the European Union had ratified the Treaty (see Andersen 2003: 50; Esquinas-Alcázar/Hilmi/López Noriega 2012: 143–144). As of 1 April 2025, the membership list of the Treaty comprises 154 countries and the EU as an intergovernmental signatory (see FAO 2025).

Party and those that are 'in the public domain'" (ITPGRFA Art. 11.2 as quoted by Manzella 2012: 153), that is, those untouched by intellectual property rights.

Annex 1 specifies 35 food crops and 29 forage crops (FAO 2001: 46–49). It "includes important food crops such as rice, wheat, maize, rye, potatoes, beans, cassava, and bananas. But it excludes species such as soybean, oil palm, cotton, sugar-cane, cocoa, groundnut, most vegetables, and important tropical forage plants." (Andersen 2003: 51) While it is usually emphasised that the 64 crops in Annex 1 make up a high proportion of the world's most important food crops for human nutrition, the composition of this list is the result of a long and difficult negotiation process. Bert Visser highlights the political and economic interests that shaped these negotiations and their outcome:

> "Regions objected to the inclusion of certain crops not because these crops were considered to be unimportant for food security but, rather, because the genetic resources of these crops were considered to be, first and foremost, economic assets for those particular regions. This is how soybean and groundnut, sugar cane and oil palm disappeared from the list, even though they had been featured for a considerable period. It also explains why some crops that no country would seriously consider to be of utmost importance to food security are included on the list, such as asparagus and strawberries. Ultimately, no region objected to a proposal to include these crops, and so they stayed on the list." (Visser 2012: 279)

International exchange of PGRFA not included in the Treaty is regulated by the CBD if these resources were acquired after the CBD entered into force (of course, this only applies to its contracting parties). No PGRFA acquired earlier fall under any binding international regulatory framework (Andersen 2003: 51).

Next to the conditions of access, the SMTA also regulates the sharing of benefits gained from the utilisation of material received through a transaction under the MLS, for example from the commercialisation of new varieties bred with the material in question (Esquinas-Alcázar/Hilmi/López Noriega 2012: 144–145). Whenever PGRFA listed in Annex 1 are shared by contracting parties of the Seed Treaty, they are officially considered as being provided by the pool of plant genetic material shared under the MLS. Accordingly, all benefits derived from these resources are to flow back into the MLS and be equally shared. While the Treaty also identifies non-monetary modes of benefit sharing, such as "the exchange of information, the access to, and transfer of, technology, and capacity building" (Manzella 2012: 155), the central goal is the sharing of monetary benefits through a multilateral Benefit Sharing Fund (BSF). The Treaty stipulates that the resources in this fund are to be directed primarily towards the support of farmers in the Global South for the conservation and sustainable use of PGRFA (Manzella 2012: 155–157). At the time of the adoption of the Treaty, the observant NGO GRAIN (2001) critically remarked that the amount, form, and conditions of payments to the BSF were still unclear.[37] The first obligatory payment was made in 2018 by a Dutch breeding company that had previously acquired and profitably processed resources from the MLS through an SMTA. According to the director of science of the Crop Trust, however, this delay is not necessarily politically motivated insofar as the breeding and marketing of new varieties can take a full decade and therefore was not to be expected much sooner (see below). As of 2019, "the Fund has supported over 60 projects in 55 developing countries, using USD 20 million in voluntary contributions" (Crop Trust 2019; see also Guarino 2018).

While the Seed Treaty and the MLS have successfully linked the facilitation of global flows of PGRFA to the acknowledgment and protection of the contribution made by farmers as the main providers of PGRFA, which is explicitly recognised in Article 9 of the Treaty, farmers' rights remain one of the core issues of debate today. This goes back to the rather unspecific recognition in the Treaty of their contribution to producing and conserving PGRFA and the need to protect their rights. NGOs criticised this from the beginning, saying that it "leaves the responsibility for implementing these rights to national governments and is not backed up by any international mechanism or enforcement procedure" (GRAIN 2001; see also ETC Group 2001: 6). The failure to implement the Treaty's provisions on farmers' rights eventually led to the creation of an intergovernmental Ad Hoc Technical Expert Group (AHTEG) for the assessment and realisation of farmers' rights in 2017. This group meets annually with the aim of monitoring and making informed recommendations for improving the implementation of Farmer's Rights as set out in Article 9 of the Treaty.[38]

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37 GRAIN is an independent international non-profit organisation that was founded in 1990. It emerged out of a group of international activists engaged in research, advocacy, and lobby work to raise awareness about genetic erosion in agricultural biodiversity in the 1980s. Today, GRAIN "support[s] small farmers and social movements in their struggles for community-controlled and biodiversity-based food systems" (see GRAIN n.d.).

38 See http://www.fao.org/plant-treaty/areas-of-work/farmers-rights/expert-group/en/ (last accessed July 18, 2025). In 2018 the UN's Human Rights Council adopted the United Nations Declaration on the Rights of Peasants and Other People Working in

Another core controversial issue in the negotiations on the Treaty, which was the main reason for the USA and Japan to abstain in the final vote, is the question of intellectual property rights (see ETC Group 2001: 4). The majority of the negotiating parties agreed that recipients of genetic material shared under the MLS may not "claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, or their genetic parts or components, in the form received from the Multilateral System" (FAO 2001: Art. 12.3(d)). GRAIN's report on the adopted version of the Treaty points out the ambiguity of this formulation: "While optimists will say it leaves room for an anti-IPR stance, the article in question basically states that the seeds and other genetic materials governed by the Treaty can be patented – as long as they are modified in some way." (GRAIN 2001)[39] Notwithstanding the shortcomings and critical reservations mentioned here, NGOs and CSOs for the most part agreed that

> "the legally binding treaty, with an access list including most of the world's major food crops, offers a good platform upon which to rebuild international cooperation and public sector agricultural science. In the years ahead, the treaty will be a platform to be proud of as long as governments ratify it quickly and as long as the FAO realizes it has a horse it should run with." (ETC Group 2001: 3)

With the Seed Treaty, an inter- and more-than-governmental platform was created for debate on and the development of policies related to the conservation and sustainable use of PGRFA.

What is more, as the first legally binding agreement settling many of the heatedly debated issues in international agrobiodiversity politics, at least to a certain degree, most importantly access to and exchange of PGRFA, the Seed Treaty was a key step on the way towards successfully establishing an international backup seed bank:

> "The idea of having a secure global backup system for hundreds of individual gene banks […] is fundable only if the gene banks agree to cooperate

Rural Areas thus strengthening the case for realising farmers' rights as stipulated by the Treaty (see UN Human Rights Council 2018).

39 Since the adoption of the Treaty, the issue has continued to re-emerge in various forms, the latest of which is an ongoing heated debate on digital sequence information patenting (see Nehring 2022).

> and to address more than their immediate national concerns: that is, they must agree to a common standard of access and benefit sharing. The international treaty provided this standard, making it possible to think of constructing a communal safety net for all crop diversity held in gene banks." (Fowler 2008b: 190)

Although no particulars were stated at the time, the Treaty established the promise to develop a funding strategy for the implementation of an international PGRFA repository (Andersen 2003: 51). In 2002, during the World Summit on Sustainable Development – the Second Earth Summit – in Johannesburg, South Africa, the FAO and the CGIAR through IPGRI formally committed to establishing the Global Crop Diversity Trust (today: Crop Trust). Its core responsibility would be to manage a Crop Diversity Endowment Fund to permanently and self-sustainingly support the global system of conservation (see Crop Trust 2025). Formally established by the FAO in 2004, with Fowler appointed inaugural director in 2005 (a position he held until 2012), the Crop Trust convened its first meeting in 2006. At this meeting, a relationship agreement with the Governing Body of the Seed Treaty was signed recognising the Crop Trust "as an essential element of the Funding Strategy of the International Treaty in relation to the *ex situ* conservation and availability of plant genetic resources for food and agriculture" (FAO 2006: Art. 2). With this financial scheme and the regulatory framework of the Treaty dispelling any remaining doubts about property rights, the way was finally clear for a second, eventually successful initiative to establish an international seed bank in Svalbard, which would act as a global safety net for seed collections all over the world: the Svalbard Global Seed Vault.

1.5 The Svalbard Global Seed Vault (I): Safeguarding the World's Plant Genetic Diversity

With both the Seed Treaty and the Global Crop Diversity Trust up and running, IPGRI approached the Norwegian government a second time with the suggestion to establish an international seed storage facility in Svalbard for safely storing duplicates of genebank collections worldwide. The Norwegian Ministry of Foreign Affairs, together with the Ministry of Agriculture, commissioned a committee of experts to conduct a Study to Assess the Feasibility of Establishing a Svalbard Arctic Seed Depository for the International Community (Fowler et al. 2004).[40] With the declared goal of establishing "an ultimate safety net" as a "security against 'worst case scenarios'" (Fowler et al. 2004: 2), the study aimed to assess "whether a facility located in Svalbard might provide ultimate 'failsafe' protection for the world's most valuable natural resources, and whether it might be able to do so in a manner that is efficient, sustainable, inexpensive, and politically and legally acceptable" (Fowler et al. 2004: 1). The following requirements were carefully evaluated: whether such a facility could (a) be designed to last forever at best, but at least for 200 years; (b) meet the highest international long-term conservation standards; (c) provide sound protection against all kinds of natural and human-induced disasters; (d) receive international political and financial support; (e) be operated at fairly low costs; and whether it would (f) be used as a backup repository by a majority of the existing holders of seed collections (Fowler et al. 2004: 2).

The feasibility study determined that Svalbard provides the safest possible environment to be found in the world for establishing a secure long-term conservation repository, on the grounds of four main factors. First, due to the remoteness of Svalbard and the fact that it belongs to Norway, which has a reputation for being politically neutral and stable, the risk of threats arising from political instability, war, or terrorist attacks is considered very low. Second, the archipelago rates as geologically safe due to a lack of tectonic activity in the Arctic, which reduces the risk of earthquakes and associated threats.[41] Third, the Arctic's cold temperatures and permafrost are considered to offer unique conditions for long-term conservation purposes. Insofar as sub-zero temperatures decelerate biochemical processes of life and decay, they facilitate the preservation of biological materials (see e.g. Friedrich/Höhne 2016). Although the FAO's *Genebank Standards for Plant Genetic Resources for Food and Agriculture* (2014: 24)[42] require a storage temperature of -18 degrees Celsius to guarantee

40 The committee was chaired by Fowler, at that time Director of Research of the Center for International Environment and Development Studies at the Agricultural University of Norway and Senior Advisor to the Director General of the IPGRI. For an overview of the committee members see Fowler et al. (2004: viii [Annex V]).

41 A critical commentary published by GRAIN shortly after the opening of the Seed Vault challenges this aspect: "Just days before the opening of the Vault, Svalbard was at the centre of the biggest earthquake in Norway's history, even though the facility's feasibility study assured that '*there is no volcanic or significant seismic activity*' in the area" (GRAIN 2008: 2, quoting Fowler et al. 2004: 4, emph. in orig.). For further information on the seismic activity mentioned here see Pirli et al. (2010).

42 The first version of these *Genebank Standards* was published by the IBPGR in 1985.

long-term viability, the Arctic permafrost's year-round natural average temperature of at least -3 degrees Celsius would guarantee continued cold storage for a storage facility built into the permafrost even in case of a temporary failure of the technical refrigeration system (see Fowler 2008c: 19). The availability of local coal mines able to provide a source of power for the technical cooling system would keep the cost of the facility's maintenance low and mean easy maintenance. Fourth and finally, building a vault in Svalbard's mountainscape with an entrance high above sea level would secure the seeds against floods and rising sea levels, thus making it a suitable location even in the face of dangers resulting from global warming.

Based on the positive results of the feasibility study and the international agrobiodiversity conservation community's endorsement of the proposal, by the end of 2004 the Norwegian government had committed to building an international seed storage facility near the town of Longyearbyen on the Arctic island of Spitsbergen in the Svalbard archipelago. On February 26, 2008, the Svalbard Global Seed Vault was officially opened, which was celebrated with a ceremony for storing the first more than 320,000 seed samples (Norwegian Ministry of Agriculture and Food n.d. a). The Seed Vault is cooperatively run by a tripartite partnership between the Norwegian government, the Crop Trust based in Bonn, Germany, and the Nordic Genetic Resource Centre (NordGen) based in Alnarp, Sweden. As legal owner of the facility, the Norwegian government bears the overall responsibility. Funding for daily operations and management as well as staff for surveillance and monitoring are provided by the Norwegian Ministry of Agriculture and Food through Statsbygg, the Norwegian public sector administration enterprise responsible for government estates. Beyond that, funding for operational costs and assistance to depositors is provided by the Crop Trust, which administers international donations. NordGen is responsible for daily management operations such as consulting with seed banks about conservation options, preparing documents, and facilitating shipments, as well as receiving, storing, and documenting seed depositories. An International Advisory Panel (IAP) composed of seven people representing genebanks, plant breeders, and other stakeholders, including a secretary delegated by NordGen oversees the operations and management of the Seed Vault.

What essentially distinguishes the Seed Vault from other conservation facilities for PGRFA is that it is not a genebank in the narrower sense. Whereas genebanks have active and working collections used by farmers, breeders, and scientists for immediate or medium-term purposes, the purpose of the Seed Vault is to provide an internationally accessible secure storage space for the long-term conservation of dormant duplicates of these kinds of collections (FAO 2014). Pellegrini and Balatti (2016: 2761–2765) distinguish three seed bank profiles: "Assistentialist", often community-based seed banks store and provide seeds directly to local farmers, usually with an interest not in long-term conservation but in facilitating exchange and independence of private seed companies. "Productivist" seed banks are focused on research and breeding to further improve the production and economic value of locally relevant varieties. "Preservationist" seed banks such as the Svalbard Global Seed Vault serve as backup repositories for duplicates of other collections with the primary purpose of long-term conservation and availability of the highest possible crop genetic diversity. While genebanks, especially those with a productivist profile, are usually complex infrastructures with sophisticated technical equipment and trained staff, the Seed Vault is designed as a low-tech, low-maintenance, and low-cost facility that requires no permanent staff.

It is frequently, but mistakenly, assumed that the Seed Vault was built in a former coalmine on Svalbard. While the backup of the Nordic seed collection, which had inspired the idea of a Global Seed Vault in Svalbard, was previously stored in an abandoned coal mine, the feasibility study for the Seed Vault determined that the high level of hydrocarbon gases in these mines would be too much of a safety hazard. Instead, the Seed Vault was carved into the "virgin rocks" (Norwegian Ministry of Agriculture and Food n.d. a) of Svalbard's Platåberget (Norwegian for "plateau mountain"), which contains no coal deposits. The entrance to the facility lies halfway up the mountain at 130 metres above sea level. It is marked by a concrete block adorned with an artwork, like every government building in Norway since the Art Programme for New Government Buildings was launched in 1997.[43] The mosaic-like installation on the top of the entrance element emanates a turquoise light, which has made for spectacular pictures especially in the dark of the long Arctic winter. It was designed by Norwegian artist Dyveke Sanne and is called "Perpetual Repercussion". According to Fowler,

> "[through] hundreds of small triangular pieces of polished steel with a mirrorlike quality […] the light sculpture reflects the environment, as the seeds reflect theirs. But in Dyveke Sanne's view it is more than that. 'The thought or idea of the installation is precisely to insist on reflection, that who you will

43 For more information on this programme, see https://koro.no/english/a-short-story-about-koro/ (last accessed July 18, 2025).

meet in the mirror is yourself and that whatever needs doing is up to you.'" (Fowler 2016: 121)

Behind the entrance door, a tunnel leads 120 metres deep into the mountain where 40 to 60 metres of solid rock and permafrost cover three seed storage chambers. Each of the three storage halls inside the vault has the capacity to store 1.5 million seed samples. A sample, also called an accession, contains an average of 500 seeds, meaning that the Seed Vault can store up to a total of 2.25 billion individual seeds. As of July 3, 2025, the Seed Vault contains 1,356,591 seed samples representing 6,378 species stored by 129 depositors (NordGen n.d. b) thus exhausting less than a third of its capacity. There are three main prerequisites to making a deposit in the Svalbard Global Seed Vault. First, the mandate of the Seed Vault only covers PGRFA. Second, all seed samples stored in the Vault must be original, meaning that no identical accession can be stored by the same or another genebank. Third, depositors agree to facilitate access to those resources in their genebanks which are duplicated in Svalbard (Westengen et al. 2020: 1315). Depositors recognise these terms by signing an agreement with the Norwegian Ministry of Agriculture and Food, which stipulates all rights, responsibilities, and obligations of both parties with respect to the deposited material and the conditions of storage and withdrawal (see NordGen 2008). This agreement also contains the provision on property rights remaining with the depositor that was crucial before many genebanks, especially in the Global South, would agree to store duplicates of their collections in the Seed Vault in the first place. Storing duplicates in the Seed Vault is free of charge, but the depositor agreement commits depositors to cover the costs of packaging and shipping. If required, the Crop Trust provides financial and technical assistance.

With no permanent staff based in Svalbard, seeds are usually brought into the Seed Vault three times a year on pre-scheduled occasions. The Seed Vault coordinator and technicians who handle the deposits who are employed by NordGen travel to Svalbard for these occasions. Seed shipments usually reach Longyearbyen by airfreight. Before entering the Seed Vault, they are x-rayed for security purposes at the local airport to make sure that nothing enters the facility except seeds. A "'black box' arrangement" (Fowler 2008b: 190; see also Asdal 2025) prohibits anyone except the depositor from opening the boxes, since they remain property of the depositor at all times. All boxes that go into the Seed Vault must fulfil certain standards with respect to size and material in order to fit the shelves inside the storage chambers. They are tagged with a label providing information on the depositor and content. The seeds inside the boxes have to be dried and vacuum-packed in specifically designed aluminium pouches to meet the conditions for long-term cold storage as specified in the FAO's *Genebank Standards* (2014). Depositors further commit to providing an electronic inventory of their deposits, which contains detailed information on the depositing institution, the seed collection and its origin, the year of harvest (which identifies the regeneration cycle of a seed sample), as well as information on the specific accessions including, for instance, the number of seeds in a sample. All this information is openly accessible through the Seed Portal, an online database managed by NordGen (see NordGen n.d. b). Pictures of the Seed Vault, its construction, storage events, and more are accessible through the Svalbard Global Seed Vault's and the Crop Trust's accounts on flickr. The Seed Vault's website also offers a virtual tour of the facility (Norwegian Ministry of Foreign Affairs/Crop Trust/NordGen n.d.).

Throughout the chapters that follow, I analyse the ways in which the Svalbard Global Seed Vault is a nodal point of the historically emergent and spatially distributed world of agrobiodiversity conservation. Rather than seeing the Seed Vault as an institutional addition to the international agro-political arena, I primarily consider it as itself a political arena within the world of agrobiodiversity conservation. This enables me to explore the agrobiodiversity politics enacted by, through, and around the Seed Vault. The following chapter shows how this analytical perspective expands the state of social-scientific and humanities research on the Seed Vault and *ex situ* agrobiodiversity conservation (2.1), and delineates the empirical-analytical process underlying this study including its methodological premises (2.2).

Figure 1: A Short History of International Agrobiodiversity Conservation Efforts (the author, 2025)