4. Assembling World(ing)s of Conservation

> Like all technoscientific facts, laws, and objects, seeds only travel with their apparatus of production and sustenance. [...] Seeds are brought into being by, and carry along with themselves wherever they go, specific ways of life [...].
> (Haraway 1997: 89)

The Svalbard Global Seed Vault is home to one of the largest collections of seeds from all over the world. These seeds are materialised carriers of a diversity of ways of life – of worlds and modes of worlding the Seed Vault assembles along with seeds. The previous chapter introduced this argument in two steps. First, by situating the Seed Vault within the history of its home, Svalbard, I explored the continuities between the appropriative frontierism and extractivism that have made the archipelago what it is and the *ex situ* conservationism that the Seed Vault embodies. Reading the history of the archipelago's colonisation since the age of European empire-making as an example of a specific type of world-making enabled me to show that the effort to preserve the largest possible diversity of natural resources is a materialisation of the same mode of worlding that has made nature the reservoir of resources the modern world assumes it to be. In this sense, the Seed Vault ultimately serves to preserve the ontological status of the natural/ised world as a resource for human purposes.

In the second part of the foregoing chapter, I argued that the repercussions of this resourcist relation to the natural/ised world materialise both in the global social-ecological problem of agrobiodiversity loss and in other, local challenges the Seed Vault faces. A pertinent example of this is the story of how its construction in Svalbard's mountainscape changed the nature of the Arctic environment in a way that made the permafrost a porous rather than

permanent cover for the vault and caused it to leak into the facility. Insofar as the response to this incident was informed by the same logic of securitisation guiding the Seed Vault's response to agrobiodiversity loss, it seems reasonable to argue that the Seed Vault is characterised by an all-encompassing logic of technological fixing. However, I have argued that it is important to consider the ways in which it is not determined by this logic. Attending to the Seed Vault as a political arena that assembles a diversity of worlds and modes of worlding carried by the seeds it conserves makes it possible to develop a more nuanced understanding of the technoscientific politics of the Seed Vault.

The present chapter develops this understanding further by focusing analytical attention on two divergent, yet interrelated worlds and modes of worlding assembled by and co-constituting the arena that is the Seed Vault. Through the analytical framework of worlds and modes of worlding, it becomes possible to develop an understanding of agrobiodiversity conservation as more than a variable set of practices and technologies. What I focus on in the following, then, is not *how* agrobiodiversity conservation is performed so much as *to what end, in what context, to supply and conserve what world*.

I begin by introducing what I call, following one of my interview partners, the *ex situ* world of conservation. This notion denotes the global system of plant genetic diversity conservation as well as the specific way of knowing, being in, and enacting the world that said system is a manifestation of. I argue that it is as such that it must be considered vis-à-vis other forms of conservation situated in other cosmological realities. This is the aim of the second section, which focuses attention on the radically different more-than-human ways of life embodied in the first Indigenous seeds deposited in the Svalbard Global Seed Vault in 2015 by the Potato Park in the Peruvian Andes. The story of the Potato Park shows that the modern way of knowing and being in the world embedding the *ex situ* world of conservation is not as universal as the universalist cosmology underlying it assumes. It is a living example of the fact that other cosmological and worldly realities exist in this world and have persisted throughout extinctionist colonial histories. Inasmuch as the global social-ecological catastrophes and transformations of the present are rooted in the ecologically destructive resourcist, appropriative, and extractivist modern mode of nature- and world-making, there is much to learn from such other worlds that have experienced and survived world-changing catastrophes and transformations.

4.1 The *ex situ* World of Conservation: Extending the Present of "Life Itself"

> "When I think of genetic resources and *ex situ* conservation, I don't think of Svalbard, because Svalbard is a vault. It has been shown to be very useful, particularly for ICARDA, for Syria. It is definitely a success story. And it is an important … structure or I don't even know what to call it … initiative … it's a very important part of the *ex situ* world. But it's a vault. It is not managed, it is not characterised, it has not done anything but kept – and kept as safe as possible – and then you can ask for it back if you need it [the deposit; FV], but the genebanks are where the work is done." (Scientist, FAO, 6 March 2020: l. 325–336)

The practice of conserving agricultural biodiversity encompasses much more than the storage of seeds in a vault, as this passage from an interview with a scientist working for the FAO indicates. I explained in the previous chapter that the Svalbard Global Seed Vault acts as a backup infrastructure for duplicates of seed collections held in genebanks across the world. As such, it is "a very important part" but not the quintessence of the global system of *ex situ* agrobiodiversity conservation. While it has become a famous icon of agrobiodiversity conservation in the past 16 years, the Seed Vault is only the tip of the iceberg that is "the *ex situ* world" of conservation, as the FAO scientist puts it in the passage quoted above. This ad-hoc phrasing resonates strikingly with Haraway's observation that "[n]othing comes without its world" (1997: 37; see chapter 2.2 and 3) as well as with Situational Analysis' focus on technologies as parts of worlds, both of which inform my analytical approach to the Seed Vault and the world of agrobiodiversity conservation. Following the claim these approaches put forward, that a comprehensive analysis of technoscientific projects requires investigating the worlds in which they are situated, the present chapter extends the focus beyond the Seed Vault to explore "the *ex situ* world" of agrobiodiversity conservation it acts as a backup for.

I begin by introducing how the FAO defines *ex situ* conservation and distinguishes it from other approaches to the conservation of plant (genetic) diversity. Through the interviews I conducted with representatives of various segments of the *ex situ* world, I show that the historical opposition of *ex situ* and *in situ* approaches outlined in chapter 1 has given way to a widely shared complementary understanding of different conservation approaches, according to which each comes with its own advantages. Underlying the idea of comple-

mentarity, as I show, are divergent understandings of the life that conservation practices target. Whereas *ex situ* conservation makes plant genetic diversity available as "life itself" (Haraway 1997; Franklin 2000; Rose 2007), *in situ* conservation facilitates the evolution and adaptation of "life beyond itself" (Folkers 2017). However, extending the focus from the divergent purposes and premises of different conservation approaches to the worlds they come with makes it possible to discern that both *in situ* and *ex situ* conservation practices can be part of the *ex situ* world if and when their modus operandi disentangles the life they aim to conserve from the (more-than-nonhuman) environments or worlds in which this life comes to matter. Insofar as in doing so, the *ex situ* world of conservation overlooks how specific worlds and modes of worlding are implicated in the loss and destruction of agrobiodiversity, its promise of "extending the present" (Wolff 2020; Lemke 2021) of endangered crop diversity also applies to the world that has endangered this diversity in the first place.

The Complementarity of *ex situ* and *in situ* Conservation

The International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA or Seed Treaty, see chapter 1.4) defines *ex situ* conservation as "the conservation of plant genetic resources for food and agriculture outside their natural habitat" (FAO 2001: 2). It differentiates *ex situ* from *in situ* approaches to conservation, defining the latter as "the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated plant species, in the surroundings where they have developed their distinctive properties" (FAO 2001: 2). The most fundamental difference between *in situ* and *ex situ* approaches to conservation, according to this definition, is that the former conserve plants within the ecological environments in which they occur, either naturally or as a consequence of long-term cultivation, whereas the latter extract plant materials from such environments and conserve them within technological (genebanks) or techno-ecological environments (field genebanks; see below). Both types of conservation involve their own distinct sets of practices to maintain the viability of the plants in their custody.

According to the FAO scientist quoted above, the choice as to whether a plant is conserved *in situ* or *ex situ* depends first and foremost on the plant itself, that is to say on what characteristics it has and which type of conservational care it requires:

> "The conservation of plant genetic resources […] includes *in situ* conservation of crop wild relatives and wild food plants in natural habitats; […] on-farm management for farmers' varieties and landraces; *ex situ* conservation of orthodox seed in seed banks; field genebanks for the conservation of species that either have recalcitrant seeds or are vegetatively propagated; and *in vitro* conservation and cryopreservation." (Scientist, FAO, 6 March 2020: l. 268–278; see also table 2, completed based on FAO 2014, 2019)

Table 2: Conservation Strategies (the author, 2025)

Conservation strategy	**Conserved Material**	**Backup options**
In situ conservation in natural habitats	Crop wild relatives, wild food plants	*Ex situ* conservation
On-farm management	Farmers' varieties/landraces	
Ex situ conservation in field genebanks	Non-orthodox/recalcitrant seeds, plant tissue of vegetatively propagated species	*In vitro* and cryopreservation
In vitro and cryopreservation		Safety duplication
Ex situ conservation in seed banks	Orthodox seeds	Safety duplication (e.g. SGSV)

This passage illustrates that there is a spectrum of conservation strategies exceeding the dichotomic distinction between *in situ* and *ex situ* conservation. What the Seed Treaty defines as *in situ* conservation encompasses *in situ* conservation in the narrower sense, which refers to the conservation of wild plants within their natural surroundings, as well as on-farm management of domesticated and cultivated food plants.[1] The *ex situ* approach to conservation

1 As the table shows, there are different kinds of both wild and domesticated plants that are relevant for *in situ* and on-farm conservation. Wild food plants are non-domesticated plants that are edible just as they grow. Crop wild relatives are non-domesticated relatives of domesticated crop plants that are not edible themselves but are "potential sources of heritable traits for use in crop breeding" (FAO 2019: 11). The term "landraces" denotes cultivated crop varieties "that [have] evolved through many years of farmer-directed selection and that [are] specifically adapted to local conditions" (FAO 2014: 164).

equally comprises various strategies of conservation; the choice between these depends on species-specific requirements.

The FAO scientist distinguishes three different types of plant species: those that produce orthodox seeds, those that produce recalcitrant, also called non-orthodox seeds, and those that propagate vegetatively, that is, produce no seeds at all. The characterisation of seeds as either orthodox or non-orthodox, a distinction coined in the context of seed banking and without meaning beyond it, denotes whether a seed "can [or cannot] be dried to low moisture content and stored at low temperatures without damage to increase seed longevity" (FAO 2014: 165). Seeds that can be dried and frozen for long-term conservation are called orthodox seeds, whereas non-orthodox seeds lose "vigour and viability" (FAO 2014: 165) or die when their moisture content is reduced. Along with vegetatively propagated plants, therefore, non-orthodox seeds require other methods of conservation than orthodox seeds, such as conservation in field genebanks or *in vitro* or cryopreservation.[2] Irrespective of the conservation strategy, the FAO's *Genebank Standards* (2014) commit all genebanks to safety duplication, as explained in chapter 3.2. Safety duplication in the Svalbard Global Seed Vault is only available for orthodox seeds (so far). Therefore, where I go into more detail on *ex situ* conservation practices in the following, the focus is on the conservation of orthodox seeds in seed banks. Where I discuss conservation approaches in a more general sense and distinguish between *ex situ* and *in situ* approaches to conservation, I follow the Seed Treaty's definition cited above, which conflates the various strategies in this broader distinction.

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2 *Ex situ* conservation in field genebanks refers to the conservation of plants by way of cultivation. It is a form of *ex situ* conservation insofar as this cultivation takes place in fields created for the purpose of conservation and not in the plants' natural habitats. The conservation of plant tissue *in vitro* "is used for maintenance of plant organs or plantlets in a medium-term time frame (some months up to some years) under non-injurious, growth-limiting conditions" (FAO 2014: 134). It is not suitable for long-term conservation due to slow growth of the material, a continuous possibility of contamination or hyperhydration, as well as the need for constant monitoring. *In vitro* conservation is often, though not necessarily, conducted in preparation or post-processing of cryopreservation. Cryopreservation denotes "[t]he storage of plant organs in liquid nitrogen (-196°C) or above, in its vapour phase (maximum -140°C). In the genebank context, it is used for buds, shoot tips, other meristematic and embryogenic tissue, explants from recalcitrant and (in special cases) entire orthodox seeds, pollen and somatic embryos" (FAO 2014: 162).

As already mentioned, conserving orthodox seeds for the long term, as in the Svalbard Global Seed Vault, requires drying and storing them at cold temperatures. The first of the two passages quoted from the interview with the FAO scientist above indicates that *ex situ* conservation is not limited to drying and freezing. The process of conserving orthodox seeds in genebanks involves a series of steps standardised by the FAO's *Genebank Standards*. These include "acquisition of germplasm, seed drying and storage, viability monitoring, regeneration, characterization, evaluation, documentation, distribution, [and] safety duplication" (FAO 2014: 5, 17–64). In addition to these procedures, there are standards for genebank personnel and security. Viability monitoring is essential because the viability of a sample can always decline during conservation, no matter how good the storage conditions. If the viability of a sample drops below 85 per cent of its initial viability, the *Genebank Standards* recommend regeneration, that is, thawing, sowing, growing, and collecting seeds to create a new sample. Regeneration is performed to increase the viability of a variety in conservation as well as to multiply the amount of seeds of a sample in storage (FAO 2014: 31, 36). The characterisation and evaluation of seed samples and the documentation of the whole process including all relevant factors is crucial because seed collections, as Pellegrini and Balatti put it, "would have a quite limited usefulness" (2016: 2759) without the collection of data and knowledge about those seeds. It is through the latter that they become valuable resources for breeders and, if and where they have access to genebank collections, for farmers.[3]

I have indicated in previous chapters that there are different types of genebanks. They differ with respect to the plants they conserve and the conservation strategies they employ (see above) as well as the objective they pursue (see Pellegrini/Balatti 2016). While some genebanks immediately supply farmers, others primarily support research and breeding and yet others, such as the Svalbard Global Seed Vault, focus exclusively on long-term storage for safety duplication. Often (though not always) genebanks that directly assist farmers operate on a community level, whereas genebanks that work with breeders or have their own breeding programmes and those that offer long-term conservation often operate on a national, international, or transnational level. This

3 Pellegrini and Balatti argue that genebanks, therefore, "can be thought of as part of a broader process of 'databasing the world', necessary for the development of a knowledge economy which needs huge amounts of standardized and classified data" (Pellegrini/Balatti 2016: 2759–2760, referencing Bowker 2000, 2005).

has much to do with the history of plant breeding, which played a crucial role in the globalisation of agriculture in the second half of the twentieth century (see chapter 1).

The IARCs under the umbrella of the CGIAR, for example, which today hold some of the largest transnational genebank collections worldwide, were established as part of the effort to 'modernise' agricultural production through the breeding and dissemination of 'improved' varieties of local crops in large parts of the Global South in the second half of the twentieth century. Collecting and conserving the genetic diversity previously cultivated in those countries in seed banks was a measure taken to prevent this diversity from going extinct while also making it available for further breeding. However, as the plant scientist from Bioversity International I interviewed explained, "there were no national genebanks at that time in many countries. Some of these international collections in the CGIAR existed or were established around that time but countries did not have *ex situ* conservation strategies at all in those days." (Scientist, Bioversity International, 20 January 2021: l. 103–107) While many countries do have national genebanks today, the creation of such national-level facilities is a slow and ongoing process. It is hampered not least by the fact that genebanks do not have the same financial resources as transnational actors with ties to the seed industry – which applies even more to community seed banks.

Ex situ conservation became the core international strategy to counteract the advancing loss of agricultural biodiversity in the 1960s and 70s at the instigation of the then most relevant inter- and transnational agro-political and agro-industrial actors, first and foremost the FAO and the CGIAR. As shown in chapter 1, historical accounts of this development suggest that *ex situ* conservation prevailed over *in situ* approaches for economic, (geo)political, and technological reasons, all of which were embedded in a larger regime of modernisation (see e.g. Curry 2017; Fenzi/Bonneuil 2016; Flitner 2003; Flitner/Heins 2002). I asked all my interview partners about their expert opinion on this historical development and, in some cases, their personal experience of it. The answer I received from Kent Nnadozie, acting secretary of the Seed Treaty, largely aligns with the historiographical narrative. However, Nnadozie also emphasised that deriving a generally adversarial conception of *ex situ* and *in situ* conservation from this development would be an erroneous conclusion:

> "It was more of a misunderstanding of some of the developments […]. Somehow that has now evolved into like an entity in itself. […] There was a major, I would say, friction between *ex situ* and *in situ* conservation because the ad-

> vocates of collection and preservation, who promoted the establishment of the CGIAR centres as part of their role then, were much more politically connected and stronger and had more access. The tendency that a lot of attention and resources were diverted to their efforts [...] is now evolving into a demarcation from [*in situ* efforts]. But to my mind, the people who were involved in those activities did not see such a distinction, this was much more a meta-definition." (Kent Nnadozie, Secretary, Seed Treaty, 26 March 2020: l. 787–809)

According to Nnadozie, at the time that the loss of agricultural biodiversity was recognised as a pressing issue on an international level, advocates of counteracting agrobiodiversity loss by collecting plant genetic resources and conserving them in genebanks were able to attract more public attention and resources (presumably primarily meaning financial resources, but possibly also scientific and biological resources) because of their greater political influence compared to proponents of *in situ* conservation measures. As he sees it, institutions with an explicit focus on *ex situ* conservation and plant breeding, like the CGIAR and its IARCs, emerged and gained influence because they offered a more immediate solution to the perceived urgent need for measures against permanent losses of diversity (see chapter 3.2). Accordingly, for Nnadozie, both the primacy of *ex situ* strategies in international conservation activities and the idea that *in situ* and *ex situ* conservation are inherently adversarial approaches were consequences rather than preconditions of this development.

Conceiving *in situ* and *ex situ* conservationists as proponents of two opposing camps competing for the dominant position in the agrobiodiversity conservation movement, in contrast, fails to see that "they all [all conservation strategies; FV] have specific roles and functions to play in the whole, for both agricultural production and food security. So, drawing that distinction has not been helpful if you ask me." (Kent Nnadozie, Secretary, Seed Treaty, 26 March 2020: l. 760–764) In other words, and in line with the differentiation of conservation strategies unfolded through the FAO scientist's perspective at the beginning of this chapter, *in situ* and *ex situ* conservation are not opposing approaches to the same problem so much as different strategies on a continuum of conservation activities counteracting agrobiodiversity loss.

Nevertheless, Nnadozie admits to a historical "friction" (see above) between advocates of *in situ* and *ex situ* conservation that arose from the differential recognition and international support for the two approaches. However, his account also indicates that today, this friction has given way to the notion

that different conservation strategies are complementary. According to Cary Fowler, who is among those of my interviewees who have worked the longest in the field of plant genetic diversity conservation, the idea of a complementarity of *in situ* and *ex situ* conservation strategies first arose in the international agro-political arena in the 1990s, although it did not immediately gain acceptance:

> "I recall in 1995 and 96, when I was at FAO and working on the Global Plan of Action, many people involved in *ex situ* conservation were very critical on *in situ* conservation. And the people who were involved in *in situ* conservation very much wanted what they were doing to be recognised and legitimised; and they started talking about *in situ* and *ex situ* being complementary approaches. I believe that the Global Plan of Action, which I personally drafted, was the first document – official document acknowledged by governments – that described the two as complementary. And that was seen, at that time, by the *in situ* advocates as a big step forward. I think after that, ironically, a lot of the *in situ* people started to attack the *ex situ* [approach; FV], I don't know why; not really consider them so much as a continuum but consider them, ironically, as juxtaposed against each other in the same way that the *ex situ* people had treated the *in situ* people earlier; which I always thought was very strange, that the roles had reversed a little bit. I still think they are complementary, and each has its place, and we just have to realise in a thoughtful way what that place is." (Cary Fowler, 19/20 March 2021: l. 254–280)

This passage sheds a slightly different light on the relation between *in situ* and *ex situ* conservationists. For one thing, according to Fowler's account the adversarial relation between *in situ* and *ex situ* conservationists is much less of an external interpretation than Nnadozie suggests. Fowler rather sees it as a mutable manifestation of historical struggles for recognition and support. In addition, this understanding of the history suggests that the *idea* of a continuum of complementary conservation activities is not the same thing as *practical* cooperation and mutual support. The emergence of the idea of complementarity in the 1990s did not coincide with the emergence of complementarity in practice. However, according to Fowler, writing it into the "Global Plan of Action on the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture" (FAO 1996), the key official document stipulating the terms for international efforts in agrobiodiversity conservation after the CBD and before the Seed Treaty, was a crucial step in that direction. It created a policy situation in which complementary conservation projects were encouraged and thus incrementally realised.

Today, the complementary understanding of *in situ* and *ex situ* conservation has by and large become common sense among crop conservationists, as most of my interview partners suggest. This does not mean that there is no ongoing friction between proponents of different approaches to conservation (I come back to this below), but the need to forge links is increasingly recognised and links are increasingly being forged. The FAO scientist quoted above concluded their delineation of the different types of conservation – *in situ*, on-farm, and *ex situ* – by pointing out the ways in which they are complementary:

> "I really see all three types of conservation as very complementary. You cannot have one without the other. […] This is my view and I believe it is also FAO's view that they are complementary. *Ex situ* conservation is absolutely necessary to make sure that as much of those species that are important for food and agriculture are conserved for as long as possible. The advantage of having them in genebanks, besides the security, is that often there is a series of steps that are taking place; often they are characterised, some of the better ones are evaluated, some of them go into breeding programs to help enhance and improve crop varieties that then go back to the farmers to help them improve their yields and their livelihoods. So, there is a lot of work that is done in genebanks that is very important and useful beyond just safeguarding. On-farm management and *in situ* – and more so the *in situ* conservation – means that they are allowed to evolve; […] and not just evolve but adapt. […] Especially the farmers' varieties that are adapting allow farmers to grow something that is resilient. Until the case be that plant breeding catches up. The problem is that crop improvement sometimes causes diversity to decrease and increased diversity uses less improved varieties. So, the idea was to have sort of a compromise. Because farmers need to eat." (Scientist, FAO, 6 March 2020: l. 293–324)

This passage illustrates that agrobiodiversity conservation means different things and serves different purposes. A key goal of *ex situ* conservation is making PGRFA available for the long term. The Svalbard Global Seed Vault, being a storage space for safety duplicates of other genebank collections, serves solely this purpose by way of safeguarding these collections. Other genebanks, such as those depositing their duplicates in Svalbard, work towards long-term availability of PGRFA by way of actively maintaining their collections. While they need safety duplicates to insure their collections against the many kinds of threats they are exposed to, the viability and value of safety duplicates depends on the work done in genebanks.

Beyond guaranteeing long-term availability, *ex situ* conservation also facilitates the production of new crop varieties through breeding by offering a supply of PGRFA and data collected alongside them. To breed 'improved' varieties and supply farmers with these varieties, which will help them achieve better yields, genebanks and breeders need an ongoing supply of a diversity of PGRFA. Therefore, they depend on farmers who cultivate that diversity and on *in situ* conservation efforts that maintain resources of potential value for food and agriculture in the wild. In a nutshell, *ex situ* conservation "is a backup for the farmers, but […] the farmers are also a backup for the genebanks" (Scientist, FAO, 6 March 2020: l. 128–130). What *in situ* conservation and on-farm management make possible that *ex situ* conservation and breeding do not is the continuous evolution and adaptation of PGRFA within the ecosystems in which plants ultimately will have to grow and thrive. Thus understood, a complementary understanding and practice of different forms of conservation is not a 'compromise' so much as mutually beneficial.

This perspective is similarly expressed by another of my interview partners, Godfrey Mwila, who has been actively involved in the plant genetic resources conservation movement since the 1990s. He has worked in different institutional contexts and capacities, mostly engaged in the establishment of national genebanks in Southern Africa and policy development on the international level. In contrast to the interviewee working for the FAO, who is a scientist with a background in conservation genetics and whose viewpoint is unambiguously situated within the *ex situ* world of conservation, Mwila's perspective is somewhat differently situated. His main concern is strengthening on-farm conservation and sustainable farming systems more generally. While he shares the conviction that "genebanks should be seen as a complementary system for on-farm seed security" (Godfrey Mwila, 12 March 2020: l. 247–249), he makes the case for complementarity, so to speak, from the other side:

> "On-farm conservation activities or programmes have not been that much supported compared to *ex situ* collections; and the on-farm conservation system is important because that is where the materials continue being grown and continue being adapted to the changing environment and so it is important that those systems are also supported. Linkages should create a situation where private actors like seed companies and other donors see the importance of on-farm activities and start supporting them, bring farmers and *ex situ* conservation and also the use part closer together. Because this is a continuum. What is happening on-farm will have an effect on what is hap-

> pening in the business of seed production and supply and also will have an effect on the future functioning of genebanks, of *ex situ* collections." (Godfrey Mwila, 12 March 2020: l. 277–298)

Like the FAO scientist, Mwila emphasises that the adaptation of plants to changing environmental conditions happens *in situ* and through on-farm cultivation. However, while the former argues that these are important sites of conservation "[u]ntil the case be that plant breeding catches up" (see above) by producing improved varieties of crops adapted to local conditions, Mwila calls for more support for *in situ* and on-farm conservation. He argues that linkages between farmers, genebanks, and the seed industry are needed to put complementarity into practice and orient conservation towards use.

Conservation for use, as nearly all my interview partners suggest, is a guiding principle in all forms of conservation. This is reflected, for instance, in the following passage from my interview with Cary Fowler:

> "For me, the purpose of conservation – even though I get good warm feelings from seeing everything conserved – is really to use it and that it is for a purpose, at the end of the day. I think where that maybe intersects with *in situ* is that farmers [...] are conserving genetic diversity, but that's not the purpose of what they are doing. [...] There are very few farmers that are farming for the purpose of conserving diversity. They want to grow food and make a living and that kind of thing." (Cary Fowler, 19/20 March 2021: l. 300–311)

Fowler draws a connection between different types of conservation insofar as they are all ultimately oriented towards use and thus towards a concrete purpose beyond conservation itself. However, it remains opaque what "use" and what "purpose" exactly he has in mind when it comes to genebanks and *ex situ* conservation. While food production might be the purpose of all conservation activities "at the end of the day", seeds travel a long way from the genebank to the field, and I have elaborated above the many steps involved. The purpose of most genebanks not directly assisting farmers – and thus that of most genebanks whose duplicates the Seed Vault holds – is to supply research and breeding. This is a type of use that both differs from and affects the use in farming that Mwila talks about.

For Mwila, use clearly means on-farm food production and direct access to PGRFA for farmers rather than breeding:

> "The central theme that should justify linkages is the actual use, is the need to actually increase the use of materials that are conserved in genebanks. And access to those materials by farmers, for example, has not been that good. Given the effects of climate change, which is reducing the resilience of farmers, there is a need for farmers to get more access or to have knowledge about the materials that are in those genebanks. And so, one of the things about these linkages is to create, to develop the farmers' capacity, to increase their capacity – in terms of understanding the role of *ex situ* collections and their own role and how these two systems are really mutually supportive." (Godfrey Mwila, 12 March 2020: l. 259–276)

Forging linkages between farmers and genebanks, as Mwila elaborates in this passage, has a threefold relevance for farmers. The main goal is for them to be able to use the material conserved in genebanks. Therefore, they need better access to it as well as to the knowledge required to put it to sensible use. Both require what Mwila calls capacity-building in order for farmers to become equal partners in the system of conservation and sustainable use. Linkages are particularly important for farmers, as Mwila argues, in light of the environmental challenges that come with climate change and necessitate new degrees and forms of resilience. According to both Mwila and, even more explicitly, the FAO scientist, resilience can be achieved by adapting cultivars to changing on-farm conditions through ongoing cultivation. However, although they agree in a number of respects, it is clear from the way Mwila and the FAO scientist talk about complementarity what part of the conservation continuum they are engaged in themselves and from which standpoint they make a case for complementarity. While from the FAO scientist's point of view, *in situ* and on-farm conservation are a backup and source of evolving diversity for *ex situ* conservation and breeding, Mwila highlights the role of genebanks as sources of supply for farmers.

In contrast to both of these accounts Hannes Dempewolf, who is a scientist at the Crop Trust, expresses an understanding of complementarity that aligns more with Fowler's above-cited conviction that "each has its place; and we just have to realise in a thoughtful way what that place is". In response to my question about the importance of *ex situ* conservation in comparison to other approaches to conservation, Dempewolf states:

> "You are talking to someone from the Crop Trust and we, of course, are all about *ex situ* conservation. That is our mandate, that is our mission, that we

> live and breathe *ex situ* conservation. That is not to say that we do not recognise the importance of *in situ* conservation and its complementarity. In fact, I am, at the moment, developing a project that is trying to get away from this idea of dividing *ex situ* and *in situ* and think about it as a conservation continuum, which I think makes a lot of more sense; and you get away from these antagonistic wars of our research allocations that are really unhelpful. I think genebanks need to support *in situ* efforts and *in situ* efforts need to work with genebanks. That is something that is bound to happen, it has to happen, and I hope it happens soon. […] By our mandate we are bound to *ex situ* but we always try to see in which way the work we support can help *in situ* efforts. […] Having said that, they also have slightly different roles. *In situ*, even when it comes to crop diversity, is a changing system. The diversity continues to adapt in the field, whereas in genebanks it is static – apart from regeneration cycles, but it is relatively static – which means that the material that evolves with farmers changes, it is not per se conserved, because it changes with environmental conditions. Of course, that means that the sort of material you conserve and the conservation dynamics differ, they are just different. We have to recognise that there are advantages and disadvantages for both." (Hannes Dempewolf, Scientist, Crop Trust, 28 May 2019: l. 704–759)

Dempewolf differentiates between *in situ* and *ex situ* conservation not only in terms of which plants are conserved, which procedures used, and which goals pursued. The fundamental difference between the two types of conservation he describes is that the conserved material exists in divergent temporal and environmental conditions. His argument that plant material conserved in genebanks is "relatively static" refers to the fact that cold storage slows down the conserved material's biochemical processes of life. Drying and freezing strip seeds of their capacity to change their current state of being and adapt to the environmental conditions in which they exist. In cold storage, therefore, seeds (ideally) neither germinate nor decay.[4] Plant genetic material conserved

4 Biochemical processes do not actually come to a halt through freezing but are merely being slowed down, the more so the lower the temperature (see also Laboissière 2019). In addition to temperature, there are other aspects that also influence the degree to which viability is preserved in storage, such as moisture content and the occurrence of pathogens. In 1984, the Nordic Genebank (the predecessor institution to NordGen) initiated a 100-year experiment to monitor the development of the viability of seeds stored inside the permafrost, at -3 degrees Celsius (the samples were stored inside an abandoned coalmine in Svalbard). Interim results after 35 years show a decline in viability which proves that the naturally occurring cold temperatures in the Arctic are

in situ, in contrast, is embedded in a living environment, within and along with which it evolves and to which it adapts. Accordingly, while the temporality of material conserved *ex situ* is relatively static, the temporality of material conserved *in situ* is dynamic; *ex situ* conservation arrests change, whereas *in situ* conservation embraces change.

The idea that plant material conserved *in situ* is "not per se conserved" is highly instructive insofar as it displays the *ex situ* conservationist understanding of plant genetic material as something that exists in itself, that can be disintegrated from a plant or an ecosystem (and introduced into other environments, whether ecological or technological) without changing the nature of what it is.[5] This *ex situ* world view, as it might be called following the notion of the *ex situ* world, resonates with the fundamental premise of technologies of biobanking. According to the sociologist and STS scholar Thomas Lemke (2012), in biobanking "the focus is entirely on securing the existence of life forms as isolated and identifiable entities that can be stripped of their natural environment, technically processed, preserved, and transferred to other contexts" (2012: 191). This definition concisely encapsulates the rationale behind Dempewolf's argument that "the sort of material you conserve" is "just different". Seeds and other isolated plant material conserved *ex situ* are the bio-objects that technologies of biobanking simultaneously assume and produce. *In situ* conservation practices, in contrast, target plants-within-ecosystems, or ecosystems that sustain the life of certain plants. *In situ* conservation does not aim to conserve specific, identifiable, extractible, and technologically processible plant genetic resources so much as ecological processes and the ongoingness of the life of species relevant for food and agriculture within the (changing) ecologies in which they thrive. Hence, that "the conservation

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not cold enough for successful long-term conservation (see Asdal et al. 2019). In 2020, NordGen launched a new 100-year experiment in which Seed Vault depositors are collaborating to assess the development of viability of seeds stored inside the Svalbard Global Seed Vault, i.e. at -18 degrees Celsius, in relation to growing, harvesting, and storage conditions (see NordGen 2020).

5 This view more generally informs processes of detaching and accessing entities from ecologies in the *ex situ* world, as a current controversy on digital sequence information (DSI) demonstrates. In this case, it is the digitalised genetic information embodied in a seed that some in the breeding industry treat as separable from the material seed. Based on this interpretation, they seek to obtain free access to the DSI by arguing that benefit-sharing regulations only apply to material resources and not to the information encoded in them (see Nehring 2022).

dynamics differ", as Dempewolf puts it, means that *ex situ* and *in situ* conservation ultimately presume and seek to preserve different things: "life itself" (Franklin 2000; Rose 2007) as opposed to "life beyond itself" (Folkers 2017).

The Politics of Conserving "Life Itself"

The notion of life itself became a pivotal point in social-scientific debates about biopolitcs around the turn of the millennium. It is well known today that the concept of biopolitics goes back to Michel Foucault (1970, 1978, 2003), who introduced it to encapsulate a modern form of governing life through the regulation of individual bodies and populations. In light of the biotechnological developments of the late twentieth century, which shifted the focus of biopolitical control from the life and death of individuals and populations to "life itself" on the molecular level, scholars such as Sarah Franklin (2000) and Nikolas Rose (2007) described the rise of a new form of "molecular biopolitics" (Rose 2007: 17). This form of biopolitics is characterised by what Haraway calls a "genetic fetishism" (1997: 141–148). "[T]he chief actor and point of origin in the drama of life itself – the gene" (1997: 133) is fetishised as an autotelic thing-in-itself – which, however, requires erasing the technoscientific apparatuses of production through which genes come to matter in the first place.

Enabling the new forms of governing life in the genomic era, according to Franklin (2000: 188–191), are three historical shifts in the onto-epistemology of life: the biologisation of nature in the modern era, the geneticisation of biology the second half of the twentieth century, and the consequential instrumentalisation and capitalisation of what has thus become "life itself". At the turn of the millennium, these developments led Franklin to conclude:

> "The twentieth-century transformation of life itself has had the consequence that the grounding or foundational function of nature as a limit or force in itself has become problematic and lost its axiomatic, *a priori* value as a referent or authority, becoming instead a receding horizon. Nature [...] has been antiquated, displaced and superseded, and now it is only a trope – a mere shadow of the referent it used to signify." (Franklin 2000: 190–191)

Today, this conclusion seems hardly tenable. Nature as a limiting force has reappeared on the horizon in the form of multiple ecological disaster scenarios presently unfolding and accelerating all over the world. Anthropogenic climate change and biodiversity loss, above all, are casting ever greater shadows on

the modern dreams of human exceptionalism and unrestrained technological emancipation from and mastery over nature.

Like previous (geo)historical situations, the current one too has given rise to new technologies of control that come with new forms of biopower and biopolitics. As I have shown throughout this chapter and the previous ones, the growing realisation that vegetal and other forms of genetic diversity and hence a great stock of capitalizable resources are threatened with extinction both *in situ* and in biobanks has resulted in the emergence of cryobanks, meaning conservation facilities that preserve genetic resources for the long term through the use of cold temperatures, or what are now known as cryotechnologies.[6] Technologies and infrastructures of refrigeration were developed as early as the second half of the nineteenth century. Today they facilitate unprecedented and increasingly refined ways of "controlling, transforming, safeguarding, and enhancing life" (Friedrich 2017: 61; see also Friedrich/Höhne 2016). Through the disentanglement of bits of life – both more-than-human and human – from the "biological, ecological and social interactions [they] originated from" (Lemke 2021: 710) and through their suspension in a state of being neither alive nor dead, cryotechnologies serve to make biomaterial indefinitely available as "biological capital" (Lemke 2021: 707; see also Sunder Rajan 2006).

The government of life that these technologies exert, or make it possible to exert, has been theorised as a form of "cryopower" (Friedrich 2017) and "cryopolitics" (Kowal/Radin 2017) or, as Lemke has recently suggested in a critical revision of the former term, a "politics of suspension" (2021, 2022). According to Lemke, this form of governing life "goes beyond conventional technologies of collecting and storing organic material as it […] not only assembles and preserves 'cryofacts' (Friedrich 2020, 329) for contemporary usages but also mobilizes and explores purposes 'as yet unknown' (Radin 2017, 55)" (Lemke 2021: 711). An excellent example of this that Lemke (2021: 711–712) himself adduces

6 The prefix *cryo* derives from the Greek word *krýo* (κρύος), which means icy cold or frost (see Radin/Kowal 2017: 4). Cryopreservation in the strict sense of the term refers to the conservation of biomaterials at cryogenic temperatures, that is, -196 degrees Celsius, which is the temperature of liquid nitrogen. Conservation through freezing is also possible and performed at lower sub-zero temperatures, for example at -80 degrees Celsius in dry ice, depending on the biomaterial in question and its behaviour at low temperatures. If not specified otherwise, I use the term cryotechnologies as a signifier for all technologies that freeze biological material at sub-zero temperatures, including the conservation and cold storage of seeds at -18 degrees Celsius.

is the conservation of plant genetic material in genebanks that do not directly assist farmers but conserve it for the medium and long term in order to make it available for various, not predefined types of future use. Insofar as the Seed Vault and the genebanks whose duplicated collections it safeguards aim to collect, conserve, and make available "every trait we might want our crops to have in the future – all the options – [that] can be found in this genetic diversity" (Fowler 2016: 18), what they assemble is biocapital with manifold, yet to be realised purposes (see also Breithoff/Harrison 2020; Dalyan 2021).

The promise of an endless continuation of capitalising 'life itself' in ways yet unknown must be situated in the current geohistorical moment, which is characterised by accumulating and intersecting social-ecological crises that challenge the modernist dream of unlimited economic growth and development through ever-expanding resource exploitation. Underlying the Seed Vault's politics of suspension is the promise that there is a way to reckon with worldwide ecological devastation that does not require suspending "the patterns of global production and consumption that have led to the ecological crisis and environmental destruction" (Lemke 2021: 712). Instead, *ex situ* conservation is a cryotechnological promise to preserve a world on the brink of extinction by way of suspending the life in danger of being lost along with the threat of extinction. The temporal horizon of the politics of suspension enacted by long-term seed conservation facilities, then, is not the future so much as the present, as Lemke (2021: 711) argues, building on Leon Wolff's intriguing analysis of the Svalbard Global Seed Vault's "politics of reversibility" (Wolff 2020). Rather than anticipating and acting on the future by striving to prevent, prepare for, adapt to, or accommodate it, the Seed Vault and the politics of suspension it exemplifies "extend[…] the present" (Wolff 2020: 3; Lemke 2021: 711) by postponing future threats or their irreversibility. Where the attempt to preserve the status quo entails postponing political and social change outside the genebank, which might address the roots rather than the effects of the contemporary social-ecological crises, the politics of suspension become conservative in every sense of the term (Lemke 2021: 712; see also von Verschuer 2021: 60).

This assessment resonates with a critique mentioned in the previous chapter, namely that the Seed Vault and *ex situ* conservation evoke "a false sense of security in a world where the crop diversity present in the farmers' fields continues to be eroded and destroyed at an ever-increasing rate" (GRAIN 2008; see chapter 3.2). Beyond objecting to *ex situ* conservation as a techno-solutionist answer to agrobiodiversity loss, as set out in the previous chapter, this cri-

tique also draws attention to the world in which the problem of agrobiodiversity arises. This world is not only a world of endangered agrobiodiversity, but one that puts biodiversity in existential danger in the first place. Agrobiodiversity loss and *ex situ* conservation of agrobiodiversity in the form of PGRFA come from the same world; they are manifestations of the same mode of worlding. Extending the present of that world and mode of worlding through *ex situ* conservation, then, also extends the presence of agrobiodiversity loss while at the same time suspending attention to its roots.

It is important to understand that the point here is not to argue against *ex situ* conservation as such. What I mean to problematise is not the practice or technology of *ex situ* conservation itself, but the *ex situ* world's hegemonic position within international conservation efforts. It is certainly fair to say that the *ex situ* world's politics of suspension works towards extending the present, as Lemke and Wolff do. However, and this is crucial, it is the present of a specific world that is extended: the present of a world made of biofacts that can be *ex situated*, biovalue that can be extracted, biocapital that can be accumulated. This world is the product and a continuously produced materialisation of an *ex situ* mode of worlding that operates by erasing both ecological and technoscientific environments producing and sustaining what is fetishised as life itself. Making the conservation of this world and mode of worlding and the extension of its present the core international strategy to counteract agrobiodiversity loss comes at the expense of other, differently cultivated worlds, presents, and futures. These are more-than-speculative, existing and lived real worlds and presents increasingly forced into a reality of devastating futures-becoming-presents (see the following section). Recognising and accommodating these would mean to not conserve just one world and its present, but to cultivate and conserve what the Zapatistas call "a world in which many worlds fit" (Ejército Zapatista de Liberación Nacional as quoted and translated by de la Cadena/Blaser 2018b: 1).

From "Life Itself" to "Life Beyond Itself" and More-Than-Human Worlds

Against the background of the earlier discussion of different modes of conservation, the question arises of what role *in situ* conservation assumes in this context and in what ways it does or does not open up different paths in and for the world of agrobiodiversity conservation as well as towards "a world of many worlds" (de la Cadena/Blaser 2018a). Based on Dempewolf's differentiation of *ex situ* and *in situ* conservation as fundamentally different approaches regard-

ing their conservation dynamics and the material they target, I have stated that *in situ*, other than *ex situ* conservation, seeks to preserve not life itself but life beyond itself. The notion of "life beyond itself" goes back to Andreas Folkers (2017), who introduced it to account for the environments or the worlds that fall into oblivion in the politics of life itself. Folkers (2017: 367) encapsulates this key argument of his text in the German word *Umweltvergessenheit*. There is no equivalent to this term in the English language, and a literal translation would amount to something like "environmental oblivion". It is important to note, however, that the German word for environment (*Umwelt*) encompasses the word for world (*Welt*). Folkers interlinks both terms in the notion of *(Um)Welt*, which illustrates that the world is more than an environment, or to put it another way that there is more to the environment than the term classically suggests. Bringing the *(Um)Welt* back into the discussion of the politics of life itself, as Folkers does, means situating life not merely in genes, cells, and seeds, but also in the ecologies that make them.

In reference to the work of Gilles Deleuze and Félix Guattari (and in contradistinction to currently flourishing neo-vitalist interpretations of their work), Folkers proposes a notion of ecology that denotes not an assemblage of biological lifeforms and their relations so much as an intricate nexus of living and non-living matter. This approach replaces dualist distinctions between nature and culture or biology and technology with an understanding of vitality as emerging in a dispersed fabric of relations "that exceeds both organic life and life itself" (Folkers 2017: 375, author's translation). Folkers condenses this conception in the notion of "life beyond itself", which serves to emphasise that life is not substantial but relational. In the same way that human bodies become what they are in more-than-human relations (Haraway 2008: 3–4; see introduction), ecologies and their components become what they are through ongoing more-than-nonhuman relations and ways of mutual affecting and being affected. Based on this understanding of life, the environment is not a sphere of its own that is merely a surface or surrounding to the lifeforms inhabiting it. Rather, lifeforms and their respective more-than-nonhuman environments – their worlds *[(Um)Welten]* – always form a "symbiotic complex of relations" (Folkers 2017: 373, author's translation).

The rationale of conserving plants *in situ* and on-farm so that they may evolve with and adapt to the (changing) environments in which they grow illustrates this notion of a politics of life beyond itself. Another passage from the interview with Dempewolf, in which he argues that *ex situ* conservation is better suited for long-term conservation than *in situ* approaches, demonstrates that

this process of plant evolution and adaptation refers to more than ecological environments in the narrower sense, namely to more-than-nonhuman worlds or *(Um)Welten*:

> "In terms of long-term conservation, if you talk about conserving material forever, which is what genebanks are for, *ex situ* is probably the preferred choice because you have much more control over the conservation process; whereas in *in situ* conservation, you work with people; and farmers are businessmen, they make decisions based on what makes sense for their conditions, and if certain incentives are missing then they may stop conserving certain materials simply because they have to feed their families; and you cannot be ignorant of that either. So, I think for the long term, *ex situ* conservation is probably something that needs to be highlighted." (Hannes Dempewolf, Scientist, Crop Trust, 28 May 2019: l. 760–773)

In this passage, Dempewolf situates not only the plant life that conservation practices target within the environment of conservation. He also situates the practice of conservation itself within the more-than-nonhuman world it is embedded in. Unlike in *ex situ* conservation, especially in preservationist facilities, where use is a long-term goal and does not necessarily refer to the use of farmers (only), farmers do not conserve to conserve but to be able to continue to cultivate crops and make a living. Accordingly, *in situ* and even more so on-farm conservation depend on environments made up not only of climate, weather, and soil – including all the fungal, bacterial, microbial and other beings constituting it – as well as pests, diseases, and other lifeforms, but also of farmers and their contingent decisions about what (not) to grow and conserve as well as the social, political, and economic relations co-constituting these decisions.

Agrobiodiversity loss, then, may result not only from ecological changes and incidents or from technological and human failure jeopardising *in situ* and *ex situ* conservation infrastructures, the reasons usually invoked to vindicate safety duplication (see chapter 3.2). Loss of agricultural biodiversity can equally be a result of non-cultivation or neglect, quite possibly as a consequence of necessity. The "control over the conservation process" that *ex situ* conservation promises, as Dempewolf argues, then, arises from the disentanglement of seeds not only from their biological and ecological entanglements (or more precisely from as many of these as possible), but also from their more-than-nonhuman worlds [*(Um)Welten*].

What remains unmentioned in Dempewolf's account, however, is that the *ex situ* world itself does not exist isolated from other human and more-than-human worlds either. To produce and maintain PGRFA, it depends on technological and infrastructural as well as political and economic apparatuses far exceeding the confines of the *ex situ* world of conservation. In the interview I conducted with a CSO representative in an Ad Hoc Technical Expert Group (AHTEG) advising the Seed Treaty, they explained how conservation activities are entangled in political and economic issues and what relevance that, in turn, has for the discussion of *ex situ* and *in situ* conservation and their complementarity.

> "It is very important to be practical, but very critical on the roles of the different types of conservation. A lot of agrobiodiversity is being lost sometimes in a year particularly in farmers' communities because they lose their seeds due to climate change, for instance. That element makes *ex situ* conservation strategies very important. But it has to be put in context. The reason why they are not very effective is because for farmers to get access to the seeds – whose value they also have contributed to – is so complicated, so expensive. So, the technical idea of having *ex situ* conservation is not bad, it is actually good and complementary to *in situ* conservation. But that strategy is not isolated from the whole economic and political context and that makes it very difficult for some countries and for some actors to access the material and very easy for others. So, that is also part of the discussion on *in situ* and *ex situ* conservation. And that is also part of the reason why community seed banks are very important. […] So, I believe that *in situ* conservation deserves more attention, more support to fulfil its purpose and also to make conservation more effective and access to seeds more effective and fairer." (CSO Representative, AHTEG/Seed Treaty, 28 September 2020: l. 554–578)

This passage introduces yet another level of distinction between different conservation approaches by foregrounding the question of use through the question of access. While the interviewee does not question the complementarity of *ex situ* and *in situ* approaches when it comes to conservation, they highlight the unequal accessibility to materials conserved *ex situ* that makes it more difficult for farmers, especially in the Global South, than for other actors, such as the seed industry, to use them.[7] It is against this background that the inter-

7 This argument refers to an ongoing controversy in the governing body and working groups of the Seed Treaty, as well as in the FAO more generally, that revolves around

viewee assesses the effectivity of *ex situ* conservation. For them, it is effective not when as much crop diversity as possible is conserved, but when that diversity is accessible for farmers to cultivate. Although the seed industry does of course supply farmers, according to the interviewee access to their seeds is far more complicated and expensive than access to community seed banks, for instance. Most hybrid crop varieties (that is, varieties developed through breeding) are bred in such a way that they do not produce seeds themselves. As a result, farmers cannot obtain seeds from the plants they cultivate and save them for future use but are forced to buy hybrid seed from breeders every year. The resulting dependence of farmers on the seed industry is particularly problematic because hybrid seed varieties are usually patented, which makes them more expensive than landraces and subjects farmers to the pricing policies of the seed industry. In this context, the interviewee emphasises the advantage of *in situ* conservation approaches: they make access to the conserved material easier for farmers. This is important not only because farmers "have to feed their families", as Dempewolf puts it (see above), but because they are the ones who ultimately cultivate the crop diversity that all forms of conservation seek to conserve. This is a present that the politics of suspension does not extend, although it is essential if the life suspended in genebanks is to come into life in the first place.

It is this oblivion of the worlds sustaining what is fetishised as life itself that Folkers (2017) draws attention to. The differentiation between world and environment is crucial here. What the term "world" in contrast to "environment" illustrates is that the world that makes a seed is a more-than-nonhuman world comprising multispecies, including human, agencies and relations as well as the political, economic, epistemic, and other power relations they are embedded in. If and where *in situ* conservation refers to the conservation of plant genetic material within natural habitats or the ecosystems in which "they have developed their distinctive properties" (FAO 2001: 2; see above) while disregarding the worlds in which these sites exist, it amounts to an *in situ* version

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farmers' rights, access and benefit sharing. The most relevant conflicting parties are the seed industry, most of which is located in the industrialised countries of the Global North, and farmers' organisations representing farmers in the Global South with the support of NGOs and CSOs. Although the Seed Treaty has established statutory provisions for farmers' rights as well as access and benefit sharing, these provisions have not been sufficiently implemented, and they are still the subject of heated discussions (see chapter 1.4).

of *ex situ* conservation. In other words, this form of *in situ* conservation is part of the *ex situ* world. The question, then, is not only which present is extended and which form of life conserved, but also which world or mode of worlding. In his discussion of the politics of life itself and life beyond itself, Folkers argues that this is neither a question about the (un)naturalness of environments nor a question of right or wrong. Instead, it is one that asks in which world [*(Um)Welt*] life – plant life but also human life – can thrive and to what degree it can unfold its vitality (Folkers 2017: 377–378). The figure of life itself, according to Folkers, is a form of life deprived of its vitality, meaning its capacity to evolve, adapt, and thrive as well as its means of spontaneous expression and aesthetic potential. This deprivation reaches its (current) climax in the cryotechnological suspension of life in cold storage. Extending the focus from "life itself" to "life beyond itself" helps us to see that what the *ex situ* world's politics of suspension suspend is not only the vitality of seeds, but also the vitality of other (human and more-than-human) worlds and modes of worlding. From this point of view, *ex situ* conservation appears as an attempt – or a technological tool serving the attempt – to retame a nature that is out of control and retain its exploitation.

4.2 From Global to Earthly Interdependence: Thinking Conservation as Mutual Care in More-Than-Human Worlds Through the Potato Park

The first time I really became aware of the plurality of worlds the Svalbard Global Seed Vault assembles and the importance of attending to the relations between them was during my second field research trip to Svalbard in February 2020. The occasion of this visit was an international summit convened by the partners behind the Seed Vault in celebration of its twelfth anniversary and the completion of the constructional upgrades to the facility undertaken in consequence of the water intrusion that had occurred in 2016 (see chapter 3.2).[8] Members of the globally dispersed *ex situ* world of conservation assembled in Longyearbyen, Svalbard, and were joined by media representatives from all over the world. I attended the summit as a participant observer.

8 The event took place only days before the COVID-19 pandemic reached a level of global concern that made in-person gatherings of international communities and any further field research temporarily impossible.

The three-day event began with a reception at the Svalbard Museum in the afternoon of the first day, followed by an information programme about Svalbard and the Global Seed Vault. The second day was the day of the main event: The 2020 Svalbard Seed Summit bearing the title "Genetic Diversity for More Resilient Food Systems". Under the banner of the UN Sustainable Development Goal (SDG) number two (zero hunger by 2030) and against the background of the impending failure to reach SDG target 2.5 (preserving the genetic diversity of crops and livestock and advancing access and benefit sharing by 2020), the summit addressed achievements, current issues, and future challenges of the global endeavour of *ex situ* agrobiodiversity conservation.[9] Towards the end of the summit, a delegation of the UN's SDG Advocates, a fluctuating group of influential people from all over the world who use their respective spheres of influence to raise awareness of the SDGs and the need to take action,[10] joined the meeting. The main purpose of this visit was the release of an Arctic Call to Action on Food Security and Climate Change (SDG Advocates 2020) urging the international community to recognise the importance of the SDGs and show more commitment in pursuing their realisation.

The SDG Advocates' special appearance concluded a series of talks and Q&A sessions, throughout which members of the partner organisations behind the Seed Vault, representatives of depositing genebanks, and other stakeholders had discussed the ways in which conserving plant genetic diversity contributes to global food security, which roles different types of genebanks assume and how to strengthen cooperation among them, as well as the technical and political challenges connected to all of this. A pivotal motive of all presentations was the complementarity of different approaches to agrobiodiversity conservation discussed in the previous section. In various ways, all speakers emphasised that conserving as much biological diversity as possible requires recognising the diversity of conservation practices and strengthening linkages between them. In his talk at the summit, the secretary of the Seed Treaty, Kent Nnadozie, took this argument to a deeper level than previously discussed by highlighting the inevitable reality of *international interdependence* that globalised agriculture has created and cannot ignore, especially in light of the dire social-ecological challenges of the present.

9 For an overview of the UN's SDGs, see https://www.un.org/sustainabledevelopment/ (last accessed July 18, 2025).

10 For more information on the SDG Advocates, see https://www.unsdgadvocates.org/about (last accessed July 18, 2025).

In this section, I discuss how the *ex situ* world of conservation frames and grapples with the issue of global interdependence, which has become a subject of increasing concern in recent years. I begin by introducing the notion of interdependence through Nnadozie's talk and then flesh it out based on some of the relevant literature on interdependence in *ex situ* agrobiodiversity conservation. This body of knowledge focuses on what is referred to as international or global interdependence, meaning the interdependence of countries and other national- or transnational-level actors in their access to plant genetic diversity. Based on this understanding, it highlights the need to improve collaboration among globally interdependent worlds.

A small number of rather recent publications that have grown out of a collaboration between *ex situ* conservationists and Indigenous activists translate the recognition of global interdependence in food and agriculture and of the fatal consequences that have arisen from its historical misrecognition into a call for global food system transformation. I go on to unfold this appeal through an extensive narrative expert interview I conducted with one of the Indigenous activists participating in this collaboration, who is also an active member of the first Indigenous community ever to have stored heritage seeds in the Svalbard Global Seed Vault: the Parque de la Papa (English: Potato Park) in the Peruvian Andes. Elaborating on the Potato Park's agri-food system and the cosmology underlying it, I highlight a more-than-human dimension of interdependence, whose recognition and cultivation is crucial for efforts to conserve, cultivate, and share agrobiodiversity among globally interdependent worlds.

To foreground what the human-centred understanding of interdependence in the *ex situ* world of conservation backgrounds, I introduce the notion of *earthly interdependence* as a concept that attends to both international and more-than-human interdependence. Recognising that interdependence is a multiple and situated concept rather than an innocent description of a global reality, I argue that it matters how interdependence is framed insofar as it shapes how global challenges and policies addressing those challenges are defined. On another level, then, this chapter is also a sociological intervention in an ongoing dialogue between interdependent yet fundamentally different worlds. It emphasises the importance of taking other worlds seriously in their cosmological otherness.

The Geopolitics of Global Interdependence

In his talk at the 2020 Svalbard Seed Summit, titled "Global goals and international interdependence: How we all depend on each other to feed ourselves", the secretary of the Seed Treaty, Kent Nnadozie, highlighted some of the ways in which different actors and their efforts to conserve and sustainably use agrobiodiversity essentially depend on one another. The following extract condenses his key arguments and illustrates his understanding of interdependence:

> "These days the greater public […] thinks that the crops that we have today are just like that, have always been like that. They have lost sight of where it [crop diversity; FV] has come from, that it was never just like that, that it was through human intervention over millennia – deliberate, sometimes trial and error, and sometimes by accident – that we have developed a lot of the crops that we have today in the shape and nature that they are in. […] They have lost sight and lost connection to the fact that we depend on crops and varieties that come from different parts of the world; and that through changes and interdependence over millennia we have been able to develop them […]. That is what brings us all together and what we should keep sight of. In practical terms: in the absence of continuous human intervention for the crops we have […] they will probably die off and that is why we need to continue conserving them as we evolve and develop them, both in *ex situ* conditions as well as *in situ* and on-farm. All countries are interdependent and depend on crops that come from other countries, and no region, no country whatsoever is self-sufficient." (Nnadozie 2020, lecture transcript: l. 12–30)

Two dimensions of interdependence are discernible in this passage, which I will preliminarily characterise as human-centred and more-than-human interdependence. *Human-centred interdependence* refers to the lack of self-sufficiency of human-centred societies or collectives – here nation states and supra-national regions – and their interdependence when it comes to access to a diversity of natural resources. *More-than-human interdependence*, in contrast, signifies the argument that crop plants do not exist or persist as they do and where they do independent of human intervention, as well as its implicit correlate that human life is under threat when crops "die off". Apart from the passages quoted here, in his talk, Nnadozie did not go into the more-than-human dimension of interdependence any further, apparently assuming it as

a fact and condition of life.[11] Instead, he focused on the interdependence of human societies, presenting it as a fact as well as an incentive for conservation and agricultural practice and policy more generally. While he used the term "international interdependence", the argument refers to a reality that has emerged through processes of globalisation and their historical forerunners (as will become clear throughout this section). Insofar as these both inhabit and transcend the national, as the sociologist of globalisation Saskia Sassen (2007: 3) has argued, in what follows I use the analytically more accurate notion of "global interdependence" instead (see also Khoury et al. 2015).

In his talk at the summit, Nnadozie argued that humanity's global interdependence is increasingly being recognised against the background of contemporary global threats such as, most acutely at the time, the outbreak of COVID-19.[12] The example of pandemics, he said, illustrates the "common vulnerability" (Nnadozie 2020, lecture transcript: l. 7) that comes with interdependence. In contrast, with regard to crop diversity, interdependence becomes discernible as a chance and "an insurance policy" (Nnadozie 2020, lecture transcript: l. 39) for human life. This choice of words is particularly noteworthy considering the context in which the talk was given. The attribute of providing an insurance policy, in the *ex situ* world, is usually associated with the Svalbard Global Seed Vault (see chapter 3.2). Unlike in the common narrative about the Seed Vault and the collection of duplicates of other genebank collections that it holds, however, it is not the diversity of crops or plant genetic diversity itself that Nnadozie identified as an insurance policy. Instead, it is the practice of sharing and exchanging seeds, which genebanks and the Seed Vault facilitate:

> "[Agricultural] practice has always been based on exchange between farmers who developed [agricultural; FV] products and new varieties. […] And that exchange also has a very practical, pragmatic purpose. It is not just because of generosity, because they realised their interdependence, that they have done that. It is also an insurance policy, that they are able to share with others. If they face any difficulties, either by natural disaster or by other means,

11 I come back to this dimension in the second half of this section.

12 At the time of the Svalbard Seed Summit (February 24–26, 2020), the COVID-19 outbreak was still a phenomenon considered mostly to affect people in and international travellers from China. The World Health Organization had already classified it as a public health emergency of international concern on January 30, then changed the global risk assessment from high to very high on February 28, but only officially declared it a global pandemic on March 11, 2020.

> they are able to go back and get what they shared with other farmers. So over time, […] scientists and the technical people have come to realise that interdependence and have tried to push for global mechanisms and global policy frameworks that would capture this reality of interdependence." (Nnadozie 2020, lecture transcript: l. 35–44)

In this passage, Nnadozie establishes a continuity between the earliest and the present forms of agricultural practice and politics. According to this narrative, contemporary efforts to establish international regulations and practices for the conservation, multilateral exchange, and sustainable use of plant genetic diversity are a modern, technoscientific form of the same kind of exchange and mutual support farmers have engaged in since the dawn of agriculture (see also Fowler 1994). The *ex situ* world of conservation with its genebanks, genebank collections, conservation and safety duplication procedures and standards, as well as its policy frameworks, then, is the global-scale apparatus of a globalised world facilitating the same kind of "shar[ing] with others" that farmers have always practised.

Underlying this argument is a conception of the evolution and recent globalisation of a monolithically conceived human culture, particularly agriculture, as a linear process of development and progress that scales up a certain form of life without transforming it along the way. This idea of "scalability" (Tsing 2019) has at least two problematic implications. For one thing, whereas scalability values and creates uniformity, interdependence arises from diversity (Tsing 2019: 145). For another, scalability obfuscates the transformations that forms of life and other things undergo when they expand "as they take on new materials and relationships" (Tsing 2019: 144). While practices of seed-sharing might be as old as agriculture itself, their nature has changed since the Neolithic Age in a similar way to how natures and the (agri)cultures cultivating them have changed throughout their co-evolution with societies, economies, and politics. These changes, which include the de-cultivation of agricultural and biological diversity in the wake of the Green Revolution (see chapter 1.1), have continuously transformed what Nnadozie calls the "reality of interdependence". So, it is a specific reality of interdependence, situated in a specific historical situation, that today's "global mechanisms" (such as the Svalbard Global Seed Vault) and "global policy frameworks" (such as the Seed Treaty) aim to stabilise and leverage.

Hence, it is crucial to consider the historical situation in which Nnadozie emphatically draws attention to global interdependence (here regarding access

to a crop diversity required for global food security and adaptation to impending social-ecological challenges) as an "insurance policy" for the future. The current (geo)historical moment is a time in which the future of human life on earth has become precarious in unprecedented ways. It is a time in which the industrialised, technologised, and globalised societies of the Global North have begun to grapple with "the shock of the Anthropocene" (Bonneuil/Fressoz 2017),[13] that is, the dawning realisation that the form of life they have been building for the past 500 years and longer is the most relevant destructive force behind the planetary-scale ecological devastations of the present, including the immense and growing loss of biodiversity. The modern world's Anthropocenic awakening not only confronts it with unprecedented social-ecological challenges regarding a more sustainable political-economic organisation of the larger part of humanity's life with/in nature. By challenging established onto-epistemological certainties, it also triggers a "cosmological shock" (Viveiros de Castro 2015: 61). To a greater extent than other realities and realisations of interdependence, which feminists and other marginalised critical thinkers have been pointing out for decades, the Anthropocene experience topples the dualist logic of dominant Western thinking that underlies reified distinctions such as that between the human and nature, production and reproduction, freedom and necessity (see Plumwood 1993: 43).[14]

13 The notion of the Anthropocene as a new geological era superseding the Holocene was coined by freshwater biologist Eugene Stoermer in the 1980s and popularised by atmospheric chemist and Nobel Prize laureate Paul Crutzen in the early 2000s (Crutzen/Stoermer 2000; Crutzen 2002). Since then, geologists and other natural scientists have been discussing whether and since when "we" are, in fact, living in the Anthropocene and what that implies (e.g. Zalasiewicz et al. 2008; Lewis/Maslin 2015; Steffen et al. 2015b; Benner et al. 2021). The Anthropocene proposal has also attracted a remarkable amount of interest and critique in the social sciences, humanities, and arts (for an overview see Barla/von Verschuer 2022). A salient strand of critique takes issue with the pivotal notion of the Anthropos insofar as it suggests that the main culprit behind the ecological devastations of the present is an undifferentiated humanity. Critics have challenged this by foregrounding specific historically and geopolitically situated forms of organising societal life in and with nature as the decisive geo-transformative forces of the present, and have proposed countless alternative names for the current geohistorical era, such as the "Capitalocene" (Moore 2015, 2016) and the "Plantationocene" (Mitman/Haraway/Tsing 2019; for an overview see Bonneuil/Fressoz 2017; Chwałczyk 2020).

14 One could therefore argue that the Anthropocene experience adds a fifth to the four "great historical wounds to the primary narcissism of the self-centered human subject,

This logic, according to Val Plumwood, is rooted in a principle of "denied dependency" (1993: 41): while both sides of a dualistically structured relation of domination and subordination achieve their identity through that relation, the logic of dualism secures the identity of the master by essentialising both identities and denying their interdependency. A common modus operandi of denial is what Plumwood calls "backgrounding" (1993: 48–49), which refers to the treatment of the subordinated side of any dualism

> "as providing the background to a dominant, foreground sphere of recognised achievement or causation. […] What is involved in the backgrounding of nature is the denial of dependence on biospheric processes, and a view of humans as apart, outside of nature, which is treated as a limitless provider without needs of its own. […] This denial of dependency is a major factor in the perpetuation of the non-sustainable modes of using nature which loom as such a threat to the future of western society." (Plumwood 1993: 21)

As the limits of backgrounding Nature come to the fore in the present time-space ironically called the Anthropocene, the Human becomes increasingly unable to deny the dependencies constituting his very existence (see also Hoppe 2024).[15]

It is in this material-discursive context that I propose to situate the *ex situ* world's surging interest in interdependence.[16] In the last decade, *ex situ* conser-

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who tries to hold panic at bay by the fantasy of human exceptionalism" (Haraway 2008: 11), as chronicled by Freud and amended by Haraway. To the three wounds Freud describes – the Copernican decentring of the earth in the cosmos, the Darwinian decentring of the human in the ensemble of creation, and Freud's own challenge to the primacy of consciousness and reason in the human self-image – she adds a fourth wound caused by cybernetics' and biotechnology's folding of the technological into the organic (see Haraway 2008: 11–12).

15 I capitalise the Human and Nature, here and in what follows, whenever I refer to their (universalist) figuration as per the logic of dualism. The Human is not the human as in *Homo sapiens* but denotes the historically situated figure of the Human, who has crafted himself as universal yet in the image of the white European bourgeois Man (see e.g. Wynter 2003; Mignolo 2015; Jackson 2020). Nature is a co-product of this "invention of the Human" (Mignolo 2018: 153–176) in colonial modernity, through which an other- or less-than-human sphere of dispensable and exploitable life including dehumanised human lives as well as non-human Nature was created (see also von Verschuer/Hartmann/Barla 2023).

16 This surge of interest in interdependence is not restricted to the issue or world of agrobiodiversity conservation. For example, Smith/Clark/Yusoff (2007) provide a compre-

vationists have been discussing global interdependence in PGRFA in a growing number of publications (e.g. Ramirez-Villegas et al. 2012; Ramirez et al. 2012; Khoury et al. 2015; Khoury et al. 2016). Cary Fowler and Toby Hodgkin systematically introduced and distinguished different levels of global interdependence based on the findings of a study on the global availability of PGRFA in a study published as early as 2004. Building on the FAO's first global assessment of *The State of the World's Plant Genetic Resources for Food and Agriculture* (1997) as well as on a few early sources mentioning forms of interdependence (Kloppenburg/Kleinman 1988; Cooper/Engels/Frison 1994; Flores-Palacios 1998), Fowler and Hodgkin (2004: 10.5–10.6) define interdependence along three axes. They show that when it comes to the conservation of PGRFA, today most countries in the world depend on (a) crops that are not indigenous to these countries; (b) 'improved' varieties usually bred with genetic resources from all over the world; and (c) other countries.

The first level of interdependence refers to the fact that all major crops cultivated around the world today are what Fowler and Hodgkin call "botanical immigrants" (2004: 10.2). Like Nnadozie, they argue that plant seeds have migrated around the world since the Neolithic Age and that global interdependence, therefore, is "the result of a kind of botanical chess game that has been played out over millennia, changing the agricultural and food systems of virtually every land" (2004: 10.5). While they do not specify the players of this game, Pat R. Mooney (1983), who coined the notion of the botanical chess game,[17] as well as a number of historians and science studies scholars have comprehensively discussed the role of European colonialism and imperialism in the large-

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hensive review of academic and political engagements with the notion of interdependence throughout the past century in order to employ it in a discussion of current and future global ecological, economic, and sociocultural challenges. Hoppe (2024) intriguingly discusses how notions of dependency, independence, and interdependence variously inform classical modernist and more recent relational approaches to social theory as well as critical approaches in feminist and postcolonial theory.

17 In "The Law of the Seed", a long read for the journal *Development Dialogue*, Mooney writes: "The history of the colonial era is, to an amazing degree, a history of plant transfers: South to North, or from Latin America to Asia, to Africa to Latin America. Like living pawns in the imperial chess game, coffee, tea, cocoa, rubber, bananas, sugarcane, cotton, and spices, were shifted back and forth over the surface of the globe. Although few could have anticipated it at the time, the botanical chess game has had long-term implications for the development and underdevelopment of the Third World that simply cannot be exaggerated." (Mooney 1983: 85)

scale, often illicit translocation of botanical resources around the globe since the fifteenth century (see Crosby 1972; Brockway 1988, 2002; and more critically Schiebinger 2004; Schiebinger/Swan 2005; Subramaniam 2024). These authors argue that although botanical migration routes have already existed for thousands of years, the global dissemination of all kinds of nonhuman lifeforms has reached unprecedented levels and given rise to unprecedented ecological transformations around the world in the wake of the enormous increase in global travel and resource exploitation since the colonial era.

In line with this historical politicisation of the global interdependence in PGRFA, in a seminal study of the history and political economy of plant breeding and the emergence of the agricultural biotechnology industry, the political scientist Jack R. Kloppenburg provides "empirical justification for the characterization of the North as a rich but 'gene-poor' recipient of genetic largesse from the poor but 'gene-rich' South" ([1988] 2004: 181; see further 180–184). Without contesting the assertion that "[t]here is no such thing as plant genetic independence for either the regions of the North or the South" ([1988] 2004: 182), Kloppenburg politicises the analysis of global interdependence in PGRFA by highlighting the asymmetrical global economic power relations in which that interdependence is embedded – not only historically but also in the present.[18]

A pertinent example of the effect those power relations have in the present day is the second level of global interdependence Fowler and Hodgkin mention: that most countries currently depend on hybrid varieties developed using plant genetic resources from all over the world. While for the larger part of history, plant genetic resources have flowed unidirectionally from the "gene-rich" regions of the Global South to the "gene-poor" Global North, a reverse flow has evolved since the mid-twentieth century. Kloppenburg elaborates this as follows:

> "The initiation of commercial seed exports from the industrial nations to the Third World introduced a crucial qualitative dimension to the established asymmetry of germplasm flow. Plant genetic resources leave the periphery

18 For a comprehensive analysis of the political economy of PGRFA and plant biotechnology, see Kloppenburg (1988, [1988] 2004) and in the German-language context Flitner (1995) and Flitner/Görg/Heins (1998). My study backgrounds this analytical perspective in favour of a focus on the onto-epistemological dimensions of global power relations, which have received much less attention to date.

> as the common – and costless – heritage of mankind, and return as a commodity – private property with exchange-value." (Kloppenburg [1988] 2004: 169)

Although the international policy situation has shifted from supporting the global expansion of the seed industry to protecting national sovereignty over PGRFA and advancing farmers' rights as well as principles of access and benefit sharing (especially after the Seed Treaty entered into force in 2004), the asymmetrical power relations between the seed industry and farmers in the Global South persist to this day (Kloppenburg [1988] 2004: 170–175; 2014; Kastler 2016; Nehring 2022). Any comprehensive account of the global interdependence in PGRFA, Kloppenburg emphasises, "must take into account this 'genetic geography'" (Kloppenburg [1988] 2004: 175; see also Flitner 2003) from which the alleged "common bowl" (Kloppenburg [1988] 2004: 175) of PGRFA has emerged.

The third level of interdependence Fowler and Hodgkin distinguish, interdependence in conservation efforts, is a result of the global dissemination of the world's PGRFA. As I elaborated in the previous chapter, medium- and long-term conservation requires periodic regeneration of the conserved samples, ideally in the environment they were collected from. Insofar as genebank collections do not necessarily comprise local species only (and the larger they are, the less this is the case), genebanks depend on cooperation (see Fowler/Hodgkin 2004: 10.6). The commitment to safety duplication as a means of securitisation further increases interdependence in conservation efforts insofar as it requires cooperation because safety duplicates have to be stored in a different location than the original collection, as per the FAO's *Genebank Standards* (FAO 2014: 57–58). This means that there is more to this question than the way in which "[g]lobal interdependence in plant genetic resources provides a strong rationale for proactively conserving and facilitating access to [plant genetic] diversity worldwide" (Khoury et al. 2015: 4), as the authors of a policy brief issued by the International Center for Tropical Agriculture (CIAT) put it in 2015. Rather, insofar as the cultivation, breeding, and conservation of PGRFA are inextricably related processes, the different levels of global interdependence are interdependent themselves.

The discussion of interdependence in the studies of Fowler and Hodgkin (2004) and Kloppenburg ([1988] 2004) focuses on the interdependence of countries and transnational actors in their access to PGRFA, that is, on what I have called human-centred interdependence. The dimension of more-than-human interdependence remains unaddressed. This issue has, however, been consid-

ered in some more recent publications bringing together the expertise of scientists from the *ex situ* world and Indigenous conservationists (Khoury et al. 2019; Argumedo et al. 2020; Argumedo et al. 2021).[19] Although they do not systematically make it a subject of analysis, these authors draw attention to the more-than-human interdependence of natures and cultures in their historical and ongoing formation.

For instance, Argumedo et al. (2021: 2) emphasise that "many different cultures around the world became increasingly interdependent with the plants and animals they interacted with through the biocultural processes of domestication". Throughout human history, this has generated an enormous diversity of crop and livestock species and genetic variations within these species, as well as a diversity of knowledges and practices around their cultivation and use. In its entirety, this diversity is encapsulated in the term "biocultural diversity" (Argumedo et al. 2021; see also Martin/Mincyte/Münster 2012). According to Argumedo et al. (2021), the homogenising tendencies of historical and ongoing urbanisation, industrialisation, and globalisation processes – in agriculture and beyond – have resulted in the loss of a large amount of food-related biocultural diversity. They argue that this biocultural de-diversification is the root of many health-related problems. In addition, globalised and industrialised agriculture is "among the most significant contributors to environmental degradation, climate change, and biodiversity loss globally" (Argumedo et al. 2021: 2).

In this biocultural situation, the authors argue, global food system transformation becomes imperative. Recognising and engaging with the diversity and resilience of Indigenous food systems and knowledges, for them, is a crucial component of such a transformation.[20] There are two core reasons for this.

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19 The groups of authors behind these papers partially overlap, with three authors involved in all of them: Alejandro Argumedo (Potato Park, Asociación ANDES, and International Network for Mountain Indigenous Peoples (INMIP), Cusco, Peru), Hannes Dempewolf (Crop Trust, Bonn, Germany), and Colin Khoury (CIAT, Cali, Colombia). I interviewed two of these three collaborators for this study: Hannes Dempewolf, whom I have already cited in previous chapters, and Alejandro Argumedo, the interview with whom I discuss below.

20 I follow the self-description of the Indigenous authors in this collaboration as "Indigenous" here. In doing so, I draw on a self-determined understanding of "Indigeneity" that resists "genomic articulations of indigeneity" (TallBear 2013). According to Kyle P. Whyte (2015a, 2015b), a member of the Citizen Potawatomi Nation and a professor at the University of Michigan whose work focuses on climate change, environmental jus-

First, the modern food system depends on access to plant genetic diversity adapted to emerging ecological conditions, whether for a transformative process of re-diversification or for the breeding of new resilient varieties. Most of this diversity, whether conserved *in situ* and on farm or growing in 'wild', i.e. non-cultivated spaces, today exists in what are known as the world's "primary regions of diversity" (Khoury et al. 2016: 2). These are the areas where crops were first domesticated and which have an exceptional richness in domesticated and wild species as well as a high degree of genetic variation within those species. Most of these regions are located in the Global South, often in mountainous or other topographically extreme areas inhabited by Indigenous peoples. Insofar as they are particularly exposed to environmental stressors and ecological challenges and changes, the authors argue that the long-term persistence of Indigenous communities, their self-sufficient food systems, and the species they cultivate and live with in these places prove their resilience and adaptive capacity (see also Khoury et al. 2019: 6).

Herein lies the second reason why Argumedo et al. (2021) consider the sharing of knowledge and expertise with Indigenous peoples to be crucial for sustainable food system transformation in light of developing and challenging

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tice, and food sovereignty with a particular interest in Indigenous peoples, "Indigenous peoples" are "the roughly 400 million people in the world who exercise cultural and political self-determination in territories dominated by occupying newcomer nations, such as the U.S. or Ecuador" (2015b: 143). In a keyword entry on "Indigeneity" he elaborates that "the indigenous movement focuses considerably on ecological concerns. Indigenous peoples' political self-determination is often centred on protecting intergenerational systems of placed-based relationships from being obstructed by globalization and other political, social, and economic forces" (2015a: 145). Insofar as they are place-based, Indigenous food systems are as diverse as Indigenous peoples. What unites most Indigenous food systems – and differentiates them from the modern industrialised and globalised food system – is that they are tailored and adapted to the land in which they exist. Accordingly, Indigenous food systems are locally specific ways of producing, distributing, sharing, and consuming food equipped with locally specific modes of adapting to "metascale forces" (2015b: 148) such as climate changes or invasions and disruptions by other (human and more-than-human) populations. While these definitions resonate with the self-conception of Argumedo and the Quechua communities in the Potato Park, it is important to understand them as operative rather than exhaustive definitions. Although broadly articulated, they do not apply to all ways of life identifying as Indigenous. On the diversity of Indigenous ecological relations see, for example, Adamson/Monani (2017) and Bargh (2021).

global ecological changes. The global food system transformation that some of these authors envision by 2050 as spelled out in an earlier paper,

> "centers on safeguarding, creatively using, and celebrating the rich diversity of food plants and animals that sustain all of us. We want to put diversity at the heart of food systems so that they are more sustainable, resilient, and equitable, and so that they are better equipped to provide healthy and delicious food to all." (Khoury et al. 2019: 1)

In the view of Khoury and colleagues, Indigenous food systems illustrate how such a transformation requires the awareness, preservation, and celebration of biocultural diversity, which lies at the heart of their perseverance.

The biocultural model many Indigenous food systems are built on is certainly not entirely compatible with the *ex situ* world's "resourcist cosmovision" (Fenzi/Bonneuil 2016: 78). Rather than considering biological diversity primarily as a resource for the flourishing of human life, many Indigenous cosmologies assume and cultivate a more fundamental relationality of biological and cultural, human and more-than-human life. While this more-than-human dimension of interdependence is mentioned in the collaborative papers cited here, it remains rather marginal. However, it became quite evident in the interview I conducted with Alejandro Argumedo, one of the Indigenous scholars in the above-cited group of authors. Attending to more-than-human interdependence such as spelled out by Argumedo and to its centrality in his community's food system adds a new dimension to the discussion of global food system transformation that I explore in what follows. Awareness of biocultural diversity as well as its preservation and celebration are certainly crucial. But if global food system transformation is to emerge from a meaningful dialogue among diverse worlds it is also crucial to take other worlds seriously in their cosmological otherness. Insofar as Indigenous worlds have a lot to teach other worlds when it comes to surviving worlds' ends (see also Danowski/Viveiros de Castro 2017; Whyte 2017; Yusoff 2018), this is essential not least in light of the existential social-ecological threats the modern world currently faces, to which the global industrial agri-food system has contributed its fair share. I discuss these matters in the following based on the interview I conducted with Argumedo.

The World/ings of the Potato Park

Argumedo is an inhabitant of the Parque de la Papa (English: Potato Park), an Indigenous Biocultural Heritage Area (IBCHA) (Argumedo 2008) covering over 10,000 hectares of the Andes in the region of Pisaq near Cusco in Peru.[21] It was established in 2000 through the combined efforts of six Quechua communities living in the area and with the support of a Cusco-based Indigenous non-profit organisation, the Asociación ANDES, founded among others by Argumedo. The Asociación ANDES developed the IBCHA model along with the Potato Park to describe its "community-led and rights-based approach to conservation which protects and enhances local livelihoods and biocultural diversity using the knowledge, traditions, and philosophies of indigenous peoples related to the holistic and adaptive management of traditional agricultural landscapes" (Argumedo 2008: 45). Today, the Potato Park is home to 6,000 Quechua people as well as over 1,400 native potato varieties and numerous other traditional crops (Asociación ANDES n.d.; Asociación ANDES/Potato Park 2015; Argumedo et al. 2021: 4–5).

In light of the increasing existential threats that global climate change poses to the biocultural heritage conserved in the Potato Park, in 2011 the Potato Park launched a three-year project in cooperation with the Crop Trust to produce and prepare botanical potato seeds for safety storage in the Svalbard Global Seed Vault. In 2015, the Potato Park became the first Indigenous community ever to make a deposit in the Seed Vault (Crop Trust 2011, 2015; see

21 The account of the Potato Park that follows is further substantiated by a thorough engagement with written and filmic documents about the Potato Park, including Argumedo (2008), Argumedo/Yun Loong Wong (2010), Asociación ANDES/Potato Park (2015), and Asociación ANDES/Black Maria (2016). Due to the international travel restrictions issued in response to the COVID-19 pandemic as well as language barriers, I was not able to conduct ethnographic research or further expert interviews. As a consequence, my account of the Potato Park and its world/ings is based on a much less "thick description" (Geertz 2008) than my account of the *ex situ* world of conservation developed in the previous chapter, for instance. Nonetheless, the examination of the Potato Park as a manifestation of a different world, albeit one that is entangled with the *ex situ* world in many ways, offers an insightful contrast insofar as it allows important questions to be raised about how to understand the loss and conservation of agrobiodiversity. In this sense, my discussion of Potato Park with primary reference to the interview with Argumedo is not to be understood as a comprehensive account of his world, but rather as a productive irritation of dominant and all but universal knowledges of and relations to the world.

also Asociación ANDES/Black Maria 2016).[22] Cary Fowler, at that time head of the Crop Trust, commented on the collaboration as follows: "The Potato Park highlights the active role that individual communities play in creating and conserving diversity […]. This partnership demonstrates the critical importance of the Seed Vault in backing up conservation efforts of all kinds." (Fowler quoted in Crop Trust 2011) In this sense, the collaboration between the Potato Park and the Crop Trust and the Seed Vault is a living example of the complementarity of conservation efforts (see chapter 4.1). Khoury et al. (2019: 5) commend it as "a truly integrated model for conservation" and food system transformation (see also Argumedo et al. 2021: 4). The interview I conducted with Argumedo as well as some of his and his community's publications offer a deeper insight into the world in which the Potato Park's food system and

22 In a storage event following the 2020 Svalbard Seed Summit (see also chapter 5.1), the Cherokee Nation, the largest of three federally recognised Cherokee tribes settled in the northeast of present-day Oklahoma, USA, became the second Indigenous community to make a deposit in the Seed Vault. During the summit as well as in its media coverage, this contribution to the Seed Vault attracted more attention than those of other first-time depositors. What makes contributions by depositors such as the Potato Park and the Cherokee Nation remarkable is not only that they usually pursue a community-based *in situ* approach to conserving their biocultural heritage. Many Indigenous communities are also sceptical of national- and international-level *ex situ* conservation endeavours due to historical and ongoing experiences of dispossession of resources as well as rights and sovereignty over their biocultural heritage. In her study of Native American seed savers and their attitudes towards *ex situ* conservation in general and the Svalbard Global Seed Vault in particular, Sheryl D. Breen points out: "[The] seeds currently being used for commercial food and crop production originated, either directly or indirectly, from the heritage seeds grown and selected by peasant farmers around the world. In accordance with that fact, […] Native American growers and seed savers stated their concerns that centralized *ex situ* collection of those seeds' genetics would constitute a confiscation of their cultural heritage and denial of their collective rights to use, exchange, and sell their seeds" (Breen 2015: 45–46). The Svalbard Global Seed Vault's unique black box agreement, which guarantees that all deposits, unlike in other genebanks, remain property of the depositor at all times (see chapter 1.5), although not sufficiently convincing in the eyes of all critics (see Breen 2015: 46), has removed some communities' doubts and made collaborations such as with the Cherokee Nation and the Potato Park possible. I focus on the story of the Potato Park here. Marleen Boschen, who investigates seed banking from a cultural studies perspective and who, like me, attended the Seed Summit in Svalbard as a participant observer, intriguingly discusses the ambiguous implications of Indigenous participation in the global seed conservation endeavour following the story of the Cherokee Trail of Tears black bean (see Boschen 2022: 112–153).

Argumedo's vision for food system transformation are situated. In what follows I unfold what I learned from afar from these sources about this world, its practices and principles, as well as its history and cosmology, and raise some questions about predominant narratives in the *ex situ* world of conservation, especially about interdependence and conservation.

I opened the interview with Argumedo by explaining the focus and interest of my research – the Svalbard Global Seed Vault and *ex situ* conservation more generally as a means to meet future social-ecological challenges with regard to food security, as I summarised it at the time. Before I got to asking my first question, he responded with a long reflection on how one frames a topic of research and approaches it based on (possibly implicit) frameworks of thinking, admonishing me to consider, as I would paraphrase it, the constructedness and situatedness of the categories underlying my research.

> "In our tradition, names have very powerful connotations because they connect us with the spirit of the land. When we frame our research – when you frame your research – with names and descriptions or definitions, it's a strong positioning. I think the power of science is the power of naming; and this speaks, in my view, to the proud perception that humans have, which is human exceptionality, that we are the top of everything. We name things, we use them as we name them, we study them as we name them, and we create economies around them because they are our property. I know this is a very old connection but it's a chain that continues and that science continues to turn into a conceptual framework or a worldview – while you may say that it is science that has to be balanced. You have to do your analysis, but from the beginning you are starting from a theoretical belief system that is not science at all; it's a given, it's this divine thing that humans are superior, humans are here to conquer, to create wealth for humans. And so, in the discussions of seeds, we treat seeds as resources, we treat seeds as something totally separated and alienated from people. It is people's rights that we discuss, people's tools that count – based on that naming, because any type of naming is an immediate association of how you do things." (Alejandro Argumedo, Potato Park, 5 November 2020: l. 6–32)

The critical account of Science[23] Argumedo unfolds in this passage resonates with some of the core arguments of feminist and postcolonial science studies, from which I derive the terms of my engagement with his deliberations. Argumedo points out what Haraway has trenchantly described as "situated knowledges" (1988): the idea that knowers, processes of knowledge production, and the knowledge they produce are always and inevitably embodied, emplaced, and engaged.[24] Building on this assumption about knowledge production, he articulates a critique of Scientific representationalism that can be understood in line with a similar argument made by Haraway. As she puts it, scientists give names to the things they are concerned with and then tend to "mistake the names for the things. […] But the things, in [her] view, do not pre-exist as ever-elusive, but fully pre-packaged, referents for the names." (Haraway 1992: 313) Rather, they become what they are through situated articulations. The power of Science, from this point of view, is the power that lies in taking possession of things by naming them in a way that silences other situated knowledges of their reality (ibid.).[25]

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23 I capitalise Science – as I have done earlier with Nature and the Human (see footnote 15 in this section) – to indicate that this argument refers to a historically and culturally specific understanding and practice of science that casts itself as Science proper. Contrary to this assumption, philosophers and historians of science situate the idea of a universal and objective Science in the Western post-Enlightenment world, using more specific terms such as "Western Science" or "Western Enlightenment Science" to highlight its geopolitical and socio-historical origin. Following Indigenous STS scholar Max Liboiron, I prefer to use the term "dominant Science" in order to neither geographically fix Science nor overshadow other Western scientific traditions and reproduce their marginalisation (Liboiron 2021: 20–21 fn 77).

24 Similar arguments have been developed by standpoint theorists such as Sandra Harding (1986, 1991, 2011) and Patricia Hill Collins ([1990] 2000). Haraway's concept of situated knowledges, partly and among other things, is a response to standpoint epistemologies. She recognises a risk in these of romanticising and appropriating subordinated knowledges and hence of both disembodying them and relieving them of the need for critical deconstruction (Haraway 1988: 583–584).

25 Using the example of the colonisation of Australia, Plumwood (2002) develops a critical analysis of "the colonizing politics of place names" (Plumwood 2002: 97), which comes very close to Argumedo's critique of Scientific naming practices. She argues that the convention in Western positivist Science and philosophy of viewing names as "neutral markers without cultural content […] reflects the concept of the land as neutral, passive and silent; as such, it is an index of the shallowness of relationships to place." (Plumwood 2002: 100) Consequently, she calls for renaming practices "as a

Argumedo's argument that in his world, names, concepts, and definitions "connect us with the spirit of the land" implies that they are situated signifiers of the more-than-nonhuman environment or world in which they were formed and of the relations in which those who use them live with this environment or world. It is important to note here that "land" is a particular category in many Indigenous cosmologies. According to Indigenous science studies scholar Max Liboiron, many Indigenous communities understand land not as landscapes in the universal (even if diverse) sense of "a fixed geographical and physical space that includes earth, rocks, and waterways" (Styres/Zinga 2013: 300–301, quoted by Liboiron 2021: 6 fn 19), but rather as "the unique entity that is the combined living spirit of plants, animals, air, water, humans, histories, and events" (Liboiron 2021: 7 fn 19).[26] Insofar as names, concepts, languages, and stories are formed in the more-than-human context in which they emerge, they are not only indicative of the latter but also shape, as Argumedo emphasises, how one thinks about what one thinks about. Against this background, I understand the sequence with which Argumedo opened the interview as an appeal to avoid uncritically (if unintentionally) reproducing the Scientific "power of naming"; to think critically about the seemingly universal Scientific terminology about seeds and conservation and the human exceptionalist paradigm underlying it, which has made the other-than-human world an appropriable resource for Human purposes by othering parts of the world as nonhuman on the basis of the ontological distinction between the Human and Nature.

Putting it in the words of decolonial philosopher and semiotician Walter D. Mignolo, Argumedo's critique of Science is directed not (primarily) at disputing the content but at "*changing the terms of the conversation*" (Mignolo 2018: 130, emph. in orig., see also 135–152).[27] Instead of talking about the practices,

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project of cultural convergence, cross-fertilization, reconciliation and decolonization" (Plumwood 2002: 104).

26 This broader definition of what is part of and makes land(scapes) resonates with the notion of the more-than-nonhuman environment I proposed in the previous chapter in order to avoid collapsing the notion of the environment into Nature understood as a sphere ontologically distinct from and surrounding the Human. For an overview of a diversity of Indigenous and non-Indigenous "epistemologies of land", see also Anderl (2024).

27 This critique is decolonial insofar as the terms it challenges constitute the grammar of what Mignolo, following the Peruvian sociologist Aníbal Quijano (2007), calls "the colonial matrix of power" (Mignolo 2018: 111–116, 141–145; see also Mignolo/Segato/Walsh 2024). Synthesised in this concept are the dimensions of an epistemic colonial-

technologies, or politics of plant genetic resource conservation, Argumedo speaks of the technoscientific belief system and terminological framework in which seeds come to matter as plant genetic resources – and in which questions about seeds thus become questions about technology and rights to seeds rather than questions about more-than-human relations.[28] This conversation, according to Argumedo, is a conversation scripted by the "divine", that is, by the allegedly metaphysical and unquestionable rationality of human exceptionalism. It is a conversation that comes from and comes with a world of meaning and power relations, which it activates. However, it is not the only conversation about seeds to be had. The interview with Argumedo shows that there are other worlds in this world, structured by other more-than-human relations and other knowledges, giving rise to other names, ideas, and practices that hold promises of other futures. My aim in tracing these in Argumedo's account of his world is to demonstrate some of the ways in which "[i]t matters what thoughts think thoughts. It matters what knowledges know knowledges. It matters what relations relate relations. It matters what worlds world worlds. It matters what stories tell stories." (Haraway 2016: 35)

Argumedo elaborated on the food system of his community by embedding it in the history of Indigenous life in the Andes and situating this history in the environment in which Andean Indigenous societies developed:

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ity historically established with European colonialism, which outlasts processes of political decolonisation and persists to this day as "the darker side of Western modernity" (Mignolo 2011). This epistemic coloniality, according to Mignolo, becomes discernible in the benevolent "rhetoric of modernity" (2018: 138–141), which works to secure "the *imperiality of power* […] not by guns and armies but by the words that justify the use of guns and armies, convincing you that it is for the good, the salvation, and the happiness of humanity" (Mignolo 2018: 140, emph. in orig.) I go into the ways in which the rhetoric of modernity justifies Scientific and more-than-human power relations below.

28 Greta Gaard (2015) develops a similar argument in her queer and posthumanist ecofeminist analysis of the antifeminist tone in dominant responses to climate change. The problem Gaard identifies is a "masculinist bias of traditional western ethics […] [which] envisions justice-as-distribution of resources among discrete individuals with rights rather than emerging through relationships which shape participant identities and responsibilities" (2015: 20). Instead of "masculinist techno-science approaches" (ibid.) she calls for "queer feminist posthumanist climate justice perspectives at the local, national, and global levels […] to intervene and transform both our analyses and our solutions to climate change" (Gaard 2015: 20–21). This chapter shares this concern (as does the book as a whole), although the focus here is on colonial onto-epistemological power relations and less on their gendered dimensions.

"In the area where I am, in the Andes, our heritage comes from people that created a very sophisticated civilisation and developed or nurtured a type of agriculture that didn't have influence from the external world. Inca agriculture had such a sophistication in terms of engineering, hydraulics, soil conservation, management of different ecological niches in the verticality – which means managing diversity because crops are adapted to each one of those niches. To do agriculture in this ecology, you had to master diversity, that's the only way you can survive. But in the end, you have to collaborate because alone, wherever you are, you cannot survive because you will be damned to a single crop. But collaborating, you have access to crops that grow in the lower part, in the middle part, or in the higher part. Our system is so defined by altitude that in the higher part you have potatoes and root crops, in the middle part you have grains like quinoas, amaranthus, all types of Andean grains that grow in that part, and in the lower part you have what we call warm crops, like fruits and other types of produce and food that people love because of their sugary and very nutritious content, even though they are not starchy. But what happens with complementarity is that potatoes and root crops have fewer carbohydrates, grains in the middle have proteins, and all the essential minerals and vitamins are in the lower part. So, things move up and down and people have to collaborate to have access to all kinds of food. It is just very natural that in doing so, they have access to a large portfolio of food crops. And knowledge and information also move up and down, pollinators work up and down – adaptation processes to changes in the climate are happening all the time, so experimentation is key, is inherent to the system. Farmers have been experimenting and doing a science of agriculture here for ten thousand years. The Incas were at the last cycle of this process, and they created this very sophisticated civilisation that was rich, the wellbeing was very high, there was no food shortage or any type of elevated poverty that we see now. And they built this empire without money, we didn't know money. So, you can build empires without money if you focus on food. For us, that was the lesson: that we want to test and see how strong this still is in our spirit, so that we can start rebuilding our society – without denying modernity and its connections, because we have been living under colonial rule for five hundred years, but that is a very a small time in our history. […] If the Incas put food at the centre of their geopolitical ambitions, if the Incas had food at the centre of their science and technology, if the Incas had food at the centre of social organisation, then there are lessons to learn there." (Alejandro Argumedo, Potato Park, 5 November 2020: l. 111–166)

There are at least two important lessons to learn from this passage. The first arises from the argument that Indigenous societies in the Andes and their agri-food systems have been in the making and have adapted to continuously changing environmental conditions for ten thousand years. Based on this, Argumedo argues that Andean agriculture is rooted in a millennia-old experimental "science of agriculture". By explicitly claiming scientific authority for the experience- and experimentation-based biocultural knowledge and practices underlying Indigenous agriculture in the Andes, he challenges the epistemological demarcation between scientific and traditional knowledge through which Indigenous bodies of knowledge have been othered and devalued as non-scientific since colonial times. This positioning critically invokes a long history of epistemic marginalisation that historians of colonial botany (Philip 2004; Schiebinger 2004; Schiebinger/Swan 2005) have shown to be deeply entangled with the material exploitation of Indigenous peoples and lands during the colonial era.

According to Kavita Philip (2004: 171, 181), most historians and political economists tell the story of the colonial appropriation of botanical and other natural/ised resources as a story of economic and political empire-making. She complements this discourse by tracing the connections between the latter and the emergence of the epistemic hegemony of Eurocentric Science. By analysing historical documents such as travel reports, Philip shows that European colonialists appropriated botanical resources deemed economically and medicinally profitable, along with local empirical knowledge about the properties and usages of these plants, on the basis of a narrative of universal humanitarian benefit and progress that concealed their national economic and political interests. This allegedly benevolent appropriation was further justified by relegating Indigenous knowledge to the realm of "unscientific" knowledges on the grounds that it was attuned to locally specific needs and therefore considered "narrow and short-sighted" (Philip 2004: 186). The taxonomy-based systematic science of botany institutionalised in the eighteenth century, in the name of which colonialists prospected for botanical resources, was accredited with observer-independence and universality and thus, it was argued, served the interests of all humanity and nature as a whole (Philip 2004: 185–192; see also Schiebinger 2005). Accordingly, Philip concludes, the demarcation between a supposedly universal Scientific knowledge and 'unscientific' local experiential knowledges is an ideological and rhetorical strategy that serves "to obscure the very specific rootedness of this knowledge in a particular political economy and set of cultural practices" (2004: 192).

Indigenous peoples such as the Andean Quechua communities in the Potato Park, who have "been living under colonial rule for five hundred years" (see Argumedo above) have been affected in different and intersecting ways by the material and epistemic power relations shaping more-than-human life in the area since the colonisation of the Americas.[29] By claiming scientific authority for the millennia-old, traditional, experimentation-based agricultural knowledge the Potato Park's food system is built on, Argumedo contests not merely the fact of epistemic marginalisation but its terms, most importantly a conception of Scientific knowledge that is built on excluding Indigenous knowledges per se. Taking this critique seriously by acknowledging the situatedness of all knowledge does not mean inverting the order of recognition by ascribing a greater degree of validity or objectivity to Indigenous ecological and agricultural knowledges than to dominant Western Science. Nor does it mean uncritically adopting, much less appropriating, Indigenous cosmologies and historical narratives. Instead, it means cultivating awareness of how agri-food systems – in the Andean Potato Park as well as elsewhere – are entangled with the knowledge systems they are embedded in and making this relation a subject of analysis. In doing so, agri-food systems become discernible as material-discursive manifestations of the (more-than-non/human) worlds they have emerged from. To phrase it in decolonial terms with Mignolo (2018: 147), it means "delinking" from the epistemic coloniality of dominant Science and "relinking" with emplaced forms of knowing, being with/in, and cultivating locally specific worlds.

This brings me to the second lesson from the last quoted passage from the interview with Argumedo. His description of how Andean agriculture embraces "the different ecological niches in the verticality" (see above) illustrates how place and ecological conditions matter to the development of food systems and societies. Mountain ecologies such as the Andes are highly diverse ecologies due to the distinct ecological conditions of different altitudes. The diversity found in mountainous regions is not only quantitative, meaning that there is a wide range of different species. Andean crop species are also diverse in nutritious quality, which differs depending on the altitude and respective

29 A number of Indigenous and decolonial movements and thinkers refer to the Americas as Abya Yala, which is a pre-Colombian local name for the American continent (see Walsh 2018: 21). Although it would be an exercise in decolonial naming practices, I do not use this term here because Argumedo and his community do not use it in the sources underlying this chapter.

ecological conditions in which they grow – the diverse "ecological niches" of mountainous regions. What distinguishes the food system that Indigenous peoples have created in the Andes and sustained for thousands of years, according to Argumedo, then, is not the sheer availability of a wide range of biological diversity so much as the capability to "master" that diversity.

Importantly, mastery has a different connotation here than in dominant Western knowledge systems. It does not mean submission and control so much as environmental literacy, (more-than-human) collaboration, and experimentation. Mastering the diversity of mountain ecologies, as Argumedo describes it, means knowing the different ecological niches and cultivating a diverse food system adapted to these niches. It further refers to the more-than-human rather than human-centred and technology-based capability to adapt to ecological changes, which extreme environments experience far more frequently than others. Argumedo further emphasises that for self-sufficient and sustainable food systems and societies to master mountain ecologies in the sense of thriving and persisting in them, collaboration across altitudes is key. Only by sharing food plants and knowledges between the higher and the lower regions does the biodiversity available in the area become accessible to all those subsisting on a diverse food system. Crucially, it is not seeds or 'plant genetic resources' that are shared across ecological niches but produce and knowledge. Insofar as food plants achieve their nutritious quality within the ecological conditions in which they thrive, the diversity of the Indigenous Andean food system Argumedo describes is literally rooted in the Andes' diversity of ecosystems. Sharing diversity, in this context, means maintaining the diversity of ecosystems (as well as the biocultural conditions required to maintain them) and sharing its fruits across different communities.

A concept that has arisen in this biocultural context and that guides food production in the Potato Park offers further insight into the knowledge system and the worldview or world the Indigenous Andean agri-food-system is embedded in: "We work under the umbrella of what we call food neighbourhoods." (Alejandro Argumedo, Potato Park, 5 November 2020: l. 76–77) This concept has found its way into the papers on global food system transformation co-authored by Argumedo and others in the context of the collaborative efforts of Indigenous and *ex situ* conservationists, as discussed above. However, the publications introduce a very vague and seemingly human-centred notion of "food biocultural diversity neighborhoods" as "defined geographic region[s] where community members work together to conserve, use, and celebrate their food-related biocultural diversity" (Argumedo et al. 2021: 4; see also Khoury

et al. 2019). In the interview I conducted with Argumedo, he put much more emphasis on the more-than-human relations underlying and encapsulated in the approach. Food neighbourhoods, he argued here, are manifestations of a "holistic" (Alejandro Argumedo, Potato Park, 5 November 2020: l. 91) approach to more-than-human relations that "look[s] beyond the farm into landscapes" (Alejandro Argumedo, Potato Park, 5 November 2020: l. 94). That is, rather than fence in, isolate from other lifeforms, and thus seek to control what is cultivated, the food neighbourhoods approach actively embeds food production in the environment in which farming takes place.

Underlying the effort to produce food in more-than-human neighbourhoods rather than on farms organised around human needs and agency is a cosmology that emphasises more-than-human "interconnection, complementarity, reciprocity" (Alejandro Argumedo, Potato Park, 5 November 2020: l. 91–92):[30]

> "In our understanding […] there are three ways of learning: one is with the head, which is intellectual; one is with your hands, which is practical; and the other one is with your heart, which is loving, the spirit, the sentiment – and that's the way you connect with a potato or a plant or with an animal more closely, with your relatives, those that live with humans. That is why what we call a human community, in reality, is a community that lives in a neighbourhood. The food neighbourhood concept comes from that because potatoes or other crops are not resources, they are neighbours. We care for each other; agriculture is a practice of caring. We have a Quechua name for it called *uyway*, which means seed but also means something that you nurture; that is literally what *uyway* means: something that you nurture, but that also nurtures you. You care for it, and it cares for you. You have to care for a potato seed because it is going to nourish you with food. It's a mutual, reciprocal relationship." (Alejandro Argumedo, Potato Park, 5 November 2020: l. 680–698)

This passage illustrates that food neighbourhoods, as concept and as agricultural practice, are a manifestation of a cosmology emphasising more-than-human interdependence, in which more-than-human relations are neighbouring or even kinship rather than resource relations. This has very profound implications for the ways in which more-than-human relations are enacted – includ-

30 As elaborated in this book's introduction, I understand and use the notion of cosmology in the anthropological sense (see footnote 11 in the introduction).

ing and especially in food production. Where plants and animals "that live with humans" are neighbours and relatives rather than resources, they are members of more-than-human communities and not parts of a nonhuman environment as distinct from human communities.

The notion of the environment, which remains the most common term for the more-than-human world as conceived in the dominant Western cosmology, presupposes a centre that is its point of reference, which it surrounds and from which it essentially differs.[31] It is a category that acquires meaning within a dualist structure of thinking insofar as the relation of centre and environment corresponds to that of self and other, inside and outside, human and nonhuman, culture and nature.[32] A neighbourhood, in contrast, is not organised around or defined in relation to a centre. It is a community that consists of the neighbours it comprises and the various relations between them. In the Quechua cosmology as Argumedo describes it, the relationship between human and other-than-human beings is not structured through a logic of dualism and hierarchy. Rather, both humans and nonhumans are members of more-than-human communities defined not by resource relations but by affective neighbouring and kinship relations that come to matter in practices of mutual care.

Agriculture, in this cosmological context, is not a practice of cultivating resources on farmland so much as "a practice of caring" for the thriving of food neighbourhoods. Crucially, this care is a more-than-human and mutual form of care, in which all participants, human and nonhuman, engage in modes of caring for one another and, collectively, for the landscapes in which communities or (food) neighbourhoods exist. The Quechua term for seed – "*uyway*, which means […] something that you nurture, but that also nurtures you" (see above) – intriguingly encapsulates this cosmology.[33] Unlike in the English lan-

31 For a similar, more extensive conceptual engagement with the notion of the "environment" and a trenchant critique of its colonial baggage, see More Worlds Collective (2025: 15–28, 57–61).

32 Dualist thinking is characteristic of the dominant cosmology of the West, the Occident, the "heteropatriarchal capitalist modern/colonial world system" (Escobar 2020: xii) or however else one might prefer to specify the world in question, the borders and theorisations of which are subject to both historical specificity and change. For a critical discussion of the various "Great Divide theories", see Viveiros de Castro (2015: 210ff.).

33 Remember: "In our tradition, names have very powerful connotations because they connect us with the spirit of the land." (Alejandro Argumedo, Potato Park, 5 November 2020: l. 6–8; see above)

guage and many other European languages, it signifies not the essence of the vegetal being it describes so much as the more-than-vegetal (or biocultural) relations and practices of care in which this being comes to matter, lives with other (more-than-vegetal) beings, and co-produces continuous relational existence.

Earthly Interdependence and More-Than-Human Mutual Care

The Quechua understanding and practice of agriculture as a form of more-than-human mutual care and the underlying relational ontology Argumedo delineates pertinently illustrate what I introduced above as more-than-human interdependence. Conceiving interdependence in terms of such a more-than-human relational ontology rather than as the international or global interdependence of human-centred communities in their access to plant genetic resources puts a fundamentally different complexion on agriculture and conservation in a globalised world in ecological crisis and the responsibilities that come with this. It raises the question of what worlds and worldings agricultural care cultivates and conservational care sustains.

An instructive source for discussing this question is Maria Puig de la Bellacasa's (2017) engagement with the ethics of care in more-than-human worlds. A premise of her inquiry into more-than-human relations of care, which aligns with the Quechua cosmology as delineated by Argumedo, is that all human and more-than-human life is ontologically and thus unavoidably interdependent (Puig de la Bellacasa 2017: 4). What is crucial for her is that "ecological interdependency is not a moral principle but a lived material constraint" (2017: 160). From this ontological assertion, Puig de la Bellacasa deduces that "for interdependent beings in more than human entanglements, there has to be some form of care going on somewhere in the substrate of their world for living to be possible" (2017: 5). The notion of care expressed in this assumption challenges more common understandings of care as an obligation that arises from an ethical, moral, affective, or even epistemic a priori one can choose to meet or not (2017: 90–91). Instead, Puig de la Bellacasa describes care as a condition of interdependent existence in more-than-human worlds and hence a "nonnormative necessity [of life]" (2017: 70). Moreover, it is "a manifold range of *doings* needed to create, hold together, and sustain life and continue its diverseness" (ibid., emph. in orig.). It is through such doings that specific interdependencies and, along with them, specific, situated, and ever-emergent ethical obligations to

care come to matter in the first place. As situated and co-evolving doings, relations of care and interdependence, then, can take many forms.

Following Puig de la Bellacasa and against the background of the differences between world(ing)s of conservation that have become evident in this and the previous chapter, I suggest understanding conservation as a matter of care for more-than-human worlds.[34] This implies that every conservational practice, from *ex situ* to *in situ* and on-farm conservation to the cultivation of sustainable food neighbourhoods, necessarily exerts some form of care. The ways in which the technoscientific practices of *ex situ* conservation (such as preparing seeds for conservation and keeping them viable in *ex situ* conservation environments) are practices of care have been described by a number of scholars working at the intersection of STS and the environmental humanities in recent years (e.g. Wickson 2016; Chacko 2019; Laboissière 2019; Boschen 2022). Argumedo's account of Quechua agriculture as a practice of mutual care in more-than-human neighbourhoods illustrates a different form of conservational care that has co-evolved with a different, more-than-human interdependent cosmology.[35] Taking seriously the idea that *ex situ* conservation and the Potato Park's agri-food system are situated within specific and in many ways fundamentally different material-discursive worlds characterised by different forms and understandings of care means that the essential question is not which one cares 'better' or 'more' (see also Puig de la Bellacasa 2017: 7–9,

34 Puig de la Bellacasa's notion of "matters of care" points to the entanglement of labour/work, affect/affections, and ethics/politics, in the interplay and unsolved tensions of which worlds come to matter (2017: 5). She developed it in a critical discussion of Latour's notion of "matters of concern" (Latour 2004). Latour self-critically proposes the latter to expand his earlier analyses of the practices (labour/work) driving the social construction of "matters of fact" by the concerns (affect/affections) motivating these practices. Next to the idea that a thing can be both real and constructed, Latour highlights that things are also lively themselves insofar they gather and hold together collectives, for whom they are a common concern (see also chapter 3.2). He thus emphasises that things become what they are in and through networks of agencies and concerns. While Puig de la Bellacasa (2017: 30–48) welcomes Latour's effort to acknowledge and symmetrise distributed agencies and affects in (knowledge) politics, she criticises his reluctance to embrace the questions of power, marginalised and erased voices, and radical politicisations often raised by this kind of politics, which she aims to rectify with her notion of "matters of care".

35 For an account of more-than-human care as a mutual relationship enacted by both humans and other-than-humans, see also Silberzahn (2024).

42–43). Insofar as answering this question would require predetermining universal standards about what good or enough care is, it would disentangle practices of care from their respective worlds. Instead, thinking with Puig de la Bellacasa, the more relevant questions to ask about different forms of conservational care are: "'For whom?' but also 'Who cares?' 'What for?' 'Why do "we" care?' and mostly '*How* to care?'" (Puig de la Bellacasa 2017: 61, referencing Star 1995, Bowker/Star 1999, Bowker/Star 2007, emph. in orig.).

Addressing these questions brings into view the more-than-human relations that different forms of conservational care cultivate. According to Puig de la Bellacasa, this is vital (in the literal sense of the term) because how exactly relations of care are enacted has profound, material consequences for the world that comes to matter in these relational practices:

> "That [care] requires doing something indicates […] that a more than human world's degree of livability […] might well depend on the caring it manages to realize. Standing by the vital necessity of care means standing for sustainable and flourishing relations, not merely survivalist or instrumental ones." (Puig de la Bellacasa 2017: 70, emph. in orig.)

In this sense, it matters – materially as well as in that it is significant – what kind of more-than-human relations agri-food systems (including conservation infrastructures) are built on, because the world they cultivate is the world they sustain. Especially in light of the continuously escalating social-ecological devastations of the present, "the question of what worlds will (our) care become enrolled in sustaining becomes even more acute" (Puig de la Bellacasa 2017: 205).

As the previous chapter showed, in the *ex situ* world of conservation technoscientifically trained conservationists carefully conserve the largest possible diversity of PGRFA so as to ensure, in a combined effort, that farmers and breeders around the world have access to as many genetic resources as possible so that they can adapt crops and agricultural production to changing environmental conditions. These efforts primarily anchor the promise of future food security in, and ultimately work to preserve or extend the present of, a technoscientific agri-culture organised around principles such as technologically facilitated adaptation, genetic optimisation, and economic profitability. Insofar as *ex situ* agrobiodiversity conservation leaves the causes of changing environmental conditions largely unaddressed, it fails to account for the fact that they are rooted, to a large degree, in this same agri-culture

and its resource-extractivist relation to the nonhuman world. Put differently, by reiterating the failure of modern agriculture to recognise more-than-human interdependence, *ex situ* conservation conserves instrumental, survivalist relations to the nonhuman world rather than cultivating more-than-human relations that might sustain or even increase earthly liveability. In the Potato Park, in contrast, farmers who derive their knowledge and proficiencies from an experimentation-based ancestral tradition of place-based agriculture strive to care for more-than-human food neighbourhoods together with their vegetal and animal relatives in order to preserve mutually life-sustaining relations.

Having said that, the degree of liveability the local communities manage to realise in the Potato Park, howsoever sustainable and flourishing the more-than-human relations they cultivate, also hinges on ecological and climatic conditions beyond local control. In times of global climatic and geo-ecological change, what is now quite commonly referred to as the Anthropocene, the ecological conditions of life are changing all over the world. The socio-economic causes of the "great acceleration" (Steffen et al. 2015a) of earth system changes since the 1950s, which many consider to mark the beginning of the Anthropocene (see Lewis/Maslin 2015), may originate in the centres of industrial capitalism. Nonetheless, in that they transform climatic and ecological conditions of the whole earth system, they affect all life on earth. Accordingly, although the Potato Park's agri-food system is designed to be self-sufficient, it is inextricably entangled in a planetary-scale web of what I propose to call *earthly interdependence*.

The notion of earthly interdependence is a critical intervention into the debate about *global interdependence* discussed at the beginning of this chapter. Without contesting the latter, the notion of earthly interdependence shifts the focus from the *globe* to the *earth* as the key figure of connection. This shift is based on the premise that "the globe" and "the earth" are more than innocent, distinct designations of a given entity or reality preceding its designation. Following Bruno Latour and Donna Haraway, I understand them as "figures" (Latour et al. 2016: 355) that in/form the ways we relate to and inhabit or *world* the world (see Haraway 2016; Latour 2018: 41 referencing Haraway); "figurations" (Haraway 1997: 11) that perform what they presume and "can be inhabited" (ibid.) themselves as a way of meddling in the worlding of the world.

The globe is the anthropocentric and human exceptionalist horizon of modernisation and globalisation. Latour argues that after centuries of being the guiding figure of modern world-making, in light of the rapid reaching

and crossing of planetary boundaries it has become evident that "there is no Earth corresponding to the infinite horizon of the Global" (Latour 2018: 42; see also Latour et al. 2016; Latour 2017: 111–145). In other words, there are earthly limits to the modernist ideas of progress and development that can no longer be ignored (Latour 2018: 18). The disappearance of the globe as a horizon of world-making, for Latour, is a loss that opens up new horizons. Whereas others (re)turn to the notion of the land, he argues that there is no going back because modernisation and globalisation have irrevocably transformed the reality of the land. Both the Local and the Global are "utopias, in the etymological sense of the word, places with no *topos*, without earth and without land" (Latour 2018: 41).

Instead, Latour appeals to Humanity to become "earthbound" (2017: 248–253). Becoming earthbound, for him, means becoming attached to Earth in a way that fundamentally differs "from the way humans were attached to Nature" (Latour 2017: 281). It means ceasing to treat the earth "as an inert and mute object [n]or as supreme judge and final arbiter" (ibid.); moving beyond a dualistic understanding of Humanity and Nature, according to which Humanity is determined to either exploit Nature's resources or fall prey to its forces – to either dominate or be dominated by Nature. Instead, "the Earthbound understand that, contrary to what the Humans have never stopped imagining, […] *they are not alone in the command post*" (Latour 2017: 283, emph. in orig.). The notion of earthly interdependence and the conceptual shift away from global interdependence that I propose is a response to this call to account for the fatal premises and repercussions of the modern world-making endeavour by recognising earthly boundaries and earthboundedness.

Another important influence for both Latour's and my turn to the earth is Haraway's thinking, as articulated above all in *Staying with the Trouble: Making Kin in the Chthulucene* (2016). In this book, Haraway embraces the figure of the earth so as to meddle constructively and responsibly (or rather response-ably) in its figuration.[36] Intervening in the scholarly debate on the Anthropocene,

36 Haraway's thinking and writing are characterised by an elective affinity with and at the same time a critical distance to Latour's work. She appreciatively describes this relation in a eulogy for Latour published in a special issue of *Social Studies of Science* that assembles a series of obituaries by his academic companions. One of the main disagreements between Haraway and Latour, which she identifies here alongside a number of shared influences and strivings, is that in thinking about technoscientific fact- and world-making, "[he] liked trials of strength and insisted on writing and inscription as the proper names for what was happening. Those moves have been extremely productive for gen-

she proclaims the "Chthulucene", which denotes the beginning age of the "chthonic ones", the "beings of the earth" (2016: 2). Unlike the Anthropocene and most of the countless neologisms critically rearticulating it in an effort to replace the eponymous Anthropos and its homogenising tendencies with a signifier more accurately encapsulating the main culprit for the current predicament, the Chthulucene does not circumscribe an era or world that is responsible for the social-ecological devastations of the present. Instead, it imaginatively prefigures "a kind of timeplace for learning to stay with the trouble of living and dying in response-ability on a damaged earth" (ibid.). The Chthulucene is a creative reminder "that the established disorder is not necessary; another world is not only urgently needed, it is possible, but not if we are ensorcelled in despair, cynicism, or optimism, and the belief/disbelief discourse of Progress" (Haraway 2016: 51).

Staying with the trouble, for Haraway, means "acknowledging the extent and seriousness of the troubles [we are in]" (2016: 4) while at the same time resisting the all-too-common sentiments of apocalypticism and game-over cynicism, on the one hand, and fantasies of techno-salvation, on the other hand. Insofar as totalising narratives such as that of the Anthropocene and many of its rearticulations effectively encourage such responses, she emphatically argues that "we *must* change the story; the story *must* change" (2016: 40, emph. in orig.). That is, in order to become capable of developing meaningful responses to "the horrors of the Anthropocene" (Haraway 2016: 3) – to become capable of response, able to respond, response-able – we need stories, narratives, figures, terms and suchlike that help us realise that "human beings are with and of the earth" (2016: 55), that "[w]e become-with each other or not at all" (2016: 4). For Haraway, changing the story – or the terms of the conversation, as decolonial thinkers say (see above) – "in times that remain at stake, in precarious times, in which the world is not finished and the sky has not fallen – yet" (2016: 55), means changing not only how we know, but how we live in, relate to, and become with the world – how we *world* the world. In this sense, responding to the troubles of the present means both rethinking and re(con)figuring relations with the world – changing the stories we tell about more-than-human relations and making kin beyond species boundaries.

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erations of STS scholars. But, with many other feminists in STS, I always wanted something other than trials of strength and tropes so close both to war and to one-eyed monsters, something more like caring and diverse collective composing and decomposing, something with a sensorium not restricted to vision or writing." (Haraway 2023: 2)

My proposition to think about global interdependence as earthly interdependence builds on Latour's call to become earthbound and on Haraway's call to stay with the trouble of "living and dying well with each other in the tissues of an earth whose very habitability is threatened" (2016: 132). Without disputing the global interdependencies that centuries of modernisation and globalisation have created, my aim is to foreground – in addition to these – the more-than-human entanglements of human life that the cosmology of the modern world has consistently "backgrounded" (Plumwood 1993: 48–49). I describe these entanglements as "earthly" because they refer to the locally specific earthboundedness of all beings and ways of life, as well as to the interdependence of all earthbound life through its earthboundedness. Insofar as recognising earthly interdependence means changing the story or the terms of multispecies life on earth, it requires delinking from the *ex situ* world's "resourcist cosmovision" (Fenzi/Bonneuil 2016: 78) and the extractivist practices this informs. This does not mean renouncing *ex situ* conservation altogether so much as recognising *ex situ* conservation and the global safety net for plant genetic diversity that the Svalbard Global Seed Vault offers as valuable emergency measures in the face of tremendous (agro)biodiversity loss without mistaking them for a sufficient solution.

This understanding of the Seed Vault also finds expression in how Argumedo describes its value for the Potato Park:

> "Svalbard could be our life insurance. The way the world is going – and I think this pandemic just amplifies all our problems – we know that climate change is not going to stop. […] Maybe we are past the tipping point, but maybe Svalbard, at some point, is going to give us back our potatoes because maybe we will survive all the catastrophic situations and then we can rebuild from the Svalbard Global Seed Vault." (Alejandro Argumedo, Potato Park, 5 November 2020: l. 506–516)

The interview passage illustrates that Argumedo and his community recognise the Seed Vault's potential value for saving the biocultural heritage of the Potato Park (and that of other worlds in this world), while remaining aware of the fact that the Seed Vault is a subjunctive space and that the futurity it promises hinges on overcoming the "catastrophic situations" unfolding in the present. Against this background, the Seed Vault did not assume a key role in what Argumedo talked about in the interview I conducted with him, and the story of the Potato Park's collaboration with the *ex situ* world does not end there.

Without contesting the importance of the Seed Vault as a safety net against the loss of plant genetic diversity in and for a globally interdependent world, the story of the Potato Park shows that the challenges of an interdependent world go beyond global interdependence in access to PGRFA. It illustrates the ontological and vulnerable condition of earthly interdependence, that is to say the more-than-human interdependence of all earthly life in local spaces as well as on a planetary scale, as well as the fact that for earthly interdependence to be "sustainable and flourishing" (Puig de la Bellacasa 2017: 70; see above), sustainable and flourishing more-than-human relations need to be cultivated. Insofar as agri-food systems assume a critical role in this, global agri-food system transformation is a crucial element of Argumedo's vision for the future articulated in the collaborative papers cited above as well as the interview. The principle of more-than-human mutual care guiding food production in the Potato Park is an instructive and generative principle for such global agri-food system transformation. As Argumedo introduced it, it is a place-specific, field- and time-tested way of cultivating non-instrumental more-than-human neighbouring or kinship relations.

Crucially, neither Argumedo's nor my intention here is to scale this particular, situated form of organising more-than-human life up to the global level and turn it into a promise for a new, sustainable global agri-food system.[37] As I have previously argued with Tsing (2019), the idea of scalability assumes and enacts decontextualisation rather than place-specific situatedness, which is a crucial part of the Potato Park's agri-food-system and cosmology. In this sense, the 2050 Vision for Global Food System Transformation (Khoury et al. 2019) that Argumedo and his Indigenous and *ex situ* world colleagues co-articulate envisions "a global village of 'diverse food neighbourhoods' spread throughout the planet, comprised of local custodians in regions with longstanding food diversity traditions, productively interconnected with one another and with the global food system as a whole" (Khoury et al. 2019: 4). While this vision does indeed scale the food neighbourhood concept up to a global level, as Argumedo set it out in the interview this does not mean modelling a singular global food system after the Quechua food system. Rather, the global village or neighbourhood of diverse food neighbourhoods he imagines arises from a transforma-

37 Accordingly, I will not spell out what more-than-human mutual care looks like in practice (nor can I, as my empirical material does not allow me to do so). Rather, I conceive it as a specific, situated modus operandi of an ontology of earthly interdependence that has enabled me to spell out the latter concept.

tion of global food systems (in the plural) based not on one (whichever) model but (again in the plural) on

> "mutually beneficial cross-fertilisation of ideas and experiences, and respect that those traditions have the right to continue evolving in their spaces. […] People have been practising agriculture in the world for more than ten thousand years and in places they have the knowledge about, they name things in their own language, they have created very effective and sophisticated systems. So, let them flourish, let them create solutions wherever they are and like a quilt start weaving, create this beautiful colourful tapestry where everything is interconnected but also maintains its own identity." (Alejandro Argumedo, Potato Park, 5 November 2020: l. 785–787; 798–807)

This vision for global food system transformation draws strength from situated earthboundedness and cosmological pluralism rather than from universalist decontextualisation and the reification of ontologies and epistemologies. A global food system conceived and cultivated as a neighbourhood of diverse agri-food systems situated in diverse more-than-human worlds is a vision for global food system transformation that takes the principle of more-than-human mutual care to the level of both earthly and global cooperation. Agro-bio(cultural)diversity conservation, then, means more than extending the present of a specific world on the brink of extinction, as I have shown to be (at least part of) what the *ex situ* world of conservation strives for. It means assembling and conserving not only a diversity of biological resources but a diversity of more-than-human worlds and modes of worlding.