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Chapter 14

GENETIC RESOURCES FOR FOOD AND AGRICULTURE AS COMMONS

Christine Frison¹ and Brendan Cooltaet^{2,3}

¹ FWO postdoctoral researcher, Faculty of Law, University of Antwerp and FNRS postdoctoral researcher, Centre for Philosophy of Law, Université catholique de Louvain, Belgium

² European School of Political and Social Sciences, Lille catholic University, France.

³ School of International Development, University of East Anglia, Norwich, UK

Abstract

Agrobiodiversity is the continuum of wild to domesticated plant, animal and ecosystemic diversity sustaining people's livelihoods. This biodiversity results from an equally diverse set of culturally defined farming practices. To maintain both forms of diversity, access to genetic resources for food and agriculture (GRFA) is crucial. However, current regulation and policy increasingly commodifies GRFA, rendering their access and use difficult for smallholder farmers and peasant communities, hence jeopardizing food security and food sovereignty, and limiting the emergence of more sustainable farming practices. In this paper, we argue that governing GRFA as commons may offer remedy to this problem. As commons, GRFA are considered networked knowledge-goods with non-exclusive access and use conditions, which are governed, produced and consumed by communities. Two case studies are used to illustrate this: first, the Global Seed Commons established under the International Treaty on Plant Genetic Resources for Food and Agriculture; second, the reintroduction and 'commonification' of a traditional pig breed by a local community enterprise in Schwäbisch Hall, Germany. These cases show that, when moving beyond a narrow institutional understanding, innovative legal frameworks and governance arrangements inspired by the philosophy of the commons can facilitate access to and sharing of GRFA, hence helping to ensure the transition towards more sustainable agriculture.

1.- Introduction

Access to the diversity of genetic resources for food and agriculture (GRFA) is vital for human survival (Altieri, 1999; Frison et al., 2011; FAO, 2015), notably given the current context of climate change (IPES-Food, 2016; Beddington et al., 2012). However, access to GRFA is under threat for at least two main reasons: (1) biodiversity erosion, caused by a multitude of drivers including climate change, land use changes and the introduction of invasive species (FAO, 1998, 2010; Esquinas-Alcazar, 2005; Butchart et al., 2010), as well as micro-level farming decisions and macro-level policies (Pascual and Perrings, 2007; 2012) including agricultural intensification, shifting cultivation, and indiscriminate crossbreeding; and (2) hyperownership over genetic resources (Safrin, 2004; Chiarolla, 2006; Aoki, 2008 and 2010), understood as “exclusive ownership and restrictions on the sharing of genetic material” (Safrin, 2004: 641). Both elements limit the use and sharing of GRFA among food and agriculture stakeholders and constrain international GRFA management within an appropriation paradigm, which stands at odds with the relative free flow of germplasm inherent to agricultural practices since the first forms of plant and animal domestication. This appropriation paradigm considers resources as commercial objects to be appropriated and sold on the global market as a commodity, reducing resources to merely an economic value and erasing all the other (cultural, social, religious, etc.) values of the resources (Bavikatte, 2014: 232; Posey, 1999). This commodification process eludes any other contributions and values related to resources and confines GRFA into a vicious circle of appropriation and exclusion which contradicts the intrinsic interdependence of such resources and their exchange systems.

These ways of governing GRFA have made access more difficult. Indeed, market mechanisms, which are regulated by a regime complex, control the access to genetic resources (Raustiala and Viktor, 2004; Gerstetter et al., 2007; Andersen 2008) and have gradually reinforced market control over homogenized GRFA. This has increasingly impeded the use and exchange of GRFA diversity (Fowler and Hodgkin, 2004; Fowler and Mooney, 1990; Kloppenburg, 2004; Pautasso et al., 2013). Acknowledging that feeding the world’s population (2015 Sustainable Development Goal n°2 “Zero Hunger”; see UN, 2015) requires changing our agricultural practices (IPES-Food, 2016), there is an urgent need to unlock access to these essential resources (Pistor and De Schutter, 2015) by stepping out of the dominant appropriation paradigm. This means facilitating the use, conservation and exchange of the diversity of local and traditional GRFA and protecting it from appropriation and homogenization. Indeed, one may question the usefulness of biotechnologically improved seeds as a solution to hunger (Saab, 2015). Moreover, protecting the diversity of local and traditional GRFA goes hand in hand with the protection of traditional and innovative farming systems, particularly well adapted to local needs, culture and social behaviours. Engaging in a virtuous circle - englobing GRFA conservation and use in a holistic system where social, cultural, spiritual needs are taken into account besides the food, nutrition and economic aspects - promises to enable local populations to produce sufficient and nutritious food for all in a resilient manner (Altieri and Merrick, 1987; IPES-Food, 2016).

Recent literature has explored the idea that managing seeds as a commons would unlock access to seed diversity and promote their efficient conservation and sustainable use (Helfer, 2005; Halewood and Nnadozie, 2008; Dedeurwaerdere, 2012; Frison, 2016). Extending this

hypothesis to all GRFA, we argue that GRFA should be governed as commons in order to ensure both food security and sovereignty, as well as to support the transition towards a more sustainable agriculture. The theory of the commons sheds light on the efficiency of local collective management systems over natural resources, where private (market) or public (State) controlling failed to sustainably manage specific resources (Ostrom, 1990 and 2010b). However, Ostrom's work remains within the boundaries of the above-mentioned appropriation paradigm by considering resources as economic objects to be governed for the sustainability of the community's living (Schlager and Ostrom, 1992). It fails to explore the governance of resources in a more holistic manner (Capra and Mattei, 2015), i.e. by focusing on the relationship between culture and nature rather than on the institutional arrangements designed mainly to manage an object considered exclusively as a "resource". As commons, we argue that GRFA exchange schemes are considered networked knowledge-goods with non-exclusive access and use conditions, which are governed, produced and consumed by communities.

To illustrate this argument, two case studies, at two different policy levels, and dealing with two different types of GRFA (plant and animal) are examined in this chapter: (a) the Global Seed Commons established under the International Treaty on Plant Genetic Resources for Food and Agriculture; and (b) the reintroduction and "commonification" of a traditional pig breed by a local community enterprise in Schwäbisch Hall, Germany. While ticking off many of the institutional boxes identified in the commons literature, these cases call for a 're-politicisation' of the conservation of GRFA. By drawing on the underlying social, political and economic values at the heart of commons-based collective governance, they highlight the need to bridge the nature-culture divide in order to achieve a genuine transition towards sustainable agriculture.

We conclude that innovative legal frameworks and governance arrangements inspired from the philosophy of the commons may help us go beyond Ostrom's views and facilitate access to and sharing of GRFA. Doing so would not only ensure food security and sovereignty, and contribute to transition towards sustainable agriculture, but also go beyond by sustaining ecologically, socially, and culturally adapted food and agriculture local systems, and enabling communities to feed themselves in the respect of their culture, needs as well as the environment.

2.- The International Treaty on Plant Genetic Resources for Food and Agriculture: Re-commonizing seeds

The International Treaty on Plant Genetic Resources for Food and Agriculture (hereafter the Treaty) entered into force in 2004 (October 2016: 142 Member States). Its objectives are the conservation, sustainable use and a fair and equitable access to agricultural seeds through a Multilateral System (MLS), where seeds are exchanged through a virtual common pool and where benefit-sharing obligations rest on its users. Access to a list of 64 crops and forages (constituting 80% of the world's staple food) is facilitated for research, breeding and training purposes to all Treaty members. When accessing seeds through the MLS using a Standard Material Transfer Agreement (SMTA: i.e. a standard contract), recipients agree that they freely share any new developments with others for further research through the MLS. If recipients protect the new material using intellectual property rights (IPRs) and sell it on the market (i.e. exclude MLS members from accessing it for free), they agree to pay a percentage of commercial benefits derived from it into the Benefit-sharing Fund (BSF). The BSF (established in 2008) is a common fund aimed at supporting conservation and further development of

agriculture in developing countries. It was created to increase resources to be invested in crop diversity with the overall objective to increase world food security.

Ostrom's work is crucial to understand the Treaty as a collective management system for seeds (Halewood et al., 2012; Halewood, 2013). However, recent analyses show that merely applying Ostrom's theory as such to the Treaty is insufficient to unlock access to seeds and fulfil food security and sustainable agriculture goals (Frison, 2016). Indeed, the way the Treaty is designed and implemented remains within and reinforces the current appropriation paradigm. Intellectual property and access to seeds are bargaining stakes directing the globalized food and agricultural market and creating major conflicts of interests between the seed industry and farmers (Kloppenborg, 2004). Seeds are regulated by a regime complex (Raustiala and Viktor, 2004; Andersen, 2008) made of the Treaty's obligations but also by IPRs regulations reinforcing market control over seeds (Gerstetter et al., 2007): the International Union for the Protection of New Varieties of Plant (UPOV) revised in 1991 – creating plant variety protection – and the Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement) in 1994 – ruling on the patenting of “plant genes” (Cullet, 1999; Helfer, 2004; Chiarolla, 2011).

Hence, the Treaty is not functioning well (i.e. facilitated access is limited to specific recipients, lack of funding impedes benefit-sharing to take place and increasing distrust between stakeholders renders implementation difficult) and is currently undergoing a review process to enhance the functioning of its MLS and to identify more secure funds for its BSF. For now, the facilitated access to seeds functions mainly for genebank curators, researchers and breeders but does not formally allow a direct access to seeds for farmers, who are the first “users” of seeds. In addition, the BSF has received very limited funding and only supports a small portion of all the potential conservation and sustainable use projects in developing countries. Moreover, the Global Information System (GLIS), which aims at facilitating the exchange of information, targets information relevant only for a specific type of users (i.e. breeders and researchers) but not the majority of smallholder farmers in the world. Finally, the general governance mechanism (i.e. Treaty's Governing Body) lacks participation from the biggest “seed user group” i.e. farmers, on which obligations are imposed without taking into account their voice, needs and interests.

These flaws constitute a quick summary of it's the deeper and more systemic issues that the Treaty has been raising in terms of obligations, tools, instruments and implementation process from 2004 to 2016 (Frison, 2016). Overall, a thorough analysis demonstrates that the Treaty expresses an imbalance of rights penalizing farmers, notwithstanding the fact that they are the ones feeding the world's population. This imbalance of rights is twofold. First, Farmers' Rights (FRs) are not recognized at the same level as IPRs. Indeed, building the funding strategy and its BSF around IPRs de facto imposes the IPR system as being the “default” system, which in turn fragilizes and marginalizes further farmers' (informal) system of exchanging seeds which recognition and support are left to national recognition and enforcement. Second, small-scale farmers are excluded from the governance of the MLS and their ancestral role of innovators is not recognized, excluding them from the research and breeding processes, at the exception of very few participatory research projects under the BSF.

Undeniably, the Treaty has created innovative tools and instruments under international law, which emphasize the collective interest in the international seed management. For this reason, analysing the Treaty using the lens of the commons is more than relevant. However, according to us, this has to be done in a more “holistic manner” (this book; Capra and Mattei, 2015; Frison, 2018; Girard and Frison, 2018; Girard, 2018), i.e. focusing on the complex,

interdependent and multi-layered relationship between human and nature rather than on the institutional arrangements designed to manage an object considered exclusively as a (potentially commercial) “resource”. Therefore, expanding to more recent developments of the Commons theory (this book), the emphasis is set on the underlying values supporting collective governance (social, cultural, ecological values etc.) and on the political philosophy of the commons (Dardot and Laval, 2014) as potential way forward to mitigate the limits of the Treaty.

Going beyond Ostrom’s work with her eight design principles, we can identify six underlying principles for a Global Seed Commons (GSC principles) to effectively function beyond this appropriation paradigm. These are: a) sustainability; b) interdependence; c) anticommons dilemma (i.e. the underuse of seeds as main risk for erosion); d) physical and informational components inextricably bound to the use of seeds; e) global seed community; f) diversity, heterogeneity and complexity. Realizing these GSC principles has the potential to transform the Treaty currently functioning as a management system focused on the collective use of seeds by specific users into a sustainable global multi-stakeholder management regime focused on the collective governance of seeds by and for the collective benefit of all (Frison, 2016).

a) Sustainability

Sustainability is seen as a “dynamically maintained system condition rather than a static equilibrium” (Agrawal, 2002:59), i.e. users of the community manage a resource with the perspective of duration and renewal in an adaptive relationship with each other and with the resources. While the conservation and sustainable use objectives of the Treaty undeniably fit with this underlying principle, the Treaty’s implementation tools and instruments do not sufficiently take this objective into account. Long term objectives for the benefit of the community should be translated into concrete rules within the Global Seed Commons, which integrate “more interactive and participatory process between scientist, policy makers and stakeholders.” (Dedeurwaerdere, 2014:24) To be sustainable, commoning should embed the act, mechanism and movement, of creating, preserving and reproducing the commons.

b) Interdependence

Interdependence goes hand in hand with sustainability. In the food and agriculture field, interdependence is the result of long run human cooperation and collaboration in the exchange of food and feed plants across the world. Farmers and breeders have selected, exchanged and bred seeds to develop such or such characteristic over millennia that respond to specific needs and adaptation (FAO, 1998; 2010; Khoury et al., 2016). There is therefore an ongoing need to exchange plant genetic resources from countries all over the world. This calls for a sustainable management of the resource in the collective interest. Interdependence thus becomes a philosophical and political goal to be attained by all countries for them to reach global food security. In the same line, Capra and Mattei state that “recogniz[ing] the interconnectedness of our global problems [would] enable us to find appropriate, mutually supportive solutions that [...] would mirror the interdependence of the problems they address” (Capra and Mattei, 2015: 159; see also Capra 1996; Moore 2015).

c) The anticommons dilemma

Heller defines the anticommons dilemma as occurring when “there are too many owners holding rights of exclusion, [then] the resource is prone to underuse” (Heller, 1998:624). Indeed, the dilemma is not that overconsumption leads to depletion of seed diversity¹ but rather that under-use leads to erosion (i.e. the drastic loss - approx. 75% - of the diversity of seed varieties). This is why over the last decades, with access to seeds that has become more and

more restricted due to the appropriation paradigm, erosion of seed diversity has never been so wide. Halewood emphasizes that this “aspect of [seeds] informs the need for collective action institutions that are necessary to support their continual creation/evolution as well as ensuring that they are conserved and available for use” (2013: 291). Therefore, the only sustainable way of managing seeds and avoiding the anticommons dilemma to erode seeds diversity is to facilitate access to them and use by all users, not only breeders and researchers as provided for by the Treaty, but at the global level for every farmer feeding the world.

d) Physical and informational components

Hess and Ostrom contend that advances in law and technology have enabled profit-oriented firms to extract value from resources previously held in common and to establish property rights over them (Hess and Ostrom, 2003). Ostrom reminds that “[f]or most of human history, the [global commons] remained unclaimed due to a lack of technology for extracting their value and for establishing and sustaining property rights. To our peril, the technology to extracting value from [the global commons] has developed more rapidly than the appropriate legal mechanism for establishing an effective property regime. The treasured resources for all mankind are threatened by the very technological abilities that we have mastered during recent eras” (Ostrom’s foreword in Buck, 1998: xiii). Hence, IPR and new technologies rather go hand in hand in enclosing information, technologies and access to knowledge and material traditionally available.

As regards seeds, the physical and informational components are inextricably bound to their use. Dedeurwaerdere clearly makes this point when he states that seeds are somewhere in between the exclusive “natural resource commons” and the exclusive “knowledge commons”, containing both a physical component and an informational component (Dedeurwaerdere, 2012). This dual component as physical and informational asset should be taken into account when considering the institutionalization of a Global Seed Commons. It would require specific governing rules, which change and adapt with the evolution of the IP protection scheme. Initiatives to facilitate access to breeding information, such as the DivSeek initiative and the Global Open Genome Sequence Data Framework, constitute false sharing and “reopening” initiatives: they will only serve specific categories of seed users, *de facto* excluding users who do not have the adequate training and technology to benefit from them.

e) Global Seed Community

Bollier reminds us that “community” is one of the three constitutive elements of a commons, along with a “resource” and a set of “social protocols” (2014:15). A commons is not only about the resource but also about surrounding practices and behaviours, i.e. the establishment of a fair, equitable and sustainable management that guarantees access to and use of the resource in the collective interest (Bollier and Helfrich, 2015:1-12). Baland and Platteau define a community as an arena where “all members of a social group have an access to the local resources” (Baland and Platteau, 1998: 644). This definition implies belonging to an identified social group, and a notion of scale. In the Treaty arena, scale and diversity of the community are crucial issues. Defining who is part of the community is crucial as it sets the legitimacy for rights in managing the resources, i.e. only those members that are part of the community may collectively manage (and benefit from) the resource. In the Treaty, farmers are clearly identified as a (passive) target group for benefit-sharing (the first benefit of which being facilitated access to seeds). Breeders, researchers and trainees for food and agriculture are those identified as part of the MLS community (Article 12.3a of the Treaty). To be congruent with the objectives of the Treaty, it would be essential to recognize the fundamental role of farmers

in the sustainable use and conservation of seeds, in innovating new seeds varieties and in producing food, and thus automatically integrate them in the “management team” of the Treaty, i.e. the Governing Body and its implementation tools and instruments to constitute the Treaty’s global community.

f) Diversity, heterogeneity and complexity

Ostrom’s design principle on “nested enterprises” (Ostrom, 2009) premised that larger commons are more complex to govern than smaller ones. Further studies showed that heterogeneity, diversity and complexity (Cox et al., 2010; Hughes, 1997; De Burca, 2012) were important aspects to consider in collective governance institutions. In studying the character of an adaptive system to a changing context, Dedeurwaerdere pointed to the importance of the modular character of organizational architecture in institutional managing systems (Dedeurwaerdere, 2012). As Ostrom and Basurto put it, “we do not seek to be complex for the sake of being complex, but we have to overcome our obsessive tendency to simplification. (...) taking into account the complex and nested character of the systems of the biophysical world, one needs to develop a social science of complexity and nested systems.” (authors’ translation)” (2013:16). Unfortunately, globalisation and the homogenisation of biodiversity governing regimes hinder the emergence of institutional diversity, regime heterogeneity and systems complexity. It is important not to forget, as Roa-Rodríguez and Van Dooren remind us, that “[t]he dynamics unleashed by IP and sovereign regimes are transforming the varied common spaces, with their multiple modalities of access, use and alienation of resources, into a *de facto* homogeneous common space where the negative and exclusive characteristics are predominant. This is a highly undesirable outcome if our true goal is the conservation and sustainable use of [seeds] for the well-being of society at large” (2008:193-194).

Although the Treaty and its instruments (MLS, BSF, GLIS, etc.) are innovative from an international law perspective, an in-depth study of their implementation reveals major dysfunctions and incongruences with a political and progressive understanding of the commons and with an ecologically oriented vision of sustainable food systems (Frison, 2016). One cross-cutting aspect is the lack of recognition of the role and rights of smallholder farmers. A “*UN Declaration on the rights of peasants and other people working in rural areas*” is currently being negotiated to address this gap. Recognition of Farmers’ Rights at the international level is promoted as a compulsory step in order to overcome the imbalance of rights pertaining to seeds and to reach the food security and sovereignty as well as the sustainable agriculture overall goals of the Treaty. The theory of the commons in its philosophical and political wide dimension is identified as a useful theoretical framework to address these constraints. Transforming the current intergovernmental multilateral legal instrument into an effective and collectively governed political Global Seed Commons would thus propose an alternative path to the current seed regulatory setting entangled in an out-of-date public/private good dichotomy appropriation scheme. It would allow stepping out from the dominant appropriation paradigm and solving major conflicts of interests and power that would inevitably arise between stakeholders, as well as moving from stakeholders managing resources to members of a global community commoning seeds and their ecosystems.

3.- Commons-based animal genetic resources governance. The case of the Swabian-Hall swine

Commons-based strategies and ideas for food and agriculture at international level need to be implemented through and complemented with both formal (top-down, State-led) and/or informal (bottom-up) collective action (Ostrom, 2004). This section offers an opposite

perspective compared to the previous one and provides an illustration of how grassroots collective action for food and agriculture can provide for public goods through bottom-up innovation.

The Swabian-Hall swine (*Schwäbisch-Hällische Landschwein*) is a local pig breed from Schwäbisch Hall, a small town, capital of the eponymous district, in the state of Baden-Württemberg, southwestern Germany. The swine is the result of a crossbreed between the Chinese Meishan pig, imported by King William I of Württemberg in 1821, and a German landrace. The locally adapted landrace gained enormous popularity in the 19th and first half of the 20th century, with a market-share of over 90% by 1959. Despite its popularity, the swine almost disappeared 25 years later, with the introduction of fast-growing Dutch ‘high-performance’ breeds, suitable for mass production and with low fat content, but ill-adapted to their environment. Livestock of the local landrace declined sharply, and by 1984 the Swabian-Hall swine was considered to be extinct.

The critical condition of the local landrace, owing to the extreme commodification of big breeding in the region, led a small group of farmers-breeders to launch a conservation campaign to save the Swabian-Hall swine. In the 1980s, they created the Schwäbisch Hall Producers’ Community (*Bäuerlichen Erzeugergemeinschaft Schwäbisch Hall*, or BESH), defending a “holistic approach to rural development”. The initiative turned into a genuine success story (Coolsaet, 2015): the local landrace was rebuilt and its genetic potential sustained, the breeding footprint was improved, and local farmers-breeders were made the main stakeholders of the farming and breeding activity. Although the swine is still considered to be at risk of extinction, the community now counts over 1400 farmers breeding the Swabian-Hall swine.

The governance arrangements set out by the BESH tick off many of the institutional boxes identified in the literature as leading to success: well-defined boundaries, predictability of the resource flow, group homogeneity, monitoring system, accountability, articulation with markets, legal recognition, *etc.* (Agrawal, 2001). However, understanding the success of the BESH requires going beyond a technicist, depoliticized and institutional approach and looking at the governance arrangements through the underlying values supporting collective governance in general, and this initiative in particular. Three broad overlapping dimensions underlie the initiative: a) economic distribution (strengthening farmers economically); b) cultural recognition (valuing traditional knowledge, cultural traditions and local identities), and; c) political representation (improving farmers’ autonomy and self-determination) (Coolsaet, 2015).

a) Economic distribution

First of all, the BESH established a community-based pricing system. Both meat prices and production amounts are fixed communally and in advance, and the association guarantees buying of these amounts. To account for higher production costs of the Swabian-Hall swine (approximately 12 % higher than for ‘high performance’ breeds; Leipprand et al., 2006), part of the network’s profits is redistributed as financial support for adaptation. More specifically, BESH breeders get a 0.33 euro ‘adaptation premium’ per kg of carcass of pork on top of the purchase price, to allow for the adaptation of their breeding practices to the community’s standards. While this allows controlling the predictability of the market and of the resource flow, hence providing stability to the production process, it also allows avoiding over-production and internal competition between farmers.

With over 1400 pig farmers-breeders, the BESH is by no means a small group. But the group's size gradually increased over time and does not constrain its activities. On the contrary, one could argue that given the peculiar nature of the resource (*i.e.* genetic resources), a rather large group is necessary to avoid genetic degradation. The BESH employs permanent staff which supports the farmers in tasks as diverse as commercialization, product marketing, logistics support, internal communication, research subsidies, and recreation.

These different elements function as a (re)distribution mechanism that guarantees a stable income and a fair share of the profits for farmers. This financial redistribution offers both autonomy from an increasingly centralized semen industry and greater independence from the retail sector, with farmers having more security with regards to the volatility of the market and global competitors.

b) Cultural recognition

Another characteristic of the group is its homogeneity regarding both production and retail. This homogeneity is a result of the group's ambition to account for both cultural and natural issues through the breeding process. Joining the association is only possible for breeders located in the traditional breeding area of the Swabian-Hall swine. This ensures an overlap between the farmers-breeders' residential and cultural location, and the resource location. As such, the landrace is not only adapted to its natural environment, hence requiring less external farming inputs, but also to local culture and traditional knowledge.

But this reliance on situational knowledge does not amount to the glorification of traditions or to some form of extreme localism. Although the project initially faced criticism and defiance from the scientific community, the BESH has been increasingly collaborating with scientists through the establishment of shared learning spaces. For example, it has recently teamed up with German universities to launch a joint project under the EU Horizon 2020 research program, studying connections between traditional feed (*e.g.* grass) and improved meat quality. Moreover, through its internal training centre, the BESH facilitates the exchange of knowledge between farmers. These instruments allow for the farmers and their knowledge to be recognized. In so doing, they promote a form of status equality between those who practice farming (*i.e.* the farmers) and those recognized as holding authoritative representational and interpretative knowledge of farming (*i.e.* the scientists).

Finally, the BESH also organizes cultural events aimed at strengthening farmers' identity and promoting sustainable agriculture. The regional 'Rock for Nature' festival combines rock music and debates on the future of agriculture (*e.g.* in 2008 it hosted both Joe Cocker and Vandana Shiva). The motto of the festival is "*Gen Tec – Nein Danke!*" (Gen[etic] [bio]tec[h]nology] - no thanks!)

Strengthening farmers' identity and recognizing the validity of their traditional knowledge and local breeding techniques was necessary to depart from high-input breeding. In the contemporary context of EU common agricultural policy, the dominance of industrial farming systems and the hierarchization of knowledge systems leave little space for the emergence of alternative ways of farming (Coolsaet, 2016). Central to the activities of the BESH was thus the idea that "the genetic code is not fixed in time, it evolves according to the environment and the farmer" (participating farmer; authors' interview, 2013). This evolution, however, is only possible when the genetic resources are free from access and use arrangements which freeze the genetic code according to characteristics defined by external, non-producing actors. As a participating farmer puts it: "rare breeds are not for the museum" (authors' interview, 2013).

c) Political representation

Governance arrangements aiming to economically and culturally strengthen the farmers have led the BESH to rethink the representational spaces and conditions. Community-based pricing systems, for instance, only work if the whole community is represented. And the whole point of collaborative learning spaces is to enlarge the evidence base through broad(er) participation.

But the issue of representation was taken a step further by specifically thinking about how to reconnect individual farmers, consumers and the broader community with a larger collective rural movement, empowering participants, both producers and consumers, as agents of change and encouraging self-determination. To allow for a strong articulation with consumers and guarantee a stable return to all the parties involved in the chain of production, the BESH created its own market. When a local slaughterhouse threatened to close, the BESH teamed up with surrounding communities and local authorities to collectively buy the slaughterhouse. It then gradually established a network of community-owned/partnering (butcher)shops and concluded a series of collaborations with regional hotels and restaurants, which exclusively supply BESH's meat. This allowed the broader community to gain control over the whole value-chain, redirecting added value to the farm instead of the industry. But it also allowed to break loose from the conditions imposed by the retail sector by redefining the conditions of market access.

While working within limited geographic and cultural boundaries, the BESH also gradually opened its production process to external actors to help improve farming practices, ensure monitoring and accountability, and creating a more direct relationship between producers and consumers. While farmers keep their autonomy and define their own farming practices, an independent environmental NGO ensures the definition and improvement of the community's breeding guidelines and production standards, as well as their monitoring and compliance throughout the production chain. Scientific partners and agricultural engineers help develop technical breeding criteria for meat quality, vitality, stress resistance, fertility, *etc.* And the inclusion of end-user and transformers has allowed to directly promote and encourage the use and consumption of the local landrace.

Beyond strengthening the conditions for farmers-breeders, these three dimensions have also allowed reducing the environmental impact of the breeding activity. Not only was the locally adapted landrace saved from extinction, hence reintroducing more genetic diversity and associated local knowledge in the industry, the breeding standards gradually incorporated strict environmental objectives. A stronger focus on animal welfare led to doubling the mandatory space per pig, developing better adapted barns, and banning the use of antibiotics and tranquilizers. Moreover, if not produced personally, BESH farmers must buy pig feed from GM-free suppliers, which are monitored and pre-selected by the BESH. While the whole enterprise obviously still produces greenhouse gases, the breeding standards also include emissions reduction objectives. A such, at least 80% of the feed must be bought from regional suppliers (max 500 km from the farm), and the whole chain of production was shortened, leading to less transport. To limit emissions and minimize nutrient runoff, the BESH imposes sufficient fallow land in the members' farms to allow for surface spreading of their pigs' manure. Finally, while official organic labelling is not imposed on the farmers, the BESH has created specific support programs to help the farmers adapt to the environmental standards and provides nature conservation training to its members.

The BESH's holistic approach hence combines a series of institutional arrangements to successfully improve access to, conservation and use of the genetic diversity of the local landrace. But these arrangements offer more than a standardized governance system. By encompassing strong socio-cultural, economic, and political objectives, the BESH replaced and complemented the tradeable dimension of food and farming with a much larger understanding based on agency and empowerment of its members, while at the same time reducing the environmental impact of pig farming.

4.- Conclusions

Access to GRFA for farmers is an essential component of more sustainable farming. It helps transforming local agri-food systems, by enabling environmentally appropriate and culturally adapted food production. However, this access has become increasingly difficult due to the way in which GRFA are being governed. Current approaches to their management tend to overemphasize their economic dimension, reducing them to tradable commodities managed through market approaches, reinforcing their appropriation by certain actors and fostering hyper-ownership.

We have argued in this chapter that governing GRFA as commons can improve access and mitigate failing management. Doing this, however, requires departing from a narrow institutional understanding of commons-based governance. The conservation and use of GRFA must be re-politicized by drawing on some of the underlying social, political and economic values at the heart of commons-based collective governance.

Transforming the current intergovernmental multilateral system of the Treaty into an effective and collectively governed political Global Seed Commons constitutes an example of a possible global “re-commonization” of seeds. The review process of the MLS could allow stepping out from the dominant appropriation paradigm and solving major conflicts of interests arising between seed stakeholders. Implementing the identified six underlying principles has the potential to transform the Treaty into a sustainable global multi-stakeholder management regime focused on the collective governance of seeds in the interest of all, including smallholder farmers. In the same vein, the Schwäbisch Hall case provides an illustration of how GRFA can shift from being a commodity to being a commons. The successful conservation and breeding of the local swine was both the driving force and the consequence of the strong sociocultural, political and environmental principles underlying the initiative.

By governing GRFA as politically constructed commons, both cases offer effective and sustainable solutions that differ from the usual market or state-based approaches, which led to the current appropriation paradigm. A political rediscovery of the commons can thus help constructing innovative legal frameworks and governance arrangements that facilitate preservation, access to and sharing of GRFA and the transition towards more sustainable agriculture.

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ⁱ Although it is obvious that when someone eats a potato, the potato is no longer available for growing or for somebody else's consumption.