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DYNAVERSITY

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Good Practices
Technical manual of the good practices to build and manage Community Seed Banks

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X PU: Public (must be available on the website)

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Abstract

WP3 "*Increasing diversity in food systems by breeding*" is led by INRA and one of the goals of the task is to "*sustain collective action and networking on PGRFA, promoting Community Seed Banks and databases*".

In this framework, in order to support collective action, it was decided to give a simple and immediate tool and general knowledge to start a CSBs manual a series of 3 handbooks.

The title of the deliverable 3.4 (first manual of the series) is "*Technical manual of the good practices to build and manage Community Seed Banks*" although in the manual series it is named "*Establishment, management and governance*".

This document follows the template provided by the European Commission in the Participant Portal.

This deliverable is based on and complying with the following reference documents:

- The GA, Annex I and Annex II (downloadable from the participant portal); and
- The Consortium Agreement (CA).

Table of contents

Introduction

This document, *D 3.4 - Technical manual of the good practices to build and manage Community Seed Banks* is a deliverable of the DYNAVERSITY project, which is funded by the European Union's Horizon 2020 Programme under Grant Agreement #773814.

DYNAVERSITY aims to increase capacities for in-situ conservation of plant genetic resources by mapping and bringing together all stakeholders involved in the dynamic management of plant genetic resources. The project intends to develop new management and governance models, establish new forms of seed networking and exchange and promote socio-environmental practices.

Technical manual series on Community Seed Banks

Manual 1
Community Seed Banks
Establishment, management and governance

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 creation of the booklets was possible thanks to the collaboration of project partners and members of the European Coordination Let's Liberate Diversity! (ECLLD). Special thanks also go to Alexandra Baumgartner and Italo Rondinella for the photographs they kindly authorised us to use.

European Coordination 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. Such diversification can be achieved by better linking the work of different food system actors (*e.g. farmers, gardeners, citizens, researchers, processors, technicians, small-scale seed companies*), supporting and promoting their knowledge and actions around cultivated biodiversity. In order to achieve this vision, EC-LLD's objective is to be an open and fruitful space for knowledge exchange and sharing of experiences among its members and the civil society, favouring the dissemination of alternative solutions to those of mainstream agriculture and food systems. Over time, EC-LLD has developed two kinds of events to achieve this objective:

• "*Let's Liberate Diversity!*", targeted to the general public and all citizens, it promotes exchange of best practices, experiences and seeds across countries and raises awareness. It is usually organised in a city to enable a broader participation.

• "*Let's Cultivate Diversity!*", targeted to farmers, food manufacturers and other food system practitioners with the aim of sharing their knowledge around crop and diversity. It is usually organised on a farm.

Community Biodiversity Management

The Convention on Biological Diversity (CBD) introduced the concept of *in situ* conservation of agrobiodiversity back in 1992, referring to the conservation of cultivated species in the surroundings where they had developed their distinctive properties.

However, the translation of this concept into practices that fit in the context of farmers' livelihoods rapidly become a greatly debated challenge. The flexible nature of farmers' management and utilization of crops and local varieties did not match the perspective of conservationists in their design of *in situ* conservation strategies for agrobiodiversity, which basically control and freeze all dynamics to ensure the conservation of the Plant Genetic Resources for Food and Agriculture (PGRFA) concerned.

In order to implement effective ways of *in situ* conservation on-farm, the need to support more dynamic processes driven by farming communities' priorities and customs became evident. Pure *in situ* conservation strategies were thus substituted by "on-farm management" approaches, which fostered the natural links between PGR conservation in farmers' fields and other crop development activities, such as participatory plant breeding and informal seed production.

The development of community biodiversity management (CBM) was the natural way of evolution of these approaches. It has become a consolidated methodology used by many farming communities and seed-focused organisations for promoting conservation and sustainable utilization of agrobiodiversity at local levels. CBM distinguishes itself from other strategies that target *in situ* conservation or on-farm management by its capacity to increase the decision-making power of communities and secure access to and control over their biological and genetic resources for the sustainable management of their livelihoods.

The CBM methodology integrates local knowledge and practices and is driven by local social systems, rules and institutions. As such, it is considered an important common framework for the operation of many different Community Seed Banks which exist all around the world, including Europe.

CBM encompasses different approaches, including community seed banks, participatory plant breeding projects, artisanal and local seed enterprises, landrace conservation and management, and seed exchanges and fairs.

What are Community Seed Banks? Origins, functions and purposes

For more than 40 years, community seed banks (CSBs) around the world have emerged as part of informal seed systems to counteract the loss of locally adapted crops through dynamic, collective management. The earliest documented experiences concern countries of the Global South, where the priority was to preserve farmers' varieties before the genetic diversity was lost under new societal pressures or recurring natural disasters, wars or famines.

In parallel or soon after, similar initiatives started emerging in nations of the Global North, kick-started by farmers' associations, (agro)biodiversity networks or amateur seed savers sharing a similar interest in keeping local or traditional crop diversity alive. Most initiatives in the global North do not use the term "community seed banks" to define themselves; they rather identify their essence as networks, houses, libraries or archives for seeds (and other plant propagation parts). However, common roles and concepts drive their missions and activities, which can be roughly described by keywords such as "diversity", "conservation", "exchange", "community", "participation", "sovereignty" and "innovation".

Most initiatives work with a wide range of crops and manage, on average, several hundreds of accessions - consisting mainly of local and farmers´ varieties (landraces), older commercial varieties, as well as mixtures or evolutionary populations (see Glossary for all these terms). CSBs' members are often engaged in training/education and awareness-raising activities directed to professional farmers as well as to the general public, contributing to the spread of technical and social innovations towards the construction of more sustainable and diverse seed and food systems.

Community Seed Banks in Europe

In Europe, the number of CSB initiatives has grown rapidly in the last 15 years, displaying a great variability in terms of size, financial resources, goals, end users and activities as well as governance structures. Some CSBs focus on making non-commercial, landrace seeds that cannot be found on the conventional market available to a small community; others serve a larger range of interested users or are linked closely to participatory plant breeding (PPB) initiatives; others may support the activity of professional farmers seeking for varieties that adapt better to organic growing systems.

Most CSBs start small, motivated by specific reasons and desires such as regaining access over crop diversity threatened by the rapid modernization/industrialization of agriculture, responding to the introduction of GMOs, developing locally adapted varieties for a specific farming context, or re-evaluating traditional foods or ways of life. Their activities often lead them to become engaged in wider agrobiodiversity networks (either national or international), and participate in innovative and far-reaching forms of collective management and dynamic cooperation for agricultural biodiversity. These often involve a wide range of actors from the food system, sometimes even formal research organisations, such as regional or national gene banks involved in *ex situ* conservation.

Identifying drivers, objectives and operating structures

A successful CSB initiative needs to be grounded in a common understanding of the main drivers underlying the need to conserve/make available/improve the diversity of given crops in a given community, as well as of the objectives of the initiative and its beneficiaries.
The following steps, not necessarily in this order and not necessarily all of them, may be kept in mind when kick-starting a CSBs:
1. Identify the main driver/threat/motivation behind the need for a CSB - The “WHY?” question
2. Establish the clear objective(s) of the initiative : to rescue/conserve/make seeds available - “The “FOR WHAT?” question
3. Decide upon who the CSB wishes to serve (anyone interested, only professional farmers, only amateurs/gardeners, or other specific categories) and reach out to them– the “FOR/WITH WHO?” question
4. Identify infrastructural/financial/management structures for running the CSB and seek for funding and collaborations - the “HOW?” question

THE EXAMPLE OF MAGHAZ SEED HOUSE (HUNGARY)

1. Why? Magház was created in response to the devastating results of intensive, large-scale agriculture and its impact on local, small-scale farmers. **2. For what?** The purpose of Magház is to promote seeds that have been forced out of the formal seed market, to boost the practice of seed exchange, to stimulate seed saving techniques and raise awareness about the rights and interests of farmers as breeders, thus preserving the biological diversity of cultivated plants in the Carpathian basin and boosting small-scale plant production by agroecological principles. **3. For/with who?** Target groups of Magház are small-holders, hobby gardeners, vegetable growers, subsistence farmers, urban gardeners and the plethora of other individuals interested in chemical-free cultivation or propagation of seeds. In the spring of 2011, a small group of farmers interested in seed saving together with ESSRG (Environmental Social Science Research Group) organised the country’s first seed exchange event in Szeged, as part of the 5th Let’s Liberate Diversity international conference. In 2012, the same stakeholders participated in further events across Europe, through which they learned about and experienced successful examples of seed networks and related good practices across Europe. A year later, in 2013, the 6th Let’s Liberate Diversity conference was organised in Switzerland, where the idea of a Hungarian civil seed network was presented and Magház (‘Seed House’) was officially established. Magház continued its awareness raising and community building efforts with the release of a free technical booklet on seed saving and organising technical workshops and seed swaps across the country.
4. How? Magház operates mainly through volunteers, occasional public funding and through international projects. Thanks to an early collaboration with a Hungarian nature conservation initiative called Bese, Magház could benefit from an organisational background and apply for grants. Magház has no legal entity for the moment and since it is still a developing initiative, it does not have a central office.

Members and volunteers are scattered throughout the country, though there are active self-organized communities, or hubs, that can be considered as main members. The main seed-saving and reproduction facility is located in Nagyszékely (Tolna county), from which a considerable amount of seed is shared within the network (approx. 7-800 packages/year). The seeds are packaged and labelled in Hungarian and English and are distributed to different parts of the country by volunteers during seed exchange events. Since 2019, nine additional farms are helping with seed multiplication for restocking the bank's collection. A future objective for Magház is to sell a portion of the seeds, particularly the most preferred varieties.

Deciding what to conserve

A central point in establishing a CSB is deciding which crops and varieties to conserve.
In terms of species, the criteria each CSB may consider in order to prioritise what to conserve, are closely linked to the objectives, priorities and scope of the CSB. While some initiatives, such as Pro Specie Rara or Arche Noah in Europe, have a mission to conserve the diversity of the widest possible range of crop (and animal!) species, other CSBs have a narrower focus that has been decided based on priority criteria.
These may include:
crops of importance for the food security/sovereignty of the target community
crops of special cultural significance for the target community
crops for which the diversity of varieties on the commercial market is very small (i.e. affected by genetic erosion)
crops for which a significant introduction of GMO varieties is being experienced (i.e. risk of genetic contamination)
crops which are promising for niche/traditional products (e.g. for organic agriculture, small scale markets, community supported agriculture - CSA)
crops for which very few varieties adapted to organic agriculture exist
crops which can be easily stored as seed (i.e. not fruit or vegetatively propagated species)
The table below describes the representation of different crop categories across 84 European CSBs surveyed during the Diversifood project:

Crop category	**Number of CSBs keeping the crop category**
Seeds	**81**
Bulbs and tubers	**27**
Field collection (e.g. perennial or non-generative)	**23**
Trees shrubs berries	**23**
Grafts	**10**

In terms of varieties, most - if not all - European CSBs have chosen to focus on *landraces*.They may also include a few older *commercial varieties* which are no longer available on the formal seed market (while still holding some potential for niche environments or markets). Some CSBs also include modern commercial varieties in their collection, either for their special features relevant for organic or small scale agriculture, or because they are used as controls in the characterization or evaluation trials the CSB may run.

Obtaining healthy, good quality seed

The most important sources of seeds and other plant parts for propagation are generally the founders and members of the CSBs themselves and the farmers, gardeners and breeders with whom they exchange their seeds. When collecting seed from a field (either in a farmer's field or from a CSB's regeneration/multiplication plot year after year), it is important to keep in mind:

Sample seeds from different parts of the field (avoiding field margins, as plants there might be the result of crosses with other varieties or be affected by the "edge effect")

Sample seeds from a number of healthy plants (the amount of seeds to be collected, in order to maintain adequate levels of genetic diversity within that given variety, will depend on the species and its reproduction system)

Only those fruits should be collected that are healthy, well-formed and are not infected by any pests or diseases

Collect seeds once they have reached full or almost full maturity (for plants which have seeds that ripen in pods, one could collect just before they open so that the seeds can continue to ripen in the pod as it dries)

Document where and when the samples were collected, especially those from other communities

SEED QUALITIES

Physiological quality refers to the performance of the seed and is indicated by the germination percentage. This percentage is an indicator of the seed's ability to emerge from the soil to produce a plant under normal conditions. Seed vigour is also important; it is the seed's capacity to emerge from the soil and survive under potentially stressful field conditions and to grow rapidly under favourable conditions.

Seed health refers to the presence or absence of pests and organisms that cause diseases, including insects, nematodes, bacteria, fungi and viruses.

Genetic quality refers to certain genetic characteristics of the seed variety. Seeds of a certain variety present the same characteristics and plants produced from such a variety can be reproduced from one generation to another.

For some CSBs, local, regional or even international gene banks have served as useful sources. When seeking seed from national or international gene banks, it is usually possible to consult some form of freely accessible online catalogue or database, or to contact the relevant staff from the institution's website. When ordering the seeds, it may be required that the CSB's reference person signs a document accepting the rules of the gene bank regarding the distribution of plant genetic resources (see manual 3 for details) and that the CSB takes care of phytosanitary requirements of the country into which the seed is imported, in case the provider is in another country. This document is also important for the traceability of the germplasm movements in and out of the bank.

Cleaning, drying and maintaining seeds

Most CSBs have developed technical guidelines for their members and other interested users about the best seed saving and seed storage practices. What follows is a general outline of the procedures which may be used in a CSB, albeit with different levels of technical infrastructure.
Seeds collected on farms in production or multiplication plots need to be cleaned from any dirt, stones and weeds, through shaking, threshing or soaking.
For beans, peas, onions, carrots, corn, most flowers and herbs, seeds are left to mature and dry as long as possible on the plant and then (usually) threshed in what is called dry processing. Threshing can be done by placing the seeds in a large cloth bag and beating it on the floor, rolling the seed heads between one's hands or pressing the seeds through a screen, to separate the seeds from the chaff. If there is a moderate air current available (even just a vertical house-fan), this process can be undertaken by gently tossing seeds into the air for the wind to catch the chaff.
Seeds that are contained in fleshy fruits, such as tomatoes, melons, squashes or cucumbers require wet processing, by which the seeds are removed from the fruits and placed in a small amount of warm water for two to four days. The good seeds will sink to the bottom and will be separated from other components (non-vital seed, flesh and impurities).
All seeds need to be fully dried before they can be stored: moisture combined with high temperatures may result in physiological deterioration, insect infestation or fungi attacks. The amount of time it takes for seeds to be fully dried depends on various factors, such as the species, humidity and the equipment used.

GERMINATION TESTS

Germination is the initial development of the seed embryo with essential structures, including shoot and roots, into a plant.
In order to make sure that the stored seed is of good quality, CSB members can undertake regular germination tests on their samples. The test consists of the following: place a few seeds of the sample you wish to test in 1-2 cm holes in a 10 x 10 pattern in a container filled with sand or soil, and make sure that the temperature and water supply is adequate for the species . Ideally, one should have up to four replicates of these containers, i.e. 100 seeds x 4.
After a few days, the average results over the four replications can be recorded as follows:

- percentage of normal seedlings, which develop into healthy plants;
- percentage of abnormal seedlings, which often do not have a shoot and/or a root (these will not develop into a healthy plant);
- percentage of dead seed, which absorb water and decay;
- percentage of hard seed, which do not absorb water during the germination test.

Storing seed

Once seeds have been cleaned and dried carefully, proper storage is important to keep the seed viable and protect it from insects and pests. Before storage, it will be important to remove any seed infested by insects, and control insect infestation by treating seed with insecticide substances (organic options are for example ash, chili pepper or garlic). Adequate storage is guaranteed by a clean, cool (below 30 degrees) and well ventilated room (ideally with some form of humidity control). Periodic inspection should be carried out on the stored seed.

Even when seeds are properly stored, the length of their storage depends on the species and can be short, medium and long-term. The seeds of maize, leek, onion, parsnip and spinach, among others, should in general not be kept longer than one season (short time periods). Other cereals, beans, carrot, celery, chard, eggplant, parsley, peas, pumpkin and squash seeds, when properly stored, can be stored for up to three years (medium time periods). Beets, all brassicas (broccoli, Brussels sprouts, cauliflower, cabbage, collards, kohlrabi), chicory (endive, escarole, radicchio), cucumber, kale, lettuce, melons, mustard, peppers, radish, rutabaga, sunflower, tomato, and turnip seed can be kept four-five years or longer (long time periods). In any case, as time goes by, the germination rate of the seed lots will progressively decline.

In Europe, only some of the CSB initiatives rely on centralized, indoor storage facilities for their seeds. Some smaller initiatives are rather decentralized, with each member being fully in charge of the storage and maintenance of a given variety or set of varieties on their farm or private garden and home. Professional, dedicated cooling and deep-freeze infrastructure are frequent only among larger CSBs which distribute samples across a greater geographical range.

The use of airtight or vacuum-tight, transparent plastic bags is effective and saves space compared to jars or metal bins, and can be aided by the addition of zeolite beads (aluminosilicate-based absorbents) to control moisture level.

Storage goes hand in hand with record keeping: it is important to know where the seeds come from, whether they were obtained from on-farm saved seeds, seeds saved within the community, seeds obtained from a gene bank or from the formal market. More details about documentation aspects and options will be given in manual 2.

Restocking the diversity: reproduction, regeneration and multiplication

In order to ensure the sustainability of the collection, a constant and possibly increasing stock of seeds should be maintained. Some CSBs regenerate their collection only to the extent needed to ensure availability for local members and a relatively local use; others produce local varieties of seeds on a larger scale, either for free distribution or for sale. Based on the scope and objective, CSBs can choose to re-stock and rejuvenate their collection in different ways, among which:

volunteer or professional CSB staff in charge of regenerating seed on grounds belonging to the CSB

volunteer or professional CSB staff in charge of regenerating seed on grounds belonging to a member farmer

paid or voluntary contract/agreement with a multiplier/regenerating farmer or gardener within or without the CSB membership (often for a specific variety or set of varieties)

agreement with users to return at least the same or double quantity of the seed received upon harvest (if possible, depending on the productivity and season)

Regardless of their size and operational capacity, most CSBs are interested in increasing their collection with the inclusion of new varieties and samples. CSB collections can be increased and further diversified through exchanges during seed fairs, through purchases on the formal market or through requests to *ex situ* genebanks.

While most CSBs strive to regenerate their collections every year or two (especially legume seeds), most vegetable seeds can be safely regenerated every 2-3 years, grains up to a maximum of every 5–7 years and oil seeds every 3–4 years.

Distributing seed

All CSBs around the world distribute seeds to some extent, in line with their mandate to foster conservation through use, and enhance the circulation of agrobiodiversity. Indeed, CSBs in all their different forms are likely the main suppliers of landraces and traditional seeds for amateur gardeners/farmers, and often even to professionals interested in reintroducing and experimenting with diversity not available on the formal seed market.

While most CSBs have some form of recording the preserved seeds and their properties, only a few have an online, publicly accessible database for users' consultation and online ordering which generally corresponds to a greater distribution capacity and geographical scope. Other CSBs manage their seed distribution campaigns through seed fairs or seed swap events and in-person contacts followed by smaller-scale distribution of postal mail packages.

Distribution may be for free, or in exchange for some quota of seed return (functioning as a seed loan), or in return for a donation to a common fund for running the CSB. Other CSBs may require a payment (even just to cover shipping costs) or may be selling seeds, particularly for some more successful varieties. In other CSBs the costs associated with a fully free sample distribution are covered by public funds from national or international projects in which the CSB is involved.

Quantities distributed are usually small, both because of technical limitations but also because of legal restrictions which limit non-commercial distribution of seed to "small" (although often not defined) quantities. Distribution of small quantities is hence a way to make exchanges for breeding/research and agrobiodiversity purposes legal.

Upon distributing a sample, some CSBs require signing an agreement, which entails a commitment by the users not to protect the seeds received with any form of intellectual property (IP) nor to restrict its further distribution to others in any way. This commitment can be requested through a formal document inspired by or similar to those used in more institutional contexts of PGR exchange and distribution (*ex situ* gene banks or breeding programmes) or a more informal agreement drafted by community members based on their own specific needs and priorities (see manual 3 for details).

Financial aspects

There is a broad range of variation also in terms of the sources and magnitude of the financial support CSBs in Europe rely on. Many CSBs in Southern Europe have a budget which relies mostly on public funds, while others (mostly in Central and Northern Europe) receive a consistent share of their financial support from membership fees and private donations.

More recently established initiatives (such as in Portugal and Greece, or in new EU member states) or CSBs which mostly serve small groups of local seed savers and amateur gardeners, can have yearly costs as low of EUR 1,000 or less. Some larger, more structured seed networks in France or Italy can reach a yearly budget of 1,000 to 100,000 EUR. Some larger European CSBs with wide-ranging distribution and promotional activities have even higher yearly budgets, even reaching 1 million EUR per year.

Any CSB budget needs to cover both the infrastructural costs as well as the costs related to human capacities. While in the average European CSB mainly voluntary members are involved in the everyday work, some CSBs in Europe have a significant group of paid staff. In addition, CSBs usually strive to develop collaborations with national extension, conservation, and research agencies, national and international NGOs or international research organizations to receive technical training and supervision in a wide range of areas, including:

- Seed, soil and crop health
- Seed management and (re)production
- Crop diversity assessment, variety selection and decentralised and participatory breeding
- Data registration and maintenance
- Organizational development

Innovation, outreach and awareness raising

Innovating with agrobiodiversity and reaching out to like-minded people and communities is an important aspect of many CBSs' work, beyond the core conservation and availability functions.
Some of the most common activities which European CSBs are engaged in include:
Seed fairs or swaps, ideally organized before the planting season for the crops of interest. At a seed fair, farmers should have ample space to display their seeds so that visitors can walk around easily and observe the showcased crop diversity, as well as getting engaged in exchanges

Rete Semi Rurali's five points regulating seed exchanges within the network for conservation/research and experimentation purposes (i.e. non-commercial uses):
• self-production (within the community) and no synthetic chemicals • reciprocity • small quantity • information (associated to the seed exchanged • public domain (no intellectual property applied to the seed exchanged)

Participatory plant breeding (PPB) or variety selection which enhances the dynamic nature of PGR conservation on-farm. In Italy and France, recent efforts have been dedicated to experimenting with evolutionary populations and heterogeneous materials (according to the new organic Regulation (EC) No 2018/848) in the context of evolutionary/participatory plant breeding
Open field days for farmers, value chain actors and the general public to visit the multiplication, research and experimentation plots of the CSB (either on its own grounds or on those of a collaborating farmer)
Workshops about the varieties conserved in the CSB and/or the related food products that can be obtained, and their nutritional, health or taste advantages
Courses or training modules about a number of issues associated with seeds, including promotion of ecological agricultural models and food systems, PPB and informal seed systems, farmers' rights and legal frameworks
Networking among CSBs, including joining forces at European level to raise awareness and conduct advocacy on issues such as legalizing farmers' seeds, promoting small-scale farming and organic agriculture, and to question the widespread application of patents on crop varieties.

Governance

At the beginning of this manual, we referred to community biodiversity management as an approach which underlies the nature and activities of CSBs. This approach is also useful for framing CSBs' governance models under a common umbrella, based on encouraging farmers to exercise custodianship over genetic, crop and landscape biodiversity in a collective manner.

Governance structures chosen by each CSB depend on several aspects - the CSB's legal form, as well as its size, age (recent or well established), and social concepts and values. In general, in young initiatives and small groups with no (yet) formed legal entity, collective decision making by those involved in the work are still possible and likely the most effective. In larger initiatives with a longer history and greater diversification of functions as well as a legal form, more complex and layered governance models are likely to provide the optimal solution.

Most CSBs in Europe are non-profits (with few exceptions) and take the legal form of associations, association networks, foundations or cooperatives. In associations, alongside those directly involved in the work, it is the board and the general assembly that play an important role in establishing objectives and in decision-making, while other management structures have less importance. In foundations, especially if larger in size, there still is an important role for the board and the general assembly but the management level is more pronounced too.

Community trust funds

A promising possibility to engage and motivate community members to take an active part in the governance and self-reliance of CSBs is the establishment of a community biodiversity trust fund. Such a fund, tailored to the specific needs of each CSB may also provide a mechanism to transfer to the community any funds generated from the use of genetic resources through access and benefit-sharing mechanisms. The Italian seed network and CSB Rete Semi Rurali (RSR) is working towards such a fund in a three-tiered approach: 1) Increasing members' commitment to the network's economic sustainability; 2) Enlarging the base of individual supporters, by improving the network's outreach and communication activities, as well as enhancing the offer of seed of varieties and populations from the CSB; 3) Establishing a sustainability fund whose functioning is agreed among members and overseen by the board, to gather contributions from members and supporters, and re-invest in RSR's activities and services.

Glossary

Accession: a distinct, uniquely identifiable sample of seeds representing a cultivar, breeding line or a population, which is maintained in storage for conservation and use.

Agricultural biodiversity or Agrobiodiversity: 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).

Genetic diversity: the genetic variability among or within a sample of individuals of a variety, population or species.

Seed system: an ensemble of individuals, networks, organizations, practices and rules that provide seeds for plant production.

Food system: collaborative network that integrates all components from food production through food consumption based on ecological, social and economic factors and values of a region or sub-region.

Variety: a plant or group of plants selected for desirable characteristics and maintained in cultivation. It may be traditional (i.e. a landrace) and maintained by farmers, or modern and developed through deliberate scientific breeding programmes (i.e. a commercial variety). **Landraces** harbour a degree of genetic variability with a certain genetic integrity that has evolved in cultivation, usually in a traditional agricultural system over long periods, and has adapted to a specific local environment or purpose. They are usually not registered in formal variety lists or registers for commercialisation. **Commercial varieties** are characterised by greater genetic uniformity and are registered in formal (official) variety lists although some which were developed in the past may have since been de-listed and made redundant (and can be known as "old" or "historical" varieties).

Population (or '**crop population**'): the term is used here to generally refer to a (large) number of plants in one location (field), in which individual plants are not genetically identical to each other. Two special cases of populations are Composite Cross Populations (CCPs) and varietal mixtures, differing in the way in which they were created, i.e., by crossing in the case of CCPs, and by physical mixing seed of existing varieties in the case of varietal mixtures. Depending on the genetic variation available and the strength and direction of environmental variables, the frequencies of different genotypes in the population will change from season to season, thus CCPs and varietal mixtures are evolving populations.

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.

Organic farming: an agricultural method that aims to produce food using natural substances and processes, limiting the environmental impact of food production and encouraging responsible use of energy and natural resources, maintenance of biodiversity and fertility and preservation of regional ecological balances.

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.

***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.

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

Recommended readings

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/

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Technical manual series on Community Seed Banks

Manual 1

Community Seed Banks

Establishment, management and governance

DYNAVERSITY

Acknowledgments

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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. Such diversification can be achieved by better linking the work of different food system actors (*e.g. farmers, gardeners, citizens, researchers, processors, technicians, small-scale seed companies*), supporting and promoting their knowledge and actions around cultivated biodiversity. In order to achieve this vision, EC-LLD's objective is to be an open and fruitful space for knowledge exchange and sharing of experiences among its members and the civil society, favouring the dissemination of alternative solutions to those of mainstream agriculture and food systems. Over time, EC-LLD has developed two kinds of events to achieve this objective:

• "*Let's Liberate Diversity!*", targeted to the general public and all citizens, it promotes exchange of best practices, experiences and seeds across countries and raises awareness. It is usually organised in a city to enable a broader participation.

• "*Let's Cultivate Diversity!*", targeted to farmers, food manufacturers and other food system practitioners with the aim of sharing their knowledge around crop and diversity. It is usually organised on a farm.

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)

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Community Biodiversity Management

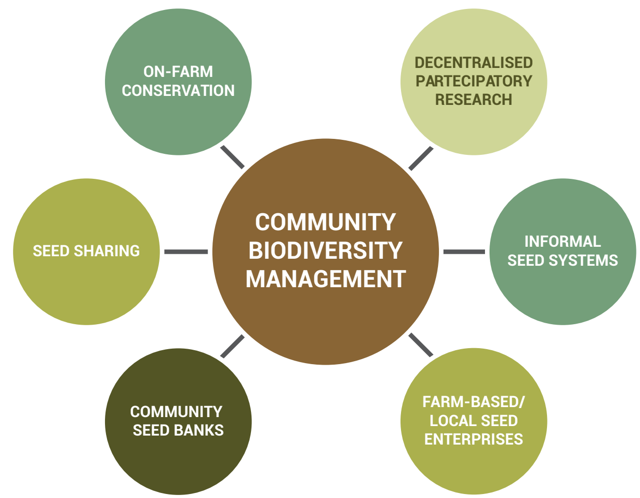
The Convention on Biological Diversity (CBD) introduced the concept of *in situ* conservation of agrobiodiversity back in 1992, referring to the conservation of cultivated species in the surroundings where they had developed their distinctive properties.

However, the translation of this concept into practices that fit in the context of farmers' livelihoods rapidly become a greatly debated challenge. The flexible nature of farmers' management and utilization of crops and local varieties did not match the perspective of conservationists in their design of *in situ* conservation strategies for agrobiodiversity, which basically control and freeze all dynamics to ensure the conservation of the Plant Genetic Resources for Food and Agriculture (PGRFA) concerned.

In order to implement effective ways of *in situ* conservation on-farm, the need to support more dynamic processes driven by farming communities' priorities and customs became evident. Pure *in situ* conservation strategies were thus substituted by "on-farm management" approaches, which fostered the natural links between PGR conservation in farmers' fields and other crop development activities, such as participatory plant breeding and informal seed production.

The development of community biodiversity management (CBM) was the natural way of evolution of these approaches. It has become a consolidated methodology used by many farming communities and seed-focused organisations for promoting conservation and sustainable utilization of agrobiodiversity at local levels. CBM distinguishes itself from other strategies that target *in situ* conservation or on-farm management by its capacity to increase the decision-making power of communities and secure access to and control over their biological and genetic resources for the sustainable management of their livelihoods.

The CBM methodology integrates local knowledge and practices and is driven by local social systems, rules and institutions. As such, it is considered an important common framework for the operation of many different Community Seed Banks which exist all around the world, including Europe.



CBM encompasses different approaches, including community seed banks, participatory plant breeding projects, artisanal and local seed enterprises, landrace conservation and management, and seed exchanges and fairs.


Clarissa
Dickson Wright
One-Pot
Tea

What are Community Seed Banks? Origins, functions and purposes

For more than 40 years, community seed banks (CSBs) around the world have emerged as part of informal seed systems to counteract the loss of locally adapted crops through dynamic, collective management. The earliest documented experiences concern countries of the Global South, where the priority was to preserve farmers' varieties before the genetic diversity was lost under new societal pressures or recurring natural disasters, wars or famines.

In parallel or soon after, similar initiatives started emerging in nations of the Global North, kick-started by farmers' associations, (agro)biodiversity networks or amateur seed savers sharing a similar interest in keeping local or traditional crop diversity alive. Most initiatives in the global North do not use the term "community seed banks" to define themselves; they rather identify their essence as networks, houses, libraries or archives for seeds (and other plant propagation parts). However, common roles and concepts drive their missions and activities, which can be roughly described by keywords such as "diversity", "conservation", "exchange", "community", "participation", "sovereignty" and "innovation".

Most initiatives work with a wide range of crops and manage, on average, several hundreds of accessions - consisting mainly of local and farmers´ varieties (landraces), older commercial varieties, as well as mixtures or evolutionary populations (see Glossary for all these terms). CSBs' members are often engaged in training/education and awareness-raising activities directed to professional farmers as well as to the general public, contributing to the spread of technical and social innovations towards the construction of more sustainable and diverse seed and food systems.

	SEED NETWORKS IN SPAIN	FARMER'S NETWORK IN FRANCE AND ITALY	MORE RECENT INITIATIVES IN NCE (I)	MORE RECENT INITIATIVES IN NCE (II)	SEED INITIATIVES IN THE NEW MEMBER STATES	SEED NETWORKS IN PORTUGAL AND GREECE
FOUNDING PERIOD	From 1995, thereof 72% from 2005	From 1995, thereof 84% from 2005	70% before 1990	From 1995, thereof 80% from 2005	From 1995, thereof 82% since 2005	From 2000, thereof 80% since 2005
LEGAL FORM	70% with legal form, mainly associations, all not for profit	68% with legal form, mainly not for profit associations, few ltds.	82% with legal form, mainly assoc., few foundations, all not for profit	50% with legal form, all not for profit associations	50% belong to a legal entity - e.g. associations, museum... all not for profit	50% with legal form, all not for profit associations
COUNTRIES	ES	FR, IT	Northern and Central Europe: AT, De, DM, CH, LI, NL, IR, GB, SE	Northern and Central Europe: AT, BE, DE, DM, NL, LU, GB	EE, HU, HR, CZ	PT, GR
FOUNDERS	producers private gardeners, teachers, agronomists, facilitators	Producers private gardeners	Private gardeners, producers many other backgrounds (teachers, breeders, journalist...)	Private gardeners, producers group with highest representation of plant breeders	Private gardeners, producers many other backgrounds (teachers, breeders...)	producers private gardeners, food activist and agronomist
TRIGGERS AND ROLE MODELS MENTIONED	Farmers based CSB movements in Global South as role models; GMOs as trigger	Farmers based CSB movements in Global South as role models; GMOs as trigger	Seed savers organisations in the US, Canada and Australia	Other CSB organisations in Europe mentioned	Other CSB organisations in Europe mentioned	Farmers based CSB movements in the Global South, GMOs and economic crisis as trigger
AVERAGE NUMBER OF MEMBERS	70	100	1,800	40	30	200
AVERAGE YEARLY BUDGET FOR CSB	<1,000-5,000	1,000-100,000	1,000-1,000,000	1,000-50,000	<1,000	< 1,000 (-10,000)
IMPORTANT SOURCES OF FUNDING	Membership fees, public money, own income	Membership fees public money, own income	Membership fees, individual private donations, funds and sponsors	Individual private donations public money, own income	Own income Membership fees, individ. private donations, Funds, sponsors	Membershio fees, own income
NETWORK VERSUS ORGANISATION	Network of more than 40 regional and local CSB initiatives	Network of more than 40 regional and local CSBs & umbrella organisations	Typically one to few organisations per country with "network within"	One to the initiatives and organisations per country, no national networks	One to few initiatives and initiatives per country, no national networks	One to few initiatives and organisations per country, no national networks
MAIN AIMS REPORTED	Sensitisation and training, providing seeds, conservation crop adaption	Sensitisation and training, providing seeds, providing data, providing breeding pool, social co-operations	Conservation, providing data, providing seeds, providing a safety backup	Conservation, providing seeds, providing data sensitisation and training	Providing seeds, providing data conservation	Sensitisation and training, adapted seeds for local production
MAIN ACTIVITIES REPORTED	Seed multiplication, storage of seeds, provide stakeholders with seeds, training and education	Training and education, partecipatory plant breeding seed multip., provide stakeholders with seeds breeding new populations	Seed multiplication, Characterisation database management, training and education, evaluation of accessons, provide samples seed storage	Seed multiplication, provision of seeds, training and education seed storage database management	Training and education, seed multiplication, storage of seeds, provide stakeholders with seeds	Training and education, seed multiplication, storage of seeds providing stakeholders with seed samples

Community Seed Banks in Europe

In Europe, the number of CSB initiatives has grown rapidly in the last 15 years, displaying a great variability in terms of size, financial resources, goals, end users and activities as well as governance structures. Some CSBs focus on making non-commercial, landrace seeds that cannot be found on the conventional market available to a small community; others serve a larger range of interested users or are linked closely to participatory plant breeding (PPB) initiatives; others may support the activity of professional farmers seeking for varieties that adapt better to organic growing systems.

Most CSBs start small, motivated by specific reasons and desires such as regaining access over crop diversity threatened by the rapid modernization/industrialization of agriculture, responding to the introduction of GMOs, developing locally adapted varieties for a specific farming context, or re-evaluating traditional foods or ways of life. Their activities often lead them to become engaged in wider agrobiodiversity networks (either national or international), and participate in innovative and far-reaching forms of collective management and dynamic cooperation for agricultural biodiversity. These often involve a wide range of actors from the food system, sometimes even formal research organisations, such as regional or national gene banks involved in *ex situ* conservation.


DEFINITIONS

Identifying drivers, objectives and operating structures

A successful CSB initiative needs to be grounded in a common understanding of the main drivers underlying the need to conserve/make available/improve the diversity of given crops in a given community, as well as of the objectives of the initiative and its beneficiaries.

The following steps, not necessarily in this order and not necessarily all of them, may be kept in mind when kick-starting a CSBs:

1. Identify the main driver/threat/motivation behind the need for a CSB - The "WHY?" question

2. Establish the clear objective(s) of the initiative : to rescue/conserve/make seeds available - "The "FOR WHAT?" question

3. Decide upon who the CSB wishes to serve (anyone interested, only professional farmers, only amateurs/gardeners, or other specific categories) and reach out to them– the "FOR/WITH WHO?" question

4. Identify infrastructural/financial/management structures for running the CSB and seek for funding and collaborations - the "HOW?" question

THE EXAMPLE OF MAGHAZ SEED HOUSE (HUNGARY)

1. Why? Magház was created in response to the devastating results of intensive, large-scale agriculture and its impact on local, small-scale farmers.

2. For what? The purpose of Magház is to promote seeds that have been forced out of the formal seed market, to boost the practice of seed exchange, to stimulate seed saving techniques and raise awareness about the rights and interests of farmers as breeders, thus preserving the biological diversity of cultivated plants in the Carpathian basin and boosting small-scale plant production by agroecological principles.

3. For/with who? Target groups of Magház are small-holders, hobby gardeners, vegetable growers, subsistence farmers, urban gardeners and the plethora of other individuals interested in chemical-free cultivation or propagation of seeds. In the spring of 2011, a small group of farmers interested in seed saving together with ESSRG (Environmental Social Science Research Group) organised the country's first seed exchange event in Szeged, as part of the 5th Let's Liberate Diversity international conference. In 2012, the same stakeholders participated in further events across Europe, through which they learned about and experienced successful examples of seed networks and related good practices across Europe. A year later, in 2013, the 6th Let's Liberate Diversity conference was organised in Switzerland, where the idea of a Hungarian civil seed network was presented and Magház ('Seed House') was officially established. Magház continued its awareness raising and community building efforts with the release of a free technical booklet on seed saving and organising technical workshops and seed swaps across the country.

4. How? Magház operates mainly through volunteers, occasional public funding and through international projects. Thanks to an early collaboration with a Hungarian nature conservation initiative called Bese, Magház could benefit from an organisational background and apply for grants. Magház has no legal entity for the moment and since it is still a developing initiative, it does not have a central office. Members and volunteers are scattered throughout the country, though there are active self-organized communities, or hubs, that can be considered as main members. The main seed-saving and reproduction facility is located in Nagyszékely (Tolna county), from which a considerable amount of seed is shared within the network (approx. 7-800 packages/year). The seeds are packaged and labelled in Hungarian and English and are distributed to different parts of the country by volunteers during seed exchange events. Since 2019, nine additional farms are helping with seed multiplication for restocking the bank's collection. A future objective for Magház is to sell a portion of the seeds, particularly the most preferred varieties.

Deciding what to conserve

A central point in establishing a CSB is deciding which crops and varieties to conserve.

In terms of species, the criteria each CSB may consider in order to prioritise what to conserve, are closely linked to the objectives, priorities and scope of the CSB. While some initiatives, such as Pro Specie Rara or Arche Noah in Europe, have a mission to conserve the diversity of the widest possible range of crop (and animal!) species, other CSBs have a narrower focus that has been decided based on priority criteria.

These may include:

- crops of importance for the food security/sovereignty of the target community
- crops of special cultural significance for the target community
- crops for which the diversity of varieties on the commercial market is very small (i.e. affected by genetic erosion)
- crops for which a significant introduction of GMO varieties is being experienced (i.e. risk of genetic contamination)
- crops which are promising for niche/traditional products (e.g. for organic agriculture, small scale markets, community supported agriculture - CSA)
- crops for which very few varieties adapted to organic agriculture exist
- crops which can be easily stored as seed (i.e. not fruit or vegetatively propagated species)

The table below describes the representation of different crop categories across 84 European CSBs surveyed during the Diversifood project:

Crop category	Number of CSBs keeping the crop category
Seeds	81
Bulbs and tubers	27
Field collection (e.g. perennial or non-generative)	23
Trees shrubs berries	23
Grafts	10

In terms of varieties, most - if not all - European CSBs have chosen to focus on *landraces*.They may also include a few older *commercial varieties* which are no longer available on the formal seed market (while still holding some potential for niche environments or markets). Some CSBs also include modern commercial varieties in their collection, either for their special features relevant for organic or small scale agriculture, or because they are used as controls in the characterization or evaluation trials the CSB may run.

Obtaining healthy, good quality seed

The most important sources of seeds and other plant parts for propagation are generally the founders and members of the CSBs themselves and the farmers, gardeners and breeders with whom they exchange their seeds. When collecting seed from a field (either in a farmer's field or from a CSB's regeneration/multiplication plot year after year), it is important to keep in mind:

- Sample seeds from different parts of the field (avoiding field margins, as plants there might be the result of crosses with other varieties or be affected by the "edge effect")
- Sample seeds from a number of healthy plants (the amount of seeds to be collected, in order to maintain adequate levels of genetic diversity within that given variety, will depend on the species and its reproduction system)
- Only those fruits should be collected that are healthy, well-formed and are not infected by any pests or diseases
- Collect seeds once they have reached full or almost full maturity (for plants which have seeds that ripen in pods, one could collect just before they open so that the seeds can continue to ripen in the pod as it dries)
- Document where and when the samples were collected, especially those from other communities

SEED QUALITIES

Physiological quality refers to the performance of the seed and is indicated by the germination percentage. This percentage is an indicator of the seed's ability to emerge from the soil to produce a plant under normal conditions. Seed vigour is also important; it is the seed's capacity to emerge from the soil and survive under potentially stressful field conditions and to grow rapidly under favourable conditions.

Seed health refers to the presence or absence of pests and organisms that cause diseases, including insects, nematodes, bacteria, fungi and viruses.

Genetic quality refers to certain genetic characteristics of the seed variety. Seeds of a certain variety present the same characteristics and plants produced from such a variety can be reproduced from one generation to another.

For some CSBs, local, regional or even international gene banks have served as useful sources. When seeking seed from national or international gene banks, it is usually possible to consult some form of freely accessible online catalogue or database, or to contact the relevant staff from the institution's website. When ordering the seeds, it may be required that the CSB's reference person signs a document accepting the rules of the gene bank regarding the distribution of plant genetic resources (see manual 3 for details) and that the CSB takes care of phytosanitary requirements of the country into which the seed is imported, in case the provider is in another country. This document is also important for the traceability of the germplasm movements in and out of the bank.

Cleaning, drying and maintaining seeds

Most CSBs have developed technical guidelines for their members and other interested users about the best seed saving and seed storage practices. What follows is a general outline of the procedures which may be used in a CSB, albeit with different levels of technical infrastructure.

Seeds collected on farm in production or multiplication plots need to be cleaned from any dirt, stones and weeds, through shaking, threshing or soaking.

For beans, peas, onions, carrots, corn, most flowers and herbs, seeds are left to mature and dry as long as possible on the plant and then (usually) threshed in what is called dry processing. Threshing can be done by placing the seeds in a large cloth bag and beating it on the floor, rolling the seed heads between one's hands or pressing the seeds through a screen, to separate the seeds from the chaff. If there is a moderate air current available (even just a vertical house-fan), this process can be undertaken by gently tossing seeds into the air for the wind to catch the chaff.

Seeds that are contained in fleshy fruits, such as tomatoes, melons, squashes or cucumbers require wet processing, by which the seeds are removed from the fruits and placed in a small amount of warm water for two to four days. The good seeds will sink to the bottom and will be separated from other components (non-vital seed, flesh and impurities).

All seeds need to be fully dried before they can be stored: moisture combined with high temperatures may result in physiological deterioration, insect infestation or fungi attacks. The amount of time it takes for seeds to be fully dried depends on various factors, such as the species, humidity and the equipment used.

GERMINATION TESTS

Germination is the initial development of the seed embryo with essential structures, including shoot and roots, into a plant.

In order to make sure that the stored seed is of good quality, CSB members can undertake regular germination tests on their samples. The test consists of the following: place a few seeds of the sample you wish to test in 1-2 cm holes in a 10 x 10 pattern in a container filled with sand or soil, and make sure that the temperature and water supply is adequate for the species . Ideally, one should have up to four replicates of these containers, i.e. 100 seeds x 4.

After a few days, the average results over the four replications can be recorded as follows:

- percentage of normal seedlings, which develop into healthy plants;
- percentage of abnormal seedlings, which often do not have a shoot and/or a root (these will not develop into a healthy plant);
- percentage of dead seed, which absorb water and decay;
- percentage of hard seed, which do not absorb water during the germination test.


Trigo recio de
Triticum durum
Trigo Madrid

Storing seed

Once seeds have been cleaned and dried carefully, proper storage is important to keep the seed viable and protect it from insects and pests. Before storage, it will be important to remove any seed infested by insects, and control insect infestation by treating seed with insecticide substances (organic options are for example ash, chili pepper or garlic). Adequate storage is guaranteed by a clean, cool (below 30 degrees) and well ventilated room (ideally with some form of humidity control). Periodic inspection should be carried out on the stored seed.

Even when seeds are properly stored, the length of their storage depends on the species and can be short, medium and long-term. The seeds of maize, leek, onion, parsnip and spinach, among others, should in general not be kept longer than one season (short time periods). Other cereals, beans, carrot, celery, chard, eggplant, parsley, peas, pumpkin and squash seeds, when properly stored, can be stored for up to three years (medium time periods). Beets, all brassicas (broccoli, Brussels sprouts, cauliflower, cabbage, collards, kohlrabi), chicory (endive, escarole, radicchio), cucumber, kale, lettuce, melons, mustard, peppers, radish, rutabaga, sunflower, tomato, and turnip seed can be kept four-five years or longer (long time periods). In any case, as time goes by, the germination rate of the seed lots will progressively decline.

In Europe, only some of the CSB initiatives rely on centralized, indoor storage facilities for their seeds. Some smaller initiatives are rather decentralized, with each member being fully in charge of the storage and maintenance of a given variety or set of varieties on their farm or private garden and home. Professional, dedicated cooling and deep-freeze infrastructure are frequent only among larger CSBs which distribute samples across a greater geographical range.

The use of airtight or vacuum-tight, transparent plastic bags is effective and saves space compared to jars or metal bins, and can be aided by the addition of zeolite beads (aluminosilicate-based absorbents) to control moisture level.

Storage goes hand in hand with record keeping: it is important to know where the seeds come from, whether they were obtained from on-farm saved seeds, seeds saved within the community, seeds obtained from a gene bank or from the formal market. More details about documentation aspects and options will be given in manual 2.

Restocking the diversity: reproduction, regeneration and multiplication

In order to ensure the sustainability of the collection, a constant and possibly increasing stock of seeds should be maintained. Some CSBs regenerate their collection only to the extent needed to ensure availability for local members and a relatively local use; others produce local varieties of seeds on a larger scale, either for free distribution or for sale. Based on the scope and objective, CSBs can choose to re-stock and rejuvenate their collection in different ways, among which:

- volunteer or professional CSB staff in charge of regenerating seed on grounds belonging to the CSB
- volunteer or professional CSB staff in charge of regenerating seed on grounds belonging to a member farmer
- paid or voluntary contract/agreement with a multiplier/regenerating farmer or gardener within or without the CSB membership (often for a specific variety or set of varieties)
- agreement with users to return at least the same or double quantity of the seed received upon harvest (if possible, depending on the productivity and season)

Regardless of their size and operational capacity, most CSBs are interested in increasing their collection with the inclusion of new varieties and samples. CSB collections can be increased and further diversified through exchanges during seed fairs, through purchases on the formal market or through requests to *ex situ* genebanks.

While most CSBs strive to regenerate their collections every year or two (especially legume seeds), most vegetable seeds can be safely regenerated every 2-3 years, grains up to a maximum of every 5–7 years and oil seeds every 3–4 years.


PER SEMINA
SVEVO · CAP
3

Distributing seed

All CSBs around the world distribute seeds to some extent, in line with their mandate to foster conservation through use, and enhance the circulation of agrobiodiversity. Indeed, CSBs in all their different forms are likely the main suppliers of landraces and traditional seeds for amateur gardeners/ farmers, and often even to professionals interested in reintroducing and experimenting with diversity not available on the formal seed market.

While most CSBs have some form of recording the preserved seeds and their properties, only a few have an online, publicly accessible database for users' consultation and online ordering which generally corresponds to a greater distribution capacity and geographical scope. Other CSBs manage their seed distribution campaigns through seed fairs or seed swap events and in-person contacts followed by smaller-scale distribution of postal mail packages.

Distribution may be for free, or in exchange for some quota of seed return (functioning as a seed loan), or in return for a donation to a common fund for running the CSB. Other CSBs may require a payment (even just to cover shipping costs) or may be selling seeds, particularly for some more successful varieties. In other CSBs the costs associated with a fully free sample distribution are covered by public funds from national or international projects in which the CSB is involved.

Quantities distributed are usually small, both because of technical limitations but also because of legal restrictions which limit non-commercial distribution of seed to "small" (although often not defined) quantities. Distribution of small quantities is hence a way to make exchanges for breeding/ research and agrobiodiversity purposes legal.

Upon distributing a sample, some CSBs require signing an agreement, which entails a commitment by the users not to protect the seeds received with any form of intellectual property (IP) nor to restrict its further distribution to others in any way. This commitment can be requested through a formal document inspired by or similar to those used in more institutional contexts of PGR exchange and distribution (*ex situ* gene banks or breeding programmes) or a more informal agreement drafted by community members based on their own specific needs and priorities (see manual 3 for details).

Financial aspects

There is a broad range of variation also in terms of the sources and magnitude of the financial support CSBs in Europe rely on. Many CSBs in Southern Europe have a budget which relies mostly on public funds, while others (mostly in Central and Northern Europe) receive a consistent share of their financial support from membership fees and private donations.

More recently established initiatives (such as in Portugal and Greece, or in new EU member states) or CSBs which mostly serve small groups of local seed savers and amateur gardeners, can have yearly costs as low of EUR 1,000 or less. Some larger, more structured seed networks in France or Italy can reach a yearly budget of 1,000 to 100,000 EUR. Some larger European CSBs with wide-ranging distribution and promotional activities have even higher yearly budgets, even reaching 1 million EUR per year.

Any CSB budget needs to cover both the infrastructural costs as well as the costs related to human capacities. While in the average European CSB mainly voluntary members are involved in the everyday work, some CSBs in Europe have a significant group of paid staff. In addition, CSBs usually strive to develop collaborations with national extension, conservation, and research agencies, national and international NGOs or international research organizations to receive technical training and supervision in a wide range of areas, including:

- Seed, soil and crop health
- Seed management and (re)production
- Crop diversity assessment, variety selection and decentralised and participatory breeding
- Data registration and maintenance
- Organizational development


RIFORMA AGRARIA
KALURA
Cos'è
PASTA

Innovation, outreach and awareness raising

Innovating with agrobiodiversity and reaching out to like-minded people and communities is an important aspect of many CBSs' work, beyond the core conservation and availability functions.

Some of the most common activities which European CSBs are engaged in include:

- Seed fairs or swaps, ideally organized before the planting season for the crops of interest. At a seed fair, farmers should have ample space to display their seeds so that visitors can walk around easily and observe the showcased crop diversity, as well as getting engaged in exchanges

Rete Semi Rurali's five points regulating seed exchanges within the network for conservation/ research and experimentation purposes (i.e. non-commercial uses):

- **self-production** (within the community) and no synthetic chemicals
- **reciprocity**
- **small quantity**
- **information** (associated to the seed exchanged
- **public domain** (no intellectual property applied to the seed exchanged)

- Participatory plant breeding (PPB) or variety selection which enhances the dynamic nature of PGR conservation on-farm. In Italy and France, recent efforts have been dedicated to experimenting with evolutionary populations and heterogeneous materials (according to the new organic Regulation (EC) No 2018/848) in the context of evolutionary/participatory plant breeding

- Open field days for farmers, value chain actors and the general public to visit the multiplication, research and experimentation plots of the CSB (either on its own grounds or on those of a collaborating farmer)

- Workshops about the varieties conserved in the CSB and/or the related food products that can be obtained, and their nutritional, health or taste advantages

- Courses or training modules about a number of issues associated with seeds, including promotion of ecological agricultural models and food systems, PPB and informal seed systems, farmers' rights and legal frameworks

- Networking among CSBs, including joining forces at European level to raise awareness and conduct advocacy on issues such as legalizing farmers' seeds, promoting small-scale farming and organic agriculture, and to question the widespread application of patents on crop varieties.

Governance

At the beginning of this manual, we referred to community biodiversity management as an approach which underlies the nature and activities of CSBs. This approach is also useful for framing CSBs' governance models under a common umbrella, based on encouraging farmers to exercise custodianship over genetic, crop and landscape biodiversity in a collective manner.

Governance structures chosen by each CSB depend on several aspects - the CSB's legal form, as well as its size, age (recent or well established), and social concepts and values. In general, in young initiatives and small groups with no (yet) formed legal entity, collective decision making by those involved in the work are still possible and likely the most effective. In larger initiatives with a longer history and greater diversification of functions as well as a legal form, more complex and layered governance models are likely to provide the optimal solution.

Most CSBs in Europe are non-profits (with few exceptions) and take the legal form of associations, association networks, foundations or cooperatives. In associations, alongside those directly involved in the work, it is the board and the general assembly that play an important role in establishing objectives and in decision-making, while other management structures have less importance. In foundations, especially if larger in size, there still is an important role for the board and the general assembly but the management level is more pronounced too.

Community trust funds

A promising possibility to engage and motivate community members to take an active part in the governance and self-reliance of CSBs is the establishment of a community biodiversity trust fund. Such a fund, tailored to the specific needs of each CSB may also provide a mechanism to transfer to the community any funds generated from the use of genetic resources through access and benefit-sharing mechanisms. The Italian seed network and CSB Rete Semi Rurali (RSR) is working towards such a fund in a three-tiered approach: 1) Increasing members' commitment to the network's economic sustainability; 2) Enlarging the base of individual supporters, by improving the network's outreach and communication activities, as well as enhancing the offer of seed of varieties and populations from the CSB; 3) Establishing a sustainability fund whose functioning is agreed among members and overseen by the board, to gather contributions from members and supporters, and re-invest in RSR's activities and services.

Glossary

Accession: a distinct, uniquely identifiable sample of seeds representing a cultivar, breeding line or a population, which is maintained in storage for conservation and use.

Agricultural biodiversity or Agrobiodiversity: 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).

Genetic diversity: the genetic variability among or within a sample of individuals of a variety, population or species.

Seed system: an ensemble of individuals, networks, organizations, practices and rules that provide seeds for plant production.

Food system: collaborative network that integrates all components from food production through food consumption based on ecological, social and economic factors and values of a region or sub-region.

Variety: a plant or group of plants selected for desirable characteristics and maintained in cultivation. It may be traditional (i.e. a landrace) and maintained by farmers, or modern and developed through deliberate scientific breeding programmes (i.e. a commercial variety). **Landraces** harbour a degree of genetic variability with a certain genetic integrity that has evolved in cultivation, usually in a traditional agricultural system over long periods, and has adapted to a specific local environment or purpose. They are usually not registered in formal variety lists or registers for commercialisation. **Commercial varieties** are characterised by greater genetic uniformity and are registered in formal (official) variety lists although some which were developed in the past may have since been de-listed and made redundant (and can be known as "old" or "historical" varieties).

Population (or '**crop population**'): the term is used here to generally refer to a (large) number of plants in one location (field), in which individual plants are not genetically identical to each other. Two special cases of populations are Composite Cross Populations (CCPs) and varietal mixtures, differing in the way in which they were created, i.e., by crossing in the case of CCPs, and by physical mixing seed of existing varieties in the case of varietal mixtures. Depending on the genetic variation available and the strength and direction of environmental variables, the frequencies of different genotypes in the population will change from season to season, thus CCPs and varietal mixtures are evolving populations.

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.

Organic farming: an agricultural method that aims to produce food using natural substances and processes, limiting the environmental impact of food production and encouraging responsible use of energy and natural resources, maintenance of biodiversity and fertility and preservation of regional ecological balances.

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.

***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.

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

Recommended readings

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/

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