Technical manual series on Community Seed Banks

Manual 3

Community Seed Banks:
access to germplasm and benefit sharing models

DYNAVERSITY

Acknowledgments

This booklet is part of a series of three manuals developed within the European Union Horizon 2020 project "DYNAmic seed networks for managing European diversity" (DYNAVERSITY). The booklets were made possible thanks to the collaboration of DYNAVERSITY project partners and members of the European Coordination Let's Liberate Diversity! (ECLLD). Special thanks also go to Isabel Lopez Noriega and Bram de Jonge for their technical and legal support to drafting the content of the manual, to the Secretariat of the ITPGRFA for clarifications on the SMTA, to Alexandra Baumgartner and Italo Rondinella for their photographic material.

European Coordination Let's Liberate Diversity!

LET'S LIBERATE **DIVERSITY!**

"Our diversity is our strength"

ECLLD draws its origins and inspiration from the annual gatherings of the European movement on agricultural biodiversity known as the Let's Liberate Diversity! Forums. Since 2005 the LLD gatherings have become a tradition and they have been organised in many different European countries! Our vision is to encourage, develop and promote the dynamic management of cultivated biodiversity on farms and in gardens, and our goal is to bring back diversity in our food systems in a socially and economically sustainable way throughout the whole food chain. The diversification of our food systems can be achieved linking the work of the different actors involved (e.g. farmers, gardeners, citizens, researchers, processors, technicians, small-scale seed companies), supporting and promoting their knowledge and actions associated to cultivated biodiversity. For this, to achieve this vision, the objective of EC-LLD is to be an open and fruitful space of exchange of knowledge and experiences among its members and civil society and we want to continue along this agroecological path and disseminate instruments that allow the multiplication of realities other than mainstream agriculture.

DYNAVERSITY project partners wish to emphasize that the term "material", often used in legal texts to refer to seeds, plants and their parts, is rather misaligned with the values that the ECLLD pursues and the organic agriculture context in which it works. An ecological conception of agroecosystems considers living beings not merely in terms of their individual biochemical materiality but rather takes into account the complex web of complementarities and synergies in which they are embedded. We therefore use the term "material" only where inevitable to correctly describe the legal, historical and regulatory context the manual deals with.

DYNAVERSITY

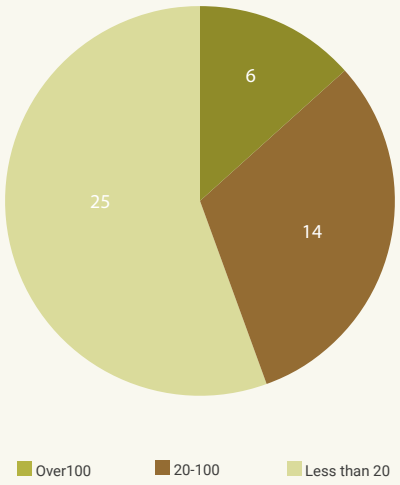
This Manual is the result of the collective work of DYNAVERSITY partners, coordinated by Gea Galluzzi (ARCADIA), with the support of Matthias Lorimer (European Coordination Let's Liberate Diversity) and Riccardo Bocci (Rete Semi Rurali)

Index

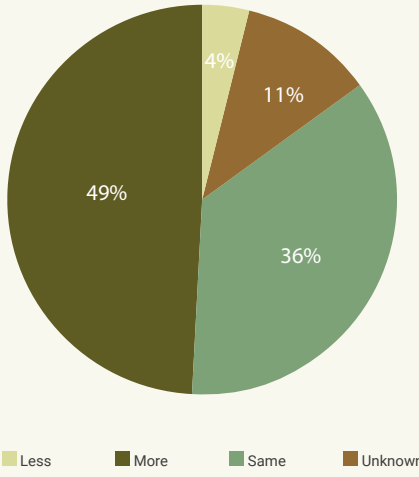
In 2018, the LINKAGES project (Assessing linkages between genebanks and direct users)[1] conducted parallel surveys to assess the extent to which *ex situ* genetic resources were being requested for purposes other than formal[2] research, breeding, experimentation and by actors different from the traditional users of *ex situ* germplasm (researchers and breeders): one survey targeted managers of European genebanks, the other was circulated among on farm users (represented by collective organisations or networks) engaged in conservation, reproduction, and informal experimentation around agricultural biodiversity.

Most of the respondents had requested seed in the past and the vast majority obtained what they asked for. Genebank curators reported a significant percentage of request for "direct use", and confirmed they also observed an increase in such requests over the past few years (graphs A and B); most requests were for landraces and heritage varieties, as described in graph C. On farm users stated that most often the local seed network or another collective organisation made the request on behalf of individuals or groups of farmers/gardeners. Furthermore, more than 40% of on farm actors reported being engaged with one or more *ex situ* institutions in collaborative projects or networks.

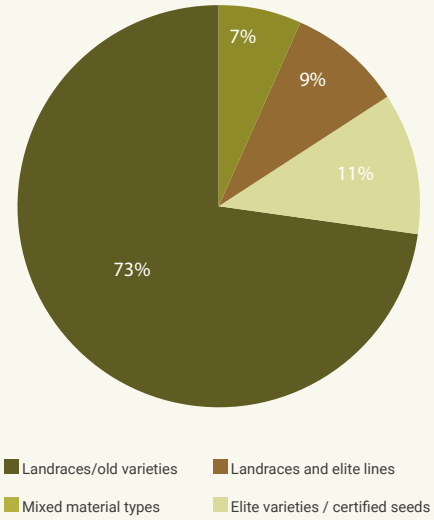
A. Average number of requests for direct use from on farm actors (individual or collective) received per year by the European genebanks surveyed



B. Most genebanks surveyed reported an increase over the last 5 years in the number of requests for "direct use" coming from on farm actors



C. The different types of genetic resources requested by users for direct use on farm, according to the *ex situ* genebanks surveyed



1 https://www.ecpgr.cgiar.org/working-groups/on farm-conservation/linkages

2 We use "formal" to address the activities of public institutions or private companies and "informal" to identify those carried out by social actors (e.g. farmers or farmers' organisations and seed networks).

Integrated approaches for dynamic management of PGRFA: access to and exchange of germplasm between formal and informal institutions

European CSBs are generally embedded in informal PGRFA conservation and seed systems, and most often their origin does not emerge out of any relationship with formal PGRFA institutions. However, as their activities and services grow and diversify in scope and outreach, it is not at all un-frequent that they interact with research institutes and national or international genebanks. Strengthened collaboration between genebanks and organisations working at different levels on seed system development is potentially beneficial for both sides: farmers may benefit from access to genetic diversity they otherwise would not have, and genebanks get to interact with seed systems they would not reach through conventional channels. Different germplasm types, useful for different context, can be more effectively conserved, with those responding to the needs of small farmers and gardeners being conserved and managed in local seed systems (such as CSBs) and germplasm more useful for research and basic breeding conserved in the institutional settings of national or international genebanks. All this raises important questions in terms of how to practically and legally handle the exchange of genetic resources among these two worlds as well as among CSBs.

3 We will use the terms access and benefit sharing in the course of the manual, with the disclaimer that the communities involved in collective, local efforts for the dynamic management and circulation of seed such as those involved in CSBs are not comfortable with using these formal terms to describe their relationships of exchange and reciprocity with farmers and gardeners. With this in mind, we do adopt these terms where inevitable for correctly describing the legal and practical instruments which CSB may (or may not) decide to adopt, and which are defined in the international frameworks described.

While public conservation institutions have to adhere to national rules about how to grant access to the germplasm they conserve and how to establish benefit sharing[3] agreements with recipients, the position of CSBs with respect to these rules is not always clear. Most CSBs are private entities, but depending on their legal form and status as well as on their countries' policies on PGRFA, they may enjoy a greater or lesser degree of freedom to develop their own rules for granting access to the resources they hold (see box on page 21). In any case, opportunities for mutually beneficial interactions with formal PGRFA institutions or just a desire to frame their activities within a legally recognized context may lead some CSBs to adhere to some of the practical instruments and tools of the legal frameworks in place in each country.

This booklet will provide an overview of the international legal framework on PGRFA and discuss its potential relevance for CSBs and farming/gardening communities. Starting on page 19, it presents three practical cases/scenarios related to access to and exchange of PGRFA involving CSBs and their on farm communities. Scenario 1 (page 19) discusses how a CSB can decide to regulate access to the germplasm it holds, depending on its own priorities and values, as well as on the legal framework in place in the country; scenario 2 (page 23) describes the possible legal and contractual elements which may emerge whenever a CSB requests seed from a formal institution such as a national or international genebank; scenario 3 (page 27) focuses on the conditions and rules that farmers (individual or collective) may follow for granting access to PGRFA located on their private land to any interested collector.

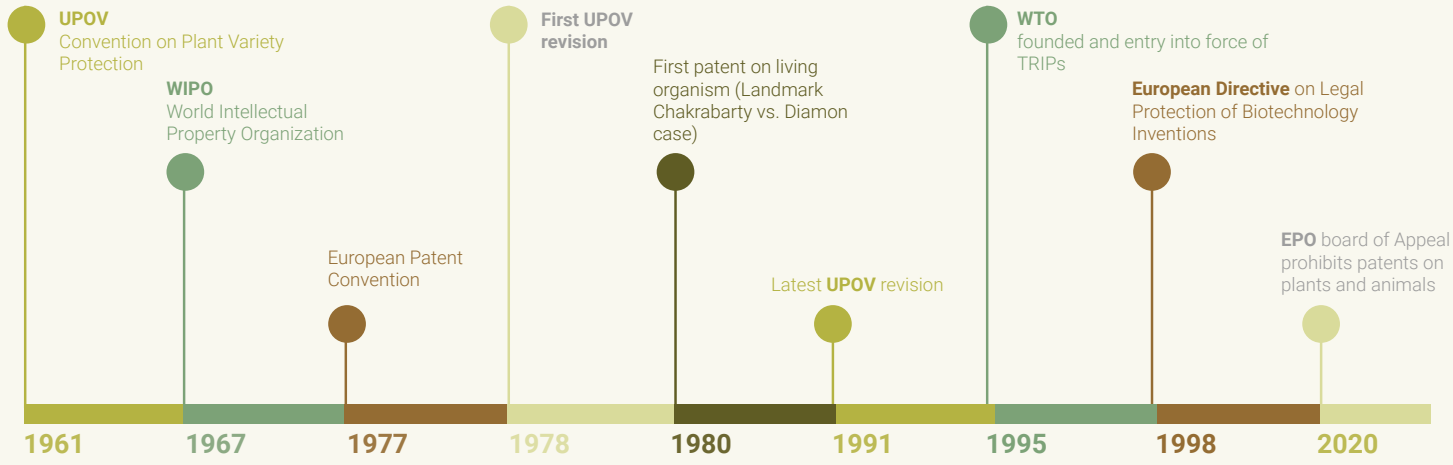
Relevant institutions and landmark events in the field of intellectual property relevant for PGRFA

The World Intellectual Property Organization (WIPO) is one of the 15 specialized agencies of the United Nations (UN), created in 1967 to promote and protect intellectual property (IP) across the world. The intergovernmental World Trade Organization (WTO) regulates and facilitates international trade between nations. It commenced operations in 1995, replacing the General Agreement on Tariffs and Trade (GATT) that had been established in 1948. The WTO facilitates trade in goods, services and intellectual property among participating countries by providing a framework for negotiating trade agreements. During the 1994 Uruguay Round of Negotiations within the GATT, negotiators sought to connect the GATT/WTO and WIPO; the TRIPs Agreement (Trade Related Aspects of Intellectual Property Rights) emerging from these rounds explicitly called for such mutually supportive relationship. TRIPS entered into force in 1995, setting minimum requirements for intellectual property rights (IPR) for its members, as part of its measures to promote/protect international trade. In terms of PGRFA, it requires that its members provide for the protection of plant varieties by some form of IPR. Article 27.3(b) allows members to exclude from patentability "plants and animals other than microorganisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes." However, in this case members "shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof."

The UPOV system is the one most used in Europe to comply with the TRIPS requirement, as it encourages the adoption of sui generis laws for protecting new plant varieties outside of patent law. It requires that a plant variety be new, distinct, homogeneous and stable in order to be eligible for protection; once approved, UPOV's Plant Variety Protection (PVP) right entitles breeders to receive royalties from the commercial sale of seed from the protected variety. In its 1978 version, UPOV makes two exceptions to the need for payments: the so-called breeders' exemption (for breeders wishing to use the protected variety for further crop improvement) and the farmers' privilege (for farmers wishing to reproduce the variety from one year to the next). In the 1991 revision, the scope of these exceptions was reduced, bringing the UPOV and the patent system closer.

In Europe, Article 53(b) of the European Patent Convention (1977) prohibits the patenting of "plant varieties" as such. Despite this, since the 1980s, the rapid rise of biotechnology in all fields including food and agriculture determined growing opportunities to apply to patents on living matter, modified through biotech tools as never before (see the Chakrabarty vs Diamond landmark case in 1980, the first instance of a patent on living matter being granted). In 1998, the European Directive on Legal Protection of Biotechnological Inventions (Directive 98/44/EC) was approved, which states that biotech inventions applied to plants and animals may be patented if the feasibility of the invention is not limited to a single plant or animal variety. The EU directive provides that "biological material which is isolated from its natural environment... may be the subject of an invention even if it previously occurred in nature". However, the mere isolation of a gene or protein from a living organism is arguably not an activity that can be considered an "invention" (hence subject to a patent) and indeed many ethical concerns were voiced about this directive by civil society groups such as those united under the campaign "No Patents on Seeds"[4]. These concerns were reinforced by the increasing tendency by the European Patent Office (EPO) to approve patent applications for plant "inventions" based on conventional, non-biotech breeding methods. Encouragingly, in 2020, the Enlarged Board of Appeal of the EPO has decided to prohibit patents on plants and animals, agreeing with a restrictive interpretation of patent law.

4 https://www.no-patents-on-seeds.org/index.php/en/news/G3-19



The international framework

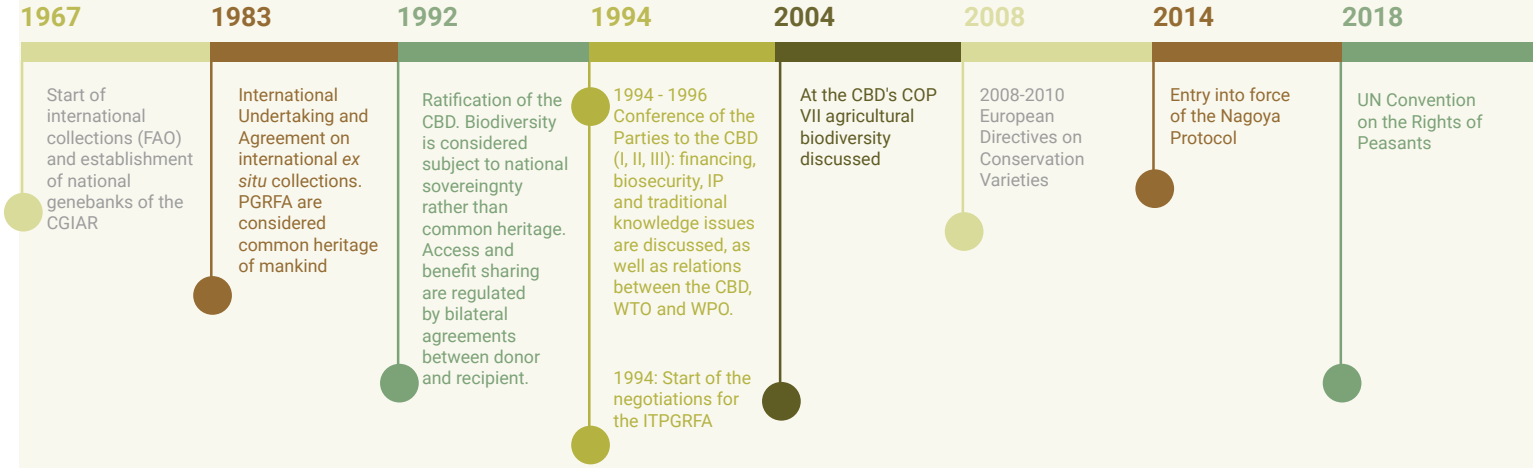
After millennia of farmer-driven conservation, selection and management, the governance of plant genetic diversity changed drastically over the 20th century, both technically and politically. During the 1900s, the re-discovery of Mendel's Laws of Heredity, the rise of pure line breeding and the application of hybrid technology within the Green Revolution allowed to exploit the existing crop diversity at unprecedented scales and speeds. Processes which had been conducted almost exclusively by farmers or amateur gardeners were being increasingly carried out by plant breeders, members of an emerging profession.

National and international research centres, as well as private companies, started setting up breeding programmes for improving the world's major crops by developing more productive, high-yielding varieties. These tended to be more responsive than landraces to external inputs and mechanisation and usually much more uniform genetically. The programmes of the Consultative Group on International Agricultural Research (CGIAR) played a central role in developing and making available new varieties of a number of globally important crops to farmers, particularly in developing countries (Pingali, 2001). Critiques to the newly established CGIAR network point out its links with the World Bank and the influence exerted over its programmes by industrialised nations and their emerging corporations to ensure that the world's seed resources would be made available for commercial plant breeding (Kingsbury, 2009).

The UPOV Convention (Convention of the International Union for the Protection of New Varieties of Plants – according to the acronym in French) arose in 1961 out of this fervent period, providing breeders – particularly those operating in the private sector - with an intellectual property right instrument (Plant Variety Protection - PVP) which awards them with returns on their or their institution's investments.

It was in this rapidly changing scenario that breeders themselves and scientists got increasingly concerned about the phenomenon of "genetic erosion" as new high-yielding cultivars replaced landraces and more heterogeneous varieties. Two important FAO technical conferences on plant genetic resources (PGR) in 1967 and 1973 set the technical and financial (donor-based) bases for kick-starting global conservation actions. The establishment in 1974 of the International Board for Plant Genetic Resources (IBPGR, now Alliance Bioversity-CIAT) allowed the organisation of collection missions worldwide over the following ten years, contributing to the collection and *ex situ* storage in national and international (CGIAR) genebanks of a great deal of plant germplasm as well as to the production of guidelines, descriptors and protocols. The 70ies and 80ies were years of almost absolute dominance of *ex situ* conservation approaches, with seed banks closely linked and functional to breeding programmes and mostly located in countries where techniques, capacities and funds were available. Critiques were voiced about the management of seeds by germplasm banks, and their links with conventional breeding programmes designed on an industrialised agricultural model.

Landmark events in the field of biological diversity



The United Nations Declaration on the Rights of Peasants (UNDROP)

An indirect effect on the development of policies dealing with conservation, sustainable use and access and benefit sharing of agricultural biodiversity may be exerted in the near future by the country-level implementation of the United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas. Approved in 2018 by the Third Committee (Social Humanitarian and Cultural) of the UN General Assembly, this decision had been strongly advocated by international actors working to promote family farming and peasant agriculture, such as Via Campesina. The Declaration aims to better protect the rights of all rural populations including peasants, fisherfolks, nomads, agricultural workers and indigenous peoples and to improve living conditions as well as to strengthen food sovereignty, the fight against climate change and the conservation of biodiversity.

FAO's Commission on Genetic Resources for Food and Agriculture (CGRFA)

The CGRFA is the only permanent intergovernmental body that specifically addresses biological diversity for food and agriculture. It aims to reach international consensus on policies for their sustainable use and conservation and the fair and equitable sharing of benefits derived from their use. The Commission initiates, oversees and guides the preparation of global sectoral and cross-sectoral assessments about the state of biodiversity and genetic resources in the respective sectors, along with their uses, drivers that contribute to their erosion, challenges and opportunities for conserving and using them sustainably. The Commission developed the Genebank Standards for Plant Genetic Resources for Food and Agriculture[5] to help minimizing the loss of genetic diversity in seed, field and *in vitro* collections held ex situ. Recognizing the importance of strengthening complementarity of ex situ and in situ conservation strategies, the Commission endorsed the Voluntary guidelines for national level conservation of crop wild relatives and wild food plants[6] in 2017. Similar guidelines for national level conservation and use of farmers' varieties/landraces were adopted in 2019[7].

5 http://www.fao.org/agriculture/crops/thematic-sitemap/theme/seeds-pgr/gbs/en/
6 http://www.fao.org/3/a-i7788e.pdf
7 http://www.fao.org/family-farming/detail/en/c/1251445/

The International Undertaking on Plant Genetic Resources

Those debates led to the establishment in 1983 of the FAO's International Undertaking (IU) on PGR, which could answer the following kind of questions: Who owns the seeds collected with money from public donors and stored in countries other than those where they were collected? Who is responsible for their long-term preservation? Who will ensure that the formula of free exchange in seeds between banks will continue in the future? What are the benefits for farmers who have produced, selected, stored and made available the seeds stored in the banks?

The drafting of the IU was managed within the FAO Conference, and in parallel a new intergovernmental body with the mandate to monitor and manage the operation of the IU was created: the FAO Commission on Genetic Resources for Food and Agriculture.

The International Undertaking was a voluntary – thus not legally binding – agreement by which countries agreed that they would seek "to ensure that plant genetic resources of economic and/or social interest, particularly for agriculture, will be explored, preserved, evaluated and made available for plant breeding and scientific purposes". The International Undertaking was based on the then universally accepted principle that plant genetic resources were "a common heritage of mankind and consequently should be available without restriction". In line with that principle, adhering governments and institutions holding plant genetic resources under their control were expected to adopt policies that would allow "access to samples of such resources and to permit their export where the resources have been requested for the purposes of scientific research, plant breeding or genetic resource conservation". They also agreed that samples should be "made available free of charge, on the basis of mutual exchange or mutually agreed terms". An important aim of the International Undertaking was to clarify the legal status of the *ex situ* collections of the CGIAR Centres and other gene banks, providing them with a legal basis to place the PGR they held in their collections officially under the auspices of FAO.

While the IU attracted wide support, a number of countries expressed concerns which can be summarized along the following lines:

- The concept of free availability of PGR might be in conflict with certain other international commitments , especially the UPOV Convention and the plant breeders' rights this convention provided for (this was a concern felt by industrialised nations, in particular);
- The global system on PGR envisaged by the IU was unbalanced, failing to recognize the important contributions of farmers to the development of PGRFA by granting any interested user the right to exploit resources which had been developed through their effort and knowledge (this one was more of a concern to diversity-rich but less industrialised countries of the South);
- Any system of PGR should more fully reflect the sovereign rights that countries have over their genetic resources (advocates for local communities particularly in the South claimed that the idea of "common heritage of mankind" could lead to misappropriation of their resources, if they were considered to be public goods).

Between 1987 and the early 1990s, discussions within the FAO Commission led to the drafting of three resolutions (FAO 4/89 on the agreed interpretation of the IU, FAO 5/89 on farmers' rights and FAO 3/91 on States' sovereignty over genetic resources) which were annexed to the IU. The key components of these Resolutions ended up in IU's successor: the International Treaty on PGRFA, which is described on page 15.

The Convention on Biological Diversity (CBD) and its Nagoya Protocol - 1

The scene was to change as the negotiations related to access to genetic resources – and the fair and equitable sharing of benefits arising from their use, began to take place in the context of a new international policy instrument towards the end of the 1980s: the Convention on Biological Diversity (CBD). Before 1986, the term biodiversity (contraction of the until then used expression "biological diversity") did not exist. It was during the National Forum on Biodiversity, held in Washington that year, that it made its first public appearance, backed by images of exotic wildlife or lush forests under threat by uncontrolled human development. This perspective captured the general public's attention much more effectively than any landrace or crop wild relative could do. In addition, the new technologies and intellectual property rights (IPRs) which were increasingly being applied to biological resources and processes in the pharmaceutical and chemical fields were making biodiversity (specifically, genetic resources) a marketable commodity as never before.

In this context, particularly those diversity-rich, but often economically poor countries no longer accepted the vision that genetic resources were common heritage of mankind, hence under an implicit free access regime, but wanted to exert their sovereignty and be granted participation in any economic gains deriving from these. Against this cultural and political battleground, the Convention on Biological Diversity (CBD) was adopted in 1992. To date, there are 196 acceding countries (the Parties).

Under the CBD, genetic resources cease to be an asset with free access (Common Heritage of Humankind) to become a good on which the governments of the states where they are located have sovereignty. The CBD also states that conservation is closely linked to the sustainable use of resources and that access to genetic resources and their immaterial values such as the associated traditional knowledge held by indigenous and local communities must be regulated (i.e. it attempts to set a mechanism for benefit sharing with the provider country).

Although the CBD places a primary focus on wild biodiversity, the agreement encompasses all genetic resources, both wild and domesticated. Hence, it influenced the scene of crop genetic resource conservation in many ways. First of all, a distinction started to be made between the generic term "plant genetic resources (PGR)" and the specific "plant genetic resources for food and agriculture (PGRFA)", to distinguish those resources of relevance to food and farming from all others. Second, the concept of access and benefit sharing (ABS) was introduced into policy and practice. Third, the CBD recognised the importance of *in situ* conservation, requiring Parties to implement a number of measures also aimed at domesticated plants (the CBD has a special programme of work on agricultural biodiversity, as per decision V/5 -, adopted in 2000), and considering *ex situ* only as a complementary measure, to be preferably carried out in the country of origin of the genetic resource.

The dominance of the *ex situ* model started to be questioned, making space for conservation and use models in which the role of farmers would regain some terrain and in which landraces and CWRs were seen not only as reservoirs of genes in refrigerators.

Prior Informed Consent (PIC)

Whether you're collecting a specimen or documenting traditional knowledge associated with it, developing a PIC is necessary. The PIC is the permission given by the competent national authority of a provider country to a user prior to accessing genetic resources, in line with the appropriate national legal and institutional framework.

It is important to determine who the competent authorities are: PICs should typically be obtained from regional and cultural authorities, with the participation of local authorities, and individual stakeholders (e.g. land owners). However, not all countries have designated single Competent National Authorities clearly.

Mutually Agreed Terms (MAT)

Officially, the MAT is an agreement between providers and users of genetic resources on the conditions of access and use and the benefits to be shared between both parties. The MAT should explicitly state the expected benefits and the commitment of the parties to ensuring benefits are shared. The MAT can specify that if opportunities for new kinds of benefits should arise, a new MAT could be developed.

Materials Transfer Agreement (MTA)

An MTA is a contract set to transfer research materials from a provider to a user, defining the rights of both parties and pointing to the MAT for the terms to be followed. Institutions track MTAs so to uphold and enforce the terms of agreements. Often, a single MTA between institutions can be for an entire project and multiple fieldwork events.

MTAs often include details of the research plan and details on how third party use will be regulated. This applies to tangible collections as well as associated knowledge or data products stemming from the collection.

The Convention on Biological Diversity (CBD) and its Nagoya Protocol - 2

The national level implementation of the CBD's provisions on ABS proved difficult in many countries, unable to fully strike a balance between protecting their sovereign rights and enhancing the public benefits of the products derived from the use of natural genetic resources. In the early 2000s, to try providing clearer guidance on how to set up straightforward and effective ABS measures, the Parties top the CBD embarked in the negotiation of the Nagoya Protocol on Access and Benefit-sharing, a supplementary, legally-binding instrument to the Convention. The Protocol was adopted in 2010 and entered into force in 2014 (119 Parties). It also aims at introducing clearer compliance measures.

The Nagoya Protocol is the most recent legally binding policy instrument to appear on the complex scene of conservation and sustainable use of genetic resources. Its implementation and harmonisation with other existing instruments (particularly the International Treaty, see next page) are challenging, and many international cooperation programmes are in place to support countries in this harmonisation. Novel challenges are also continuously emerging in the implementation of access and benefit sharing policies, such as those related to the case of digital sequence information, which is increasingly present in all branches of life sciences and modern biology.

Fitting PGRFA in the CBD's framework proved to be challenging, because of their distinctive features. Agricultural genetic resources depend on continuous human management and are a cornerstone of the breeding process, whether it is carried out by farmers, breeders or gardeners. Breeding requires a wide range of variability to meet a wide range of production needs, compared to the needs, say, of a pharmaceutical industry interested in extracting a single molecule from a wild plant for medical or cosmetic use. Bilateral negotiations for each genetic resource employed in a breeding programme would be too cumbersome and have a disastrous outcome rather than facilitating sustainable use of resources for continued crop improvement. Also, defining a single country of origin for a PGRFA (particularly if a domesticate) is often impossible, given how crops have been moved across continents throughout history and varieties have been crossed, introgressed and mixed. Who should a breeder negotiate access with and with who, as original provider, should he enter into a benefit-sharing agreement? All countries of the world are by now mutually interdependent on the facilitated circulation of PGRFA, while any barriers to the availability of an important PGRFA can pose serious constraints to crop improvement and food security over time.

After the entry into force of the CBD, the FAO's Commission on PGRFA was called to bring the International Undertaking into harmony with the provisions of the CBD, also considering the special nature of PGRFA. The outcome was a new legally binding instrument, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA).

The Crop Diversity Trust

The Crop Diversity Trust (established in 2004) is another pillar of the Treaty's funding strategy, functioning as an endowment fund and providing long term grants to safeguard *ex situ* collections around the world. Priority is given to 25 crops among those listed in Annex 1 of the International Treaty. The Svalbard Global Seed Vault opened in 2008, thanks to a partnership between the Government of Norway, NordGen, and the Crop Trust. It is a long term seed storage facility, built to stand the test of time and the effects of natural or man-made disasters, safely storing duplicates (backups) of seed samples from the world's crop collections.

Farmers' Rights are understood as the customary rights of farmers to save, use, exchange and sell seed, their rights to be recognized, rewarded and supported for their contribution to the global conservation of genetic resources as well as to the development of commercial varieties of plants, and to participate in decision making on issues related to crop biodiversity. Although the ITPGRFA does not give a formal definition of these rights, it recognizes their importance in its Art. 9, and encourages governments to protect and promote them, while choosing the measures to do so according to their needs and priorities. Measures may include the protection of traditional knowledge, equitable benefit sharing, participation in decision-making, and the right to save, use, exchange and sell farm-saved seeds and propagating material.

In intellectual property law, "**public domain**" is understood as to cover goods or information that are not subject to intellectual property rights and which can therefore be freely used without payment to or authorization from third parties. The concept is comparable to that of "res communes", something that is available for common use. 'Public domain' may be deemed to include goods or information: (i) whose protection by intellectual property rights has expired; (ii) eligible for protection but not protected because of failure to comply with certain requirements for the acquisition of the applicable rights (e.g. filing of a patent application before the disclosure of the invention); (iii) not eligible for protection. The expression "under the management and control" indicates that a Contracting Party has the capacity to exercise, directly or through a third party under its control or supervision, acts of conservation and utilization, and can make available, upon request, the PGRFA under its management according to the facilitated access conditions provided for in the MLS (Source : http://www.fao.org/3/be047e/be047e.pdf).

The International Treaty on Plant Genetic Resources for Food and Agriculture

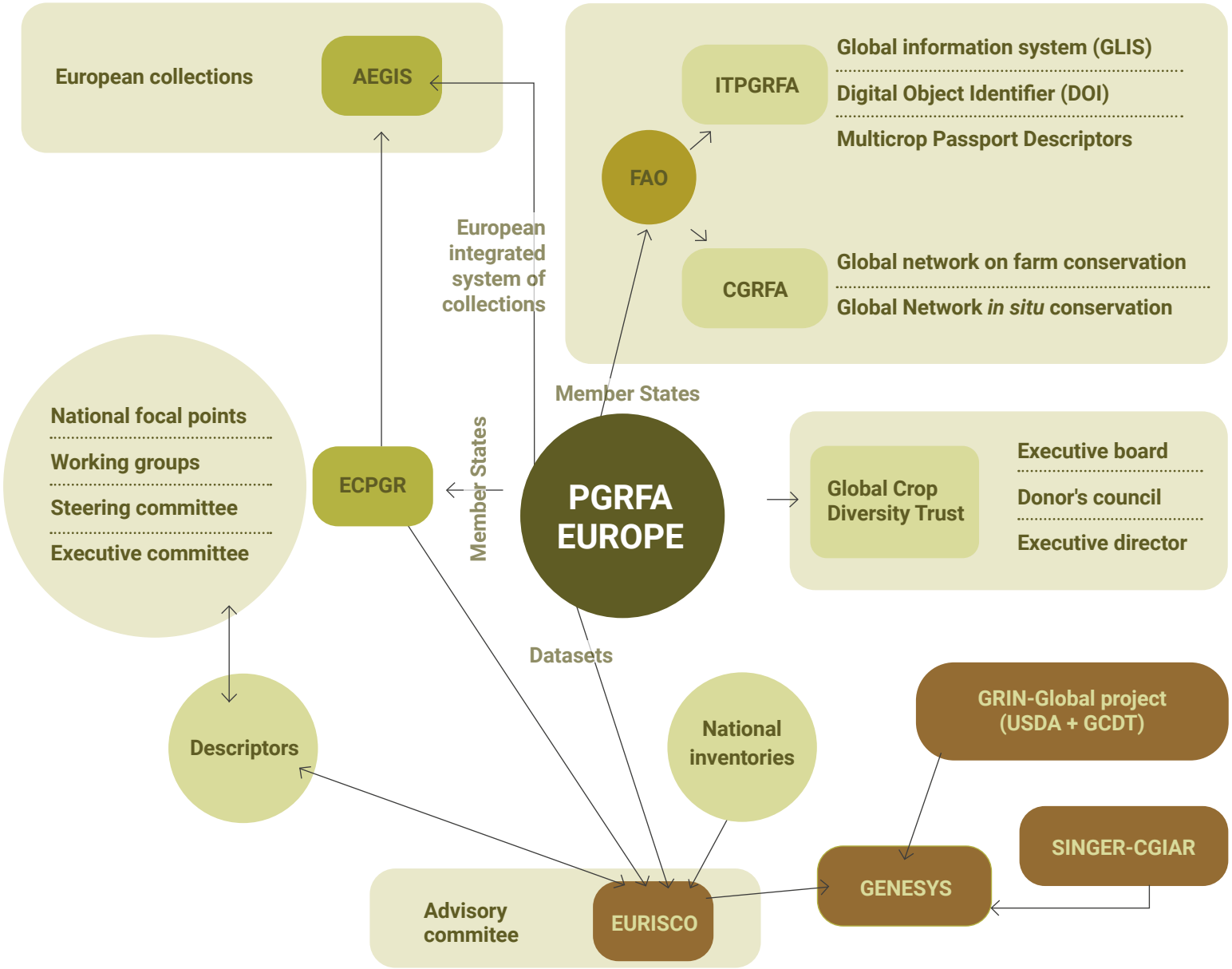
The ITPGRFA puts forward an innovative solution to ABS issues in the specific case of PGRFA: it is based on the declaration that 64 of our most important crops and forages - that account for 80 percent of human consumption - will comprise a pool of genetic resources (the Multilateral System, MLS) accessible to everyone. These species are listed in the Annex 1 to the ITPGRFA. In line with the CBD, the ITPGRFA reaffirms the sovereign rights of countries over their PGRFA: in the exercise of these rights, Member countries agree to place within the MLS any collection – provided it is in the public domain and under the direct control of the Party (see box on page 14) - of those PGRFA that are most important for food security and on which countries are most interdependent. Parties can also voluntarily include collections of non-Annex 1 crops in the MLS.

Those who access genetic resources through the MLS agree, by entering into a Standard Material Transfer Agreement (SMTA), that they will use the germplasm for research, breeding and training and that they will freely share information deriving from those activities. If the improvement leads to a new variety that is protected by IPs in a way which restricts future use (such as with patents), developers agree to pay a percentage of commercial benefits into the Treaty's Benefit Sharing Fund, which supports PGRFA conservation and sustainable agriculture in the developing world. When the final products are protected with "non-restrictive" property rights (understood to refer to UPOV-style plant breeders' rights), developers are encouraged to make voluntary payments[8]. Hence, benefits arising from the utilization of PGRFA are not shared directly with the provider as expected under the CBD's system. However, while voluntary donations have been made by governments or private entities, few user-based contributions accrued[9]. Recently, a proposal was made to enhance the functioning of the MLS by introducing a subscription system: commercial users of the MLS agree to pay an overall annual fee into the BSF, calculated as a percentage of the seed sales deriving from the MLS genetic resources they use in their research and development activities. However, lack of agreement between Parties has not allowed to put this proposal into practice yet.

While the term "PGRFA under the management and control of the Contracting Party", encompasses both PGRFA held *ex situ* and under *in situ* conditions, in practice the MLS's access and benefit sharing mechanism is mostly an *ex situ*-focused instrument. Indeed, the status of *in situ* genetic resources is more difficult to define; in many instances these are not under the management and control of Contracting Parties, being subject to proprietary rights of local farmers, communities or other private owners. They hence fall out of the MLS' scope, unless the owners decide to include them in the system voluntarily, as the Swiss organization Pro Specie Rara and the Peruvian Potato Park community have done. Other sections of the Treaty, such as those on sustainable use (Art. 6) and Farmers' Rights (Art. 9), place a strong focus on promoting *in situ* and on farm conservation, which are highly relevant to CSBs activities.

8 The Treaty does not stand in the way of plant protection rights, but favours less restrictive forms of intellectual property rights, such as the plant variety rights enshrined in the UPOV agreement. This form of intellectual property guarantees the "availability" of the product without any restrictions for further breeding and research (the breeders' exemption) and – to some extent - for farming (farmers' privilege).

9 A first payment was made in 2018 (http://www.fao.org/plant-treaty/news/news-detail/en/c/1143273/) and some other have followed (http://www.fao.org/plant-treaty/news/news-detail/en/c/1305965/)


European collections
AEGIS
ITPGRFA
Global information system (GLIS)
Digital Object Identifier (DOI)
Multicrop Passport Descriptors
FAO
European integrated system of collections
CGRFA
Global network on farm conservation
Global Network *in situ* conservation
Member States
National focal points
Working groups
Steering committee
Executive committee
ECPGR
Member States
PGRFA EUROPE
Global Crop Diversity Trust
Executive board
Donor's council
Executive director
Datasets
Descriptors
National inventories
GRIN-Global project (USDA + GCDT)
SINGER-CGIAR
GENESYS
Advisory commitee
EURISCO

The European legal framework and access to germplasm from European collections

With regard to access measures in the EU, Member States are free to establish such measures, if they deem it appropriate. Such measures are not regulated at EU level, although if established they need to comply with other relevant EU law. The compliance part of the Nagoya Protocol is 'transposed' into the EU legal framework by means of the EU ABS Regulation, which entered into force on 9 June 2014 and is applicable from the date on which the Nagoya Protocol entered into force for the European Union, i.e. on 12 October 2014. The EU ABS Regulation is complemented by Implementing Regulation (EU) 2015/1866, which entered into force on 9 November 2015 ('the Implementing Regulation'). Both are directly applicable in all Member States of the EU, regardless of the status of the Nagoya Protocol's ratification.

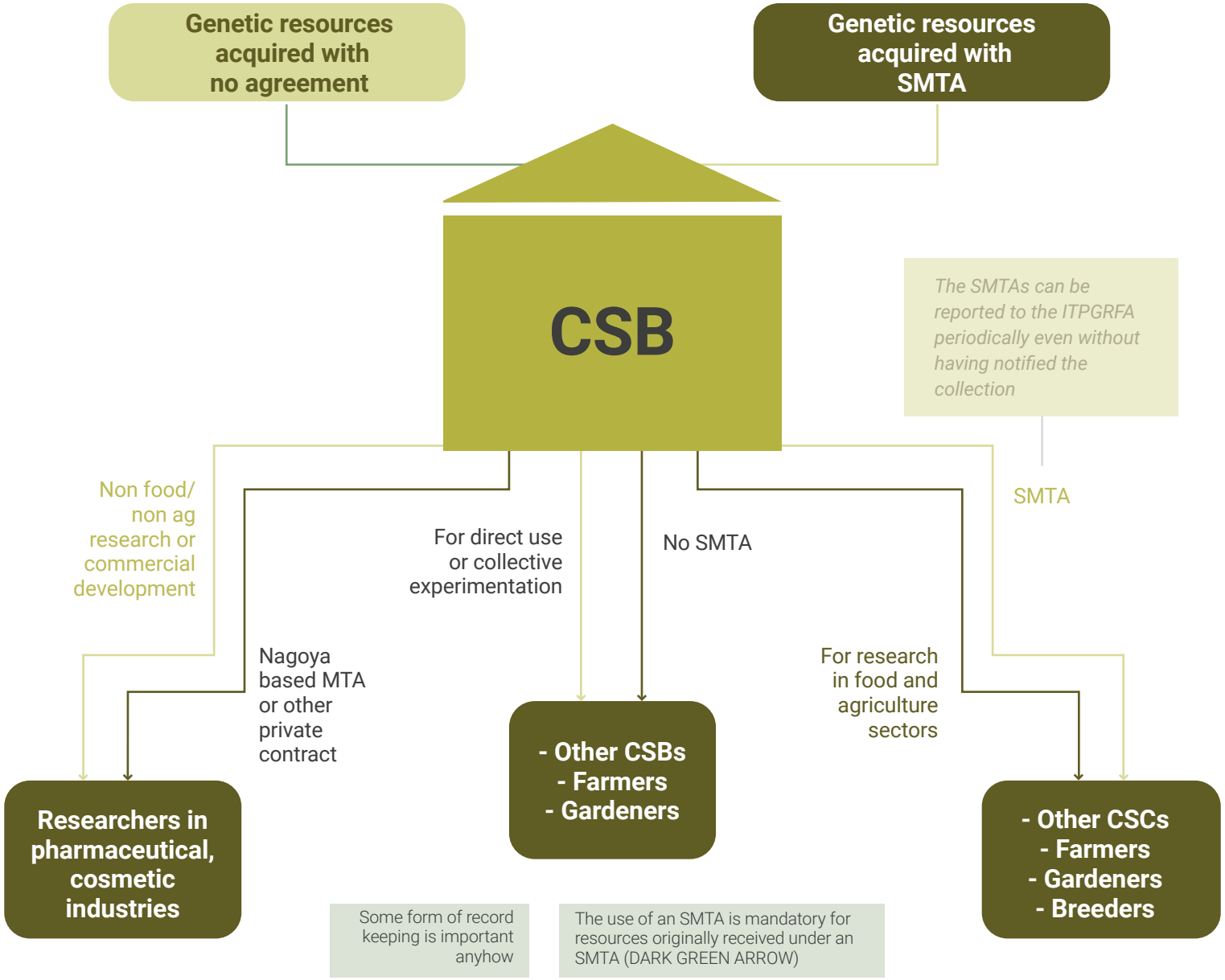
Regarding PGRFA, the European ABS Regulation covers all genetic resources, except:

- PGRFA covered by Annex 1 of the ITPGRFA, included into the MLS and obtained from ITPGRFA Parties. Such genetic resources are covered by the ITPGRFA conditions, which are consistent with, and do not run counter to, the objectives of the Convention and the Nagoya Protocol
- PGRFA received under a standard material transfer agreement (SMTA) from third persons/entities who themselves received them under an SMTA from the MLS of the ITPGRFA.
- Any PGRFA received under an SMTA from International Agricultural Research Centres or other international institutions that have signed agreements under Article 15 of the ITPGRFA, such as the CGIAR centres. These also covered by the ITPGRFA.
- Non-Annex 1 PGRFA, whether from ITPGRFA Parties or non-Parties, supplied under the terms of the SMTAs. A Party to the Nagoya Protocol can determine that PGRFA which is under its management and control and in the public domain but not included in Annex 1 to the ITPGRFA will also be subject to the terms and conditions set by the ITPGRFA.

If access measures are in place in any given country, the National Focal Point as designated by the Protocol (NFP) should be available to clarify what procedures are required to access genetic resources in the country in question.

On a practical level, to facilitate access to European *ex situ* collections, a continent-wide Integrated System, called AEGIS, operates as a virtual (pan-European) genebank. The accessions from adhering European genebanks are maintained in accordance with agreed quality standards, and are made freely available based on the terms and conditions set out in the ITPGRFA. Upon entering AEGIS, a country must be member of the European Cooperative Programme for Plant Genetic Resources (ECPGR), and either Contracting Parties to the ITPGRFA or willing to make PGRFA under their jurisdiction available under its conditions. The ECPGR was founded in 1980 to better coordinate European initiatives around genetic resources with an initial strong focus on *ex situ* actions. Its data management activities are centred around the European Search Catalogue for Plant Genetic Resources (EURISCO) internet platform, which serves as a central point of access to a network of national information systems that store and manage data on plant genetic resources. It is also linked to other foreign or international information systems such as Genesys[10] and GRIN-Global[11]. Any user can consult the online EURISCO portal and perform queries about accessions available in European genebanks and the characterisation/ evaluation data associated to these.

10 https://www.genesys-pgr.org/ 11 https://www.grin-global.org/


Genetic resources acquired with no agreement
Genetic resources acquired with SMTA
CSB
The SMTAs can be reported to the ITPGRFA periodically even without having notified the collection
Non food/ non ag research or commercial development
Nagoya based MTA or other private contract
For direct use or collective experimentation
No SMTA
SMTA
For research in food and agriculture sectors
Researchers in pharmaceutical, cosmetic industries
- Other CSBs
- Farmers
- Gardeners
- Other CSCs
- Farmers
- Gardeners
- Breeders
Some form of record keeping is important anyhow
The use of an SMTA is mandatory for resources originally received under an SMTA (DARK GREEN ARROW)

Scenarios relevant for CSBs and private collections in Europe

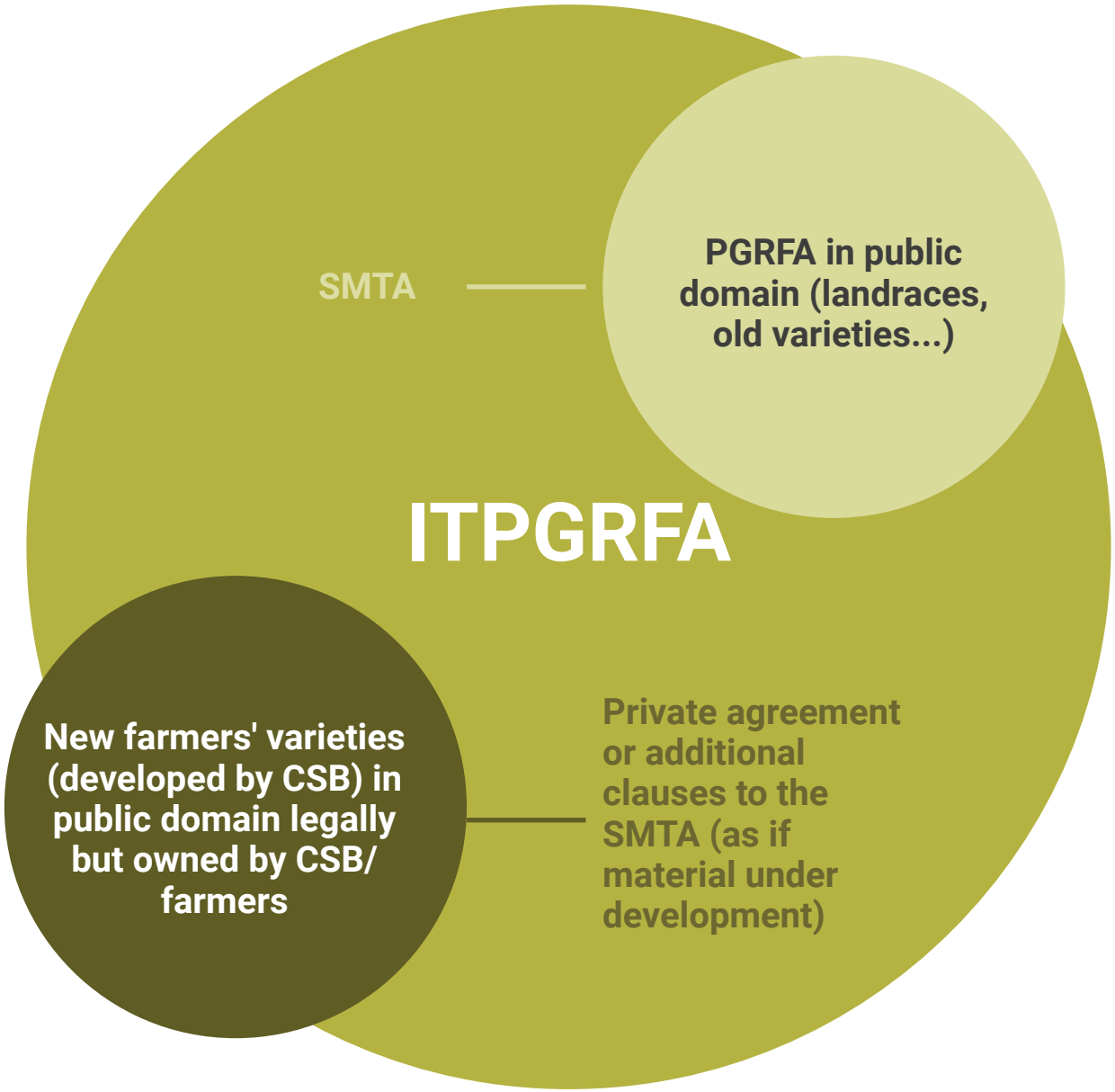
Scenario 1. How can a CSB regulate access and benefit-sharing on the seed it distributes? - 1

Most CSBs are private entities and hence have somewhat different obligations, and a somewhat greater freedom, than public genebanks concerning how to regulate access and exchange of the PGRFA they host. However, they operate in a national and international legal context governed by a series of agreements, as described in the previous pages. It will be useful for CSBs to understand such legal context, so that they can assess their legitimacy and rights to: 1) impose access and benefit sharing conditions when sharing genetic resources that are in the public domain; 2) impose access and benefit sharing conditions when sharing genetic resources developed or under development by them (such as populations from participatory/evolutionary plant breeding)[12]; and 3) clearly decide on the opportunity and advantage of imposing conditions based on their broader objectives of conservation, sustainable use and farmers' rights.

At a European level, in countries that have adhered and actively implemented the ITPGRFA (creating legal space for the MLS, notifying the Treaty Secretariat about the collections that are placed in it, using the SMTA, etc.), CSBs and other privately led initiatives that conserve and share public domain PGRFA can use the SMTA for transferring them and in this way apply the MLS's conditions. This option becomes mandatory in the case of those PGRFA which originally came into the CSB's collection through an SMTA, for instance by acquisition from a national or international genebank: since the SMTA binds the recipient to keep transferring the germplasm with further SMTAs whenever the transfer is for the purposes of "utilization and conservation for research, breeding and training for food and agriculture". However, an SMTA is not required for transfers to users who wish to use the resources directly in cultivation, i.e. for "direct use" purposes. While many genebanks still use an SMTA even for direct use requests (see box on page 23), this is not mandatory. Another exception to the use of an SMTA applies to those PGRFA that a CSB distributes to its own network of collaborating farmers/gardeners in the context of a participatory research project. If the CSB is still the entity in charge of the programme and hence responsible for the PGRFA within it, even if it received the accessions originally under an SMTA, it may avoid using multiple SMTAs with individual collaborating farmers.

When the seeds held by a CSB came into the collection with no formal agreement, the CSB may still choose to operate within the ITPGRFA framework and thus use the SMTA for transfers with research/breeding purposes; if the genetic resource is requested for non-food/non-agriculture purposes or does not fall within the scope of the ITPGRFA (for instance a non-Annex 1 species or any species requested for the development of a commercial cosmetic product), the CSB could choose to apply the CBD/Nagoya framework (if its country has ratified it and implemented its provisions) or develop its own private agreements/contracts for accessions it can legally dispose of (see the example of ProSpecieRara on page 29).

12 PGRFA under development are those PGRFA which are still being modified and perfected through breeding/selection/adaptation, hence are not yet ready for commercial use. The Treaty states that material being developed by farmers is also to be considered as "material under development". Access to such material "shall be at the discretion of its developer, during the period of its development" (Article 12.3 (e)).


SMTA
PGRFA in public domain (landraces, old varieties...)
ITPGRFA
New farmers' varieties (developed by CSB) in public domain legally but owned by CSB/ farmers
Private agreement or additional clauses to the SMTA (as if material under development)

Scenarios relevant for CSBs and private collections in Europe

Scenario 1. How can a CSB regulate access and benefit-sharing on the seed it distributes? – 2

Another relevant distinction concerns the type of genetic resources. What about varieties or populations that farmers or farmer associations develop through selection and breeding? Farmers (or CSBs on their behalf) can impose conditions on the use of these genetic resources. In the (likely) case that farmers or CSBs do not apply for patents or plant breeders' rights over the materials they have developed, materials will be in the public domain from an IP point of view. This lack of publicly sanctioned IPRs means that public administrations will not recognize nor protect the farmers' monopoly over their varieties, but farmers can still protect their rights by controlling/limiting the sharing of their varieties. Hence, for these self-created cultivars, farmers are free to decide whether they share them using the Standard Material Transfer Agreement (SMTA) of the ITPGRFA, add additional conditions to that agreement, or use a different contract altogether.

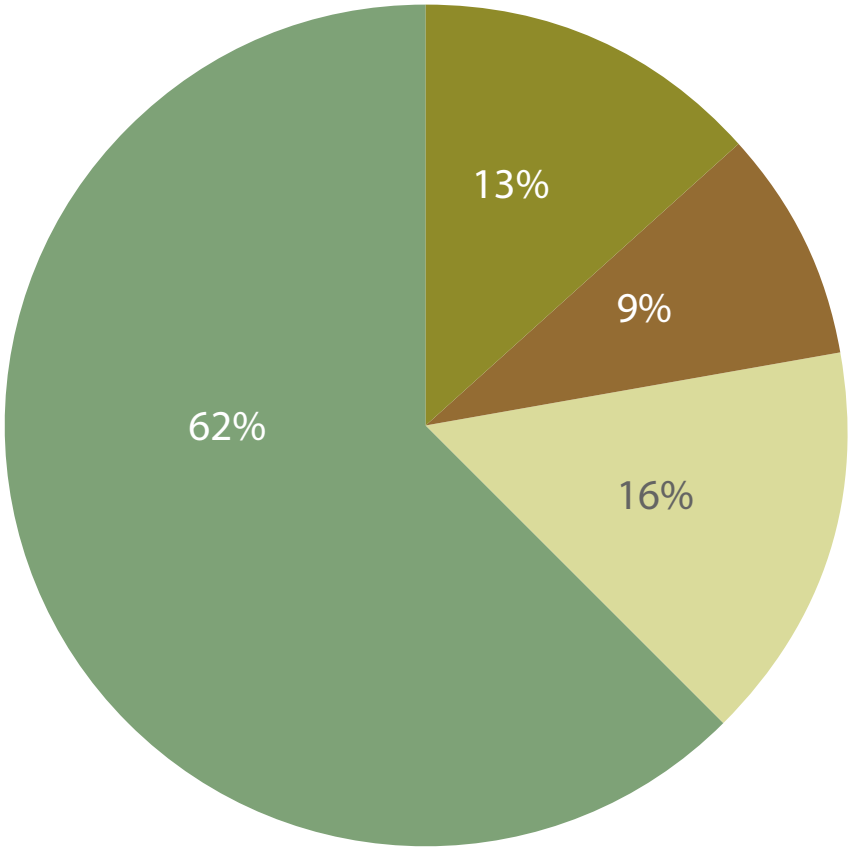
Most European CSBs have established some degree of rules around access and benefit sharing (although these are often not defined under these terms) for the distribution and exchange of germplasm among members and external interested persons. A study conducted among European CSBs by the DIVERSIFOOD[13] project reported that around half of the initiatives have reserved certain rights or services for members or participants that are actively engaged in the CSB. Access to seeds or propagating parts, as well as to associated data, is granted only or with priority to those special groups, which usually consist of farmers and hobby gardeners (in other words, "direct users" not engaged in formal experimentation, training or research, nor in any commercial development based on the seed received).

This preferential treatment is more often than not motivated by the limited size and scope of the CSB and the small amounts of seeds available; it is also often intended as a means to obtain some economic support through membership or affiliation. In other words, it is not determined by an attempt to "privatise" the resources held, particularly those which are clearly in the public domain as landraces and old varieties. Usually in these instances, the CSB just keeps a record of the personal details of the recipient, the date of the transaction and the resources (type and quantity) involved; the only commitment requested to users is to return part of the seed received at harvest time, to replenish the CSB's stocks. This is usually a non-binding clause, which applies only when the user's harvest is sufficient to justify some return of seed. Some CSBs may ask for the recipient to pay for the shipment of the seed or to return some information on its performance in the local context in which it is grown.

Other CSBs (usually larger ones) have decided to align their policies to those of national or international frameworks. This choice can derive from the decision by the CSB to collaborate with a broader range of different users, which include farmers and gardeners as well as with more formal organisations engaged in some level of research, training, and development around PGRFA. It can also provide for greater legal certainty and legitimacy to CSBs' seed distribution activities, also in the case that an inappropriate use is made of a resource originally transferred from a CSB and a dispute needs to be resolved.

13 www.diversifood.eu

Agreement types used by European genebanks when dealing with direct use requests, as revealed by the survey of the LINKAGES project



Scenarios relevant for CSBs and private collections in Europe

Scenario 2. How can a farmer or a CSB access germplasm from institutional *ex situ* collections? -1

The formal genebank system (national and international) was not set up with the reintroduction of seeds directly to farmers or their collective organisations in mind, but rather organized to provide samples to breeders and researchers. Still, reintroductions of seeds to on farm communities took place from various genebanks from the 1990s, and, probably in rare cases, also before. Today, many genebanks are reporting an increase in requests from farmers or seed savers/CSB networks (i.e. "direct users") for either reintroduction of specific varieties in cultivation or for participatory on farm research and experimentation.

When a farmer or her/his CSBs approaches a national or international genebank with a request for seed, there are likely to be issues related to quantities available or related to the legal framework and policies adopted by the genebank in question, as described in the examples below.

Policies for "direct use" distributions: experiences from European genebanks

Policies for "direct use" distributions: experiences from European genebanks

Results from the survey conducted among European genebank managers within the LINKAGES project revealed that while most institutions do not have a specific policy for dealing with direct users' requests (70%), the use of an sMTA was frequent, but often in a simplified form. Around 22% of curators stated not to be using a transfer agreement at all in these cases while others did not specify how they responded to these requests. Regarding collaborations with on farm/direct users, genebank managers stressed the fact that their mandates often preclude them from distributing more than minimum quantities of seed to users, although they are aware that such quantities are often limiting for the collective experimentations and direct uses which the on farm communities are involved in. Some of the curators attending the meeting expressed their willingness to be involved in projects, to be developed by the on farm community, to multiply greater quantities of seed for distribution among farmers participating in collective experimentation, thus giving more visibility to certain cultivars they host and serving the on farm communities better.

The Nordic Genetic Resource Center (NordGen) has experienced a great increase in orders from private gardeners and farmers during recent years. Unable to fulfill all the requests, they have proceeded to limit the annual time period through which online orders can be made: in 2010, NordGen handled 186 requests of in total 1552 from private gardeners and farmers. In 2015 and 2016 each seed requester could only order maximum 10 samples and NordGen had also made a cap on 6000 samples. NordGen is currently working with national seed saver networks and community seed banks to overcome challenges related to catering to requesters through the development of a new model for participatory plant conservation and breeding, in the form of a "user genebank" taking on the tasks of seed multiplication and distribution as well as gathering data on seed performance and characteristics.

(continues on page 25)

Scenarios relevant for CSBs and private collections in Europe

Scenario 2. How can a farmer or a CSB access germplasm from institutional *ex situ* collections? -2

European public *ex situ* collections of PGRFA are mostly managed under the ITPGRFA framework. As described earlier, the ITPGRFA does not require an SMTA for "direct use" cases. However, it is often difficult in practice to separate direct use in cultivation from some degree of experimentation or conservation activities; for this reason, some genebanks may choose to request an SMTA even for those cases that are formulated as requests for direct use by individual or collective farmers or gardeners. At the practical level, the likelihood that farmers or CSBs which are small in size and scope use a new SMTA for further transfers is very low, given the informality that prevails in their seed exchanges; at the same time, the risk that farmers claim or assert intellectual property rights over resources received is also very low, particularly small farmers and CSBs. These arguments may lead genebanks to apply a more flexible approach, according to which they may require the signature of an SMTA only where there is a declared intention or a reasonable probability that the samples will be used by farmers or their collective organisations for research or breeding. A CSB requesting seed for on farm experimentation or collective breeding would hence be required to sign an SMTA, but exempted from subsequent SMTAs when distributing to collaborating farmers involved in participatory projects (as described in the previous scenario). A CSB or a collective of seed saving amateurs or gardeners wishing to receive seed of certain varieties only for conservation and small-scale exchanges may also be exempted by signing an SMTA, given that primary interest is pure conservation and direct use on small holdings. A case-by-case approach, ensuring dialogue between the CSB's representatives and the genebank, is likely the best way forward to define the best suited solution.

(continued from page 23)

The German national genebank (IPK) considers direct use to not be a priority in its mandate. However, it strives to make germplasm available to interested farmers and gardeners, while asking for a fixed fee to cover handling and shipment costs. Dutch Centre for Genetic Resources (CGN) evaluates each request for direct use they receive and if they deem it possible for the user to access the same or similar sample from a more informal source (a seed network or CSB that they know of) they may decline the request and refer the user to the alternative sources.

All the above examples suggest that the relationship between direct users (farmers and gardeners) and genebanks for the purpose of accessing and exchanging germplasm and information can be greatly facilitated and enhanced by the intermediation of a network, or a collective organisation such as a CSB. Placing a request in the framework of a more formalised "project" of on farm reintroduction, experimentation, multiplication and testing makes it easier for genebanks to release the material according to their policies and mandates, while also ensuring to on farm actors that the burden of having to enter in any form of legal agreement is shared at a more collective level rather than falling on a single farmer or gardener.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IMPERIAL
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PALODUZA 1€

Scenarios relevant for CSBs and private collections in Europe

Scenario 3. How can farmers decide about granting access to germplasm growing *in situ* in their property to third parties?

Collecting plant germplasm from the wild and farmers' fields is considered an essential task for the acquisition of genetic resources for conservation and use. Indeed, while for many major crops a large part of the genetic diversity is currently represented in the *ex situ* collections, sometimes even over-represented due to duplication, for many others, especially minor crops and crop wild relatives, considerable gaps remain. Until recently, collecting activities have been carried out within and across countries in a largely unregulated fashion, governed by a patchwork of provisions from the CBD, the Nagoya Protocol and the Treaty. In Europe, requests for permission to collect in European countries often involve authorities at different levels of governance (national, regional, local). Moreover, in many, if not all countries, collectors are requested to get a permit from the owner of the land where the plant samples are found.

Under the Treaty, the rules to be applied to plant genetic resources of Annex 1 crops growing *in situ* (including wild plants, as well as traditional crop varieties obtained from farmers or markets) are still not totally clear: while the system of facilitated access is designed to apply to resources under the management and control of national governments, and in the public domain, regardless of where they are found (*ex situ* or *in situ*/on farm), the Treaty also states that access to *in situ*/on farm PGRFA should be provided according to national legislation or in accordance with the standards set out by the Governing Body (standards which have not been developed yet). The European ABS Regulation also states that until the ITPGRFA has agreed an access policy for genetic resources belonging to crops listed in Annex 1 and found in *in situ* conditions, these need to be accessed and utilised according to national legislation of the provider country, and will fall within the scope of the EU ABS Regulation (if accessed from a country that is a Party to the Nagoya Protocol and with access legislation applicable to such genetic resources in place).

Hence, obtaining a permit to collect a resource from a private land appears to fall within a grey area. Once again, however, if a farmer is part of a collective organisation or a CSB, there are more chances that she/he can obtain legal support and assistance were there to be an interest by a formal institution in collecting germplasm in her/his fields. This may also support the development of more meaningful PIC/MAT/MTA agreements to the benefit not only of the individual farmer involved but of a larger community of practice which may be managing the resource in question.

Access and Benefit-Sharing at Pro Specie Rara

The aim of Pro Specie Rara is to make the access to their collection as easy and cheap as possible. Exchanges within the network (among PSR[14] members) take place without any formal ABS agreement. However, external users and companies who wish to use the varieties conserved by PSR for breeding or research and development are required to sign a contract. For crop breeders, this contract is the Standard Material Transfer Agreement (sMTA) of the International Treaty on PGRFA. For breeders of ornamentals and for purposes which are not related to research in the food and agriculture sectors (e.g. for cosmetics, drugs or flavouring), a different contract is used, to be developed jointly with the user on a case-by-case basis.

The above process is practically implemented as follows: when a user orders seed or vegetative plant parts from PSR's website (using the Variety Finder functionality), she/he can choose among two options. The user will choose the first one if she/he does NOT intend using the variety for commercial, breeding and research purposes and will not pass it on to third parties for these purposes, which will lead to the release of samples with no formal contract (as direct use). She/he will click on the second option in case the variety is intended for research or breeding, in which case she/he will be redirected to another page for signing an SMTA. If the purpose is research and commercial development in other non-food/non-agriculture sectors, the user will be redirected to an explanatory page describing how an ad-hoc access and use contract will be developed.

14 https://www.prospecierara.ch/

Easy SMTA

Within the framework of the ITPGRFA, an Information Technology Tool is available under the name of Easy-SMTA, to assist users with compiling and generating SMTAs in the six official languages of the International Treaty, as well as with reporting on SMTAs concluded in accordance with the instructions made by the Governing Body of the International Treaty.

Such a tool can be embedded within any organisation's germplasm database, so to automatize the generation and reporting of transfers occurring under an SMTA even further, and transmitting them automatically to the Treaty Secretariat. The italian seed network RSR is working on such an integration in its own database.

Glossary and useful links

Biodiversity: a term defined in the CBD to describe the variability that exists among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes which they are part of. It includes diversity within species, between species and their ecosystems. Agricultural biodiversity or Agrobiodiversity is the variety and variability of animals, plants and microorganisms that are used directly or indirectly for food and agriculture, forestry and fisheries. It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predators, pollinators), and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic).

ABS: Acronym for "Access and Benefit-Sharing". It is used to refer to the way in which genetic resources or traditional knowledge associated with such resources is accessed and how the benefits that result from their utilisation are shared with the countries and/or indigenous and local communities providing them.

Ex situ conservation: the conservation of components of biological diversity outside of their natural habitats.

Genebank: a type of biorepository which preserves genetic resources. For plants, this is done by stocking the seeds (e.g. in a seedbank), or through *in vitro* storage, or freezing cuttings from the plant.

Indigenous and Local Communities: The CBD and the Nagoya Protocol do not define this term. It is left to the Parties of the Protocol to define in their implementing measures. In the context of the Nagoya Protocol the term ILCs is generally understood to encompass communities living close to nature and holding genetic resources and traditional knowledge associated with genetic resources.

In situ conservation: the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings. In the case of domesticated or cultivated species, it refers to conservation in the surroundings where they have developed their distinctive properties. On farm conservation is a dynamic form of crop and animal genetic diversity management in farmers' fields, which allows the processes of evolution under natural and human selection to continue.

Plant breeding: the science of changing the traits of plants in order to produce desired characteristics. Plant breeders strive to create a specific outcome of plants and potentially new plant varieties. **Participatory plant breeding** is a form of plant breeding in which farmers, as well as other partners (extension staff, seed producers, traders, NGOs) participate in the development of a new variety. The objective is to produce varieties adapted not only to the physical but also to the socio-economic environment in which they are utilized. In **evolutionary plant breeding**, crop populations with a high level of genetic diversity are subjected to the forces of natural selection: year after year, those plants favored under prevailing growing conditions are expected to contribute more seed to the next generation than plants with lower fitness, thus, evolving crop populations have the capability of adapting to the conditions under which they are grown.

Traditional knowledge (associated with genetic resources): International agreements do not define this term; it is left to the Parties to define it in their implementing measures. Generally, the term is used in relation to the knowledge, innovations and practices of indigenous and local communities that result from the close interaction of such communities with their natural environment, and specifically to knowledge that may provide key information for scientific discoveries on the genetic or biochemical properties of genetic resources or for the breeding of new varieties of crops based on landraces and crop wild relatives.

Useful links

DIVERSIFOOD (2018) Community Seed Banks in Europe. Report from a DIVERSIFOOD stakeholder workshop in Rome on September 21st, 2017. http://www.diversifood.eu/community-seed-banks-in-europe/

ITPGRFA: http://www.fao.org/plant-treaty/en/

The MLS and the sMTA: http://www.fao.org/plant-treaty/areas-of-work/the-multilateral-system/the-smta/en/

Opinions and advice of the Ad Hoc Technical Advisory Committee on the Multilateral System and the Standard Material Transfer Agreement, http://www.fao.org/3/i4578e/i4578e.pdf

Easy sMTA: https://mls.planttreaty.org/itt/

Farmers' rights: http://www.farmersrights.org

CBD: https://www.cbd.int/

Nagoya Protocol: https://www.cbd.int/abs/

Information on PIC/MAT/MTA: https://learnnagoya.com/guides/

Agricultural biodiversity in the CBD: https://www.cbd.int/agro

EU ABS Regulation guidance document: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC0112(02)&from=EN

United Nations Declaration on the Rights of Peasants: https://undocs.org/en/A/C.3/73/L.30

Seed Systems: N. Louwaars, Seeds of Confusion, 2007. https://edepot.wur.nl/121915

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