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NEXT Black Sea Basin

SeedGuard

BSB00450, SEEDGUARD: Seed Guardians for Biodiversity, Agrobiodiversity, Ecosystem Services and Climate Adaptation

Module 3. Provision of seeds of old vegetable varieties to CSCs for on-farm management and conservation of Plant Genetic Resources for Food and Agriculture (PGRFA)

Activity 1.3. Trainings “Guardians of the Seeds”

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The research covers topics, such as: providers of heritage seeds; delivery of healthy, good quality seeds, cleaning, drying, storing, documenting (with description of origin and history), reproduction, regeneration, multiplication and distribution.

Photo: On documentation of plants

What are the CSCs and CSBs about?

The adopted definition of a CSB is a local, mainly informal institution whose core function is to maintain, safeguard, and exchange local and farmer-preferred seeds for local use (Vernooy et al. 2015).

It has to be noted, that a local organization that produces and sells seeds as its core function is a seed enterprise and cannot be considered a CSC or a CSB, as its main objective is not the conservation and sustainable use of PGR. The CSCs and the CSBs are organized and managed by a small group of local small farmers and gardeners. They

provide services to a great number of similar structures within the community and outside it, when provisioned in the Statute. They act as preservers of local diversity where there are no other sources for getting access to the locally adapted plants.

Crop selection and seed collection

An important decision to be taken by the CSB's members is about which species and varieties are to be chosen for preserving in the CSB: the local varieties or also the improved ones as well? Should the minor, rare, neglected, and underutilized species be saved as well? These are decision with pluses and minuses, therefore, not easy to take. The focus, maybe, should be in those, which have a strategic meaning for the sustainability of the community. The factors, that may determine the decision, could be:

- species grown locally, that make the community popular and may generate the market demand;
- availability of the seeds;
- the level of the local species and varieties' infiltration in local food culture and gastronomy and their meaning in social practices, beliefs and rituals;
- devoted local human capacity and technical opportunities to store the seeds;
- human potential to track down valuable varieties and collect their seeds from the community and surrounding areas;
- the awareness of the value of local genetic resources, their meaning and role in conservation and willingness of community members to contribute to their saving;
- evidence of understanding among influence factors (policy and decision makers) to become part of an CSB's enabling environment.

Photos: CHI, Strandja presentation on seed saving

It will be good that the CSC prepares a kind of a handbook on how to take seed samples, how to choose the disease-free material, etc. Traditional practices teach that the sampling takes place from different parts of the garden/farmland, not from one part, only. It is advisable to avoid sampling from parts next to the edges, as they may have been contaminated by different plant varieties from other fields. Disease-free plants have to be used, only. Careful seed selection should be done in the field, followed by further examination of collected seeds later.

Before starting a CSC or a CSB, discussions with the potential members have to take place and some basic questions have to be asked, such as:

- Do you, or did you cultivate old local vegetable varieties and populations?
- What do you know about seeds and their conservation?
- How do you proceed, when it happens that a certain vegetable variety has been lost?
- Which varieties would you like to cultivate again?
- How could the lost local seed varieties be recovered?
- Is it realistic to consolidate the community for action in favor of the local seed protection? How?
- Did you collect and conserve local seeds before?
- What are the difficulties and obstacles you face?

- What should be, according to you, the steps to be taken to establish and support the CSC or the CSB?

Photo: Strandja presentation, Gathering of the CSB members

The CSCs and the CSBs execute activities, such as:

- Awareness raising, training and knowledge provision
- Documentation of origination, history, main characteristics, etc., of the collected seeds of local varieties
- Provision of information to their members
- Collection, production, distribution, and exchange of seeds
- Sharing of experiences with peers and collaborative initiatives
- Promotion of agrobiodiversity
- Community engagement and participation
- Execution of schemes for financial rewarding of their members
- Networking for generation of problems' solutions and policy initiatives

The existing practices demonstrate, that the CSCs and the CSBs can have different prime focusses, complementing the other functions of theirs:

- some CSBs and CSCs can put a priority on seeds' preservation for agrobiodiversity
- some CDBs can prioritize revival of lost local varieties
- CSBs can give priority to conservation and access and availability of diverse types of seeds and planting materials, primarily for local farmers.
- CSBs can prioritize seed and food sovereignty

To summarize, functions and services of CSBs can be grouped into three core areas:

- Conservation - conserving local and heirloom varieties and restoring lost varieties from the area
- Providing access and availability - offering access to varieties at the community level
- Fostering exchange and production of seeds
- Ensuring seed and food sovereignty - local control over variety and seed conservation, sharing of agricultural biodiversity knowledge and expertise and promoting agrobiodiversity

Some community seed banks combine functions, e.g.:

• Conservation + access and availability
• Conservation + access and availability + seed and food sovereignty.

Steps to follow

For the purposes of this project, the conseguent steps to follow will be based on the executed consultations with the founders on the topics:

1. Why do we want to establish a CSB? Hints could be given, e.g. industrialized and globalized monoculture agriculture, meaning that the same tomato variety, for example, can be, and is sold in several countries. Another incentive could be to support the small and family based farming and give it a chance to survive and create diversity for the market.

2. What is the purpose of establishment of the CSC? To promote local seeds and increase attractiveness of the produce of small farmers and family gardens with forgotten and preferred vegetable varieties? Or, to create a platform for exchange of seeds between farmers and with other parts of the country or with the neighboring countries? Or, to stimulate seed saving and raise awareness about the rights and interests of farmers as breeders, thus preserving the biological diversity and agrobiodiversity?
3. Who will benefit from the CSC or the CSB? Small farmers, gardeners, hobby growers, urban gardeners, etc., who want to cultivate vegetables without using fertilizers and propagate seeds of local varieties?
4. How will the CSC become self-organised and operational? What about the financial, human capital/volunteering, technical/infrastructural aspects? How will seed saving and reproduction materialize? How will seeds be packaged, labeled and shared? And distributed to other beneficiaries (by volunteers during seed exchange campaigns?). How will selling of the most demanded vegetable varieties be organized?

Establishment of a CSC is a methodical process which takes as much time as necessary to interact with farmers as potential members, considering the important social aspects of the community.
The physical aspect of the CSC, the seed storage facility can go in parallel with the organizational aspects. The commonly followed steps in establishing and supporting a CSC or a CSB are:

1. SWOT analysis
2. Inspiring and organizing farmers as contributors of seeds
3. Choosing local, old vegetable species and varieties for preservation
4. Seed preparation for storing, seed health assurance
5. Seed storage (facility, furniture, equipment, and methods)
6. Registration and documentation requirements for selected local vegetable varieties
7. Regeneration of collected seed material by farmers
8. Information sharing
9. Monitoring of operations and results

How to save vegetable seeds? What is seed saving?

With seed-saving, you grow some extra vegetables which you save just to harvest their seeds. Then you store those seeds over the winter to use them in the spring. Seed-saving is to preserve heirloom varieties and to promote genetic diversity.

Why Save Seeds?

The main reasons to learn how to save seeds:

- Saving seeds ensures that you'll always have seeds of a favorite variety. Just because you've been able to order a seed variety from a commercial source in the past doesn't mean it will always be available.
- Saving seeds is cost effective. It makes no sense to buy seeds that you can produce yourself.
- Savings seeds opens a perspective for sale of seeds. At least half the vegetable varieties being grown today have no commercial sources. If you want to reproduce and propagate them, you have to exchange seeds that you have for seeds you want to have. Saving and sharing seeds is essential to the cultivation of sustainable heirloom gardens and healthy living.
- Using seeds from your own plants connects you with the Nature and people enjoy this feeling.

New farmers and gardeners ask themselves: which vegetable seeds to save? Save heirlooms, Not Hybrids

Some people experiment with saving seeds from hybrid varieties. But, the truth is in saving ONLY open-pollinated varieties.

The open-pollinated plants replicate the parents and guarantee that the seeds you propagate will bring you the same vegetables year after year. Open-pollinated plants may be "heirlooms," which have been passed down through generations, with nature keeping only the best traits.

The plants grown from hybrids, which seeds result from crossing two or more varieties to obtain specific characteristics, will have an unknown combination of traits of the initial plants. Often, the result is decrease of quality.

It has to be kept in mind, that some crops can cross-pollinate (via insects) if they are planted too close to each other, which results in a spoiled flavour. This happens to cucumbers, peppers, melons, etc.

For starters, self-pollinating vegetables which do not require special treatment are advisable. Such as tomatoes, peppers, peas, beans, etc.

Seeds from biennial crops are not advised as a start of seeds' production, as the gardener needs two seasons for that. These are seeds from cabbage, beet, carrot, cauliflower, onion, etc.

Importance of the right time to collect seeds

When do seeds ripe?

Ripeness of seeds is when they are viable to be used for propagation, which does not always coincide with the time the fruits of the plant are harvested for eating.

For example:

- Peas and beans are ripe when the pods become brown and shrink around the seeds.
- Pepper seeds are ripe when peppers are at their full color and start to look drying.
- Tomato seeds are ripe when they get their full colour and are slightly soft to the touch and tender.
- Cucumber seeds are ripe when the fruit becomes yellow. Then, they have to be collected and kept for some 20 days before delivering the seeds.

  And, so on.

Steps on saving seeds - gathering, treating and storing

The general principle is to select only the strongest plants with the best fruits as parents for the next year's crop.

Below, some vegetable plants are mentioned as an example:

Saving tomato and cucumber seeds

Tomatoes and cucumbers' seeds are covered with a gel. The first thing to do is to remove it by fermentation. This is how to do it: squeeze or use a spoon to take the seeds out of the fruit and put it in a glass pot, jar or plastic cup. Add as much water as to equal the volume of the seed mass, and put the container in a warm spot out of direct sunlight. The content needs to be stirred once a day. In a couple of days, the viable seeds will sink to the bottom and bad seeds and white mold will stay on the surface. It takes 5 days for the good seeds to drop. Then, rinse the seeds and wash them in several waters. The seeds are now ready to be put on a proper surface to dry, normally for several weeks.

Saving Pepper Seeds

Cut the pepper and take out the seeds. Put them onto a plate to dry.
Etc.

Storing seeds

All seeds like dark and dry place for storing. After proper drying, seeds can be put in airtight containers and stored in the refrigerator or freezer for several years. The seeds of some crops live longer. Tomato seeds and beans can stay for many years in proper storage conditions, compared to onion and carrot seeds which live for a shorter time. When storing seeds, they have to be labeled with the type, variety name and other data, which characterizes them. The date of harvesting the seeds, and number of plants the seeds come from should be mentioned as well. For larger seeds, e.g. beans, a cardboard boxes from snack foods can be used for storing. For small seeds, such as peppers and tomatoes, washed-out pill bottles will do.

The life longevity of seeds is different. Tomato seeds may last for more than 5 years. The seeds' viability can be prolonged by freezing them. The best would be a zero-degree freezer. Properly dried and frozen seeds can remain viable for as many as 40 years!

The steps for storing the seeds:

- Put the dryed seeds in labelled paper packs or envelopes in an airtight container with some material to remove excess moisture, e.g. calcium chloride or silica gel
- Excess humidity or warmth can make seeds deteriorate or die from fungal disease or rotting
- Certain seeds, like walnuts cannot be dried out as they cannot then take up water for germination. Some seeds require to be stored in a plastic bag of damp vermiculite, sand, or a mix of moist coir and sand for several months
- Store in a refrigerator at 5°C until required. Most seed will remain viable in this way for many years.

Some more seed storing tips:

- Keep seeds out of direct sunshine in a consistent temperature. Sunlight is giving a sign to the seeds that it is time to germinate. It also encourages microbes to life. You can keep seeds in drawers.
- Freezing is not necessary for short-term storage, but you can refrigerate seeds, provided they (and the refrigerator) are sufficiently dry. Freezing seeds with remaining moisture can damage them.

Humidity of the place/room where seeds are drying and are stored

Proper drying is a key to saving seeds. If the seed is dry, when it is hit with a hammer, it will break. If it is soft, it needs more drying before storing. The humidity of the place you dry seeds and the area where seeds are stored is important to keep them in a proper shape. A relative humidity of 40% or lower is best for both drying and storing places. It is advisable to have a humidity gauge to monitor relative humidity.

Drying seeds in small quantities at home

It is a common practice in rural areas to dry seeds by spreading them out on a surface where airflow is able to reach them evenly.

Another way to dry small amounts of seed is by hanging the seeds in blossom bags in a cool, dry place.

If you're not sure if your seeds dried enough, try snapping or crushing some of them. If they shatter or break cleanly, they're ready for storage. If they bend, give them more time to dry before storing. Most seeds take from a few days to a few weeks to dry completely.

Consistency of temperature is very important. It is not recommended to store seeds in a spot that isn't climate-controlled, like a garage or shed, where temperatures and moisture levels can fluctuate wildly.

Zeolite drying method is one of the modern approaches, applied by the CSBs. A Protocol on the use of zeolite dessicant drying beads to dry seeds and maintain them at low moisture contents during storage was developed. The method allows absorb water from seeds and lower their moisture content, thus increase their lifetime.

In places with high humidity seeds can deteriorate quickly. Traditional approach of sun-drying cannot dry seeds enough. It has been proven, that with 1% increase in seed moisture content, its lifetime is halved.

Zeolite drying beads can be used for drying horticultural seeds and maintaining their quality during storage. The beads can be used again and again after heating them between uses. The drying beads allow keep very low moisture content of seeds, without using heat, which

preserves their quality, increases seed longevity, germination rates and plant vigor, thus increasing yields of farmers.

The price of the drying beads is around $8-15 per kilo. It is enough to have an airtight container to keep seeds dry.

How to protect the dried seeds

Take care of pests! Rodents, and bugs like eating seeds. Choose a storage that is pest-free and you can control it. Use glass jars, metal containers, plastic pill bottles, ziploc bags, etc., which can protect seeds from pests.

When your storage is cool and dry, you may keep seeds in paper bags, mesh bags, or envelopes. This is called “open storage”.

Modern seed storage techniques

Smallholder farmers conserve their preferred crop varieties at home and, increasingly, in community seed banks. Most often, community seed banks do not have resources to keep seeds in cold storage (refrigerators, freezers) and they use traditional methods, which are different in different areas. There are modern methods, such as hard plastic bottles, glass jars, bins, etc.

Seeds can be are dried using various desiccants (Zeolite beads, Silica gel). Keeping the seeds and these desiccants close to each other in a sealed container for some time will result in the seeds losing moisture. After this process, the moist desiccants are taken out and the dry seeds are stored under hermetic (air-tight) conditions.

The seed containers must be airtight: to keep seeds dry after making them dry. To check the seed moisture content inside the bottles/containers/jars, a small indicator paper (cobalt chloride-coated □lter paper strips) can be kept inside, which indicates any leakage or rise in the moisture level inside the container. These paper strips turn pink when moisture enters the containers and blue when the air is dry. The various advantages of storing seeds using this technology are:

- They are cost effective
- Beads can be reused hundreds of times

- There is no dependency on power unlike refrigerated storage
- Dry seeds do not attract insects and fungus
- Beads are very safe
- There is no need for experts or complicated machines for using them or working with them.

To summarise: How should the members of the CSC or a CSB proceed for their seed saving?

Necessary steps to be taken by the CSC's and CSBs members:

Seed health and cleaning

To ensure good-quality seed (free from disease, insects, weeds and keeping them away from other varieties), community seed banks have to take preventive actions. A person can be hired to take responsibility for quality. The most important is to prevent from seed diseases and pests.

Registration of new varieties and seeds

Few community seed banks have documented accessions with complete characterization by using standard descriptors. If they did, often they do not publish a kind of a register or a catalogue. To do this is very important and to do it properly, they need to collaborate with research institutes. The standard description includes traditional knowledge, nutritional and medicinal properties of local varieties. Register Books have to be used (one for incoming and one for outgoing seeds), where the seeds deposited by farmers and seeds, leaving the deposit will be registered in detail – the dates, the farmers, delivering or taking seeds, name of the place, the seeds originate from, and OBLIGATORY – the name of the crop and variety. Also, the quantity of the deposited seed material and the quantity of the seed material, given to a farmer for reproduction, should be noted. In this way, every new entry will have a "passport". This will ease collaboration with the national gene bank, as the information can be linked to it as an ex situ depositor of PGR.

Seed processing

It has been mentioned above how seeds can be stored traditionally. Farmers are rather familiar with traditional methods from generations. Most community seed banks step on the specific for the area traditions in drying and then storing them in various types of containers. It is important to have seeds dry and clean. The CSC's and CSBs are gradually replacing traditional storage structures with modern equipment, such as airtight, transparent plastic or glass jars, metal bins and even SuperGrain bags (multi-layer plastic bags that provide a gas and moisture barrier). Some are using zeolite beads (aluminosilicate-based absorbents) to reduce moisture levels.

Seed storage (physical) structure and method

To keep seed clean, healthy and viable, proper storage equipment should be used. There is a wide variety of it, depending on the goal, objectives, and core values of the CSC.

It is good to start with traditional storage practices and methods. Involvement of women is advisable, as they are usually knowledgeable in storing seeds for two or three seasons. It is key to have equipment for controlling temperature and humidity for maintaining longevity of the seeds.

Seed health monitoring

It is advisable to regularly monitor the health and quality of the stored seeds. This is often done visually and by checking the moisture, pest and disease occurrence. A good farmer can easily determine whether the seeds are properly kept, save and healthy. A useful instrument is a hygrometer that registers room temperature and humidity level. Some modern containers have a hygrometer built in. Hydrion Humidicator Paper can also be used. Responsibility for seeds' monitoring can be assigned to a CSB member.

Seed regeneration

Most of the CSCs and CSBs regenerate the seeds they conserve annually, in order to fill in the reserve and support the on-farm selection on the field of their members. Some of them produce seeds not for the members, only, but for the broader market as well. The quantity of the saved seeds depends on the local demand and on the CSCs and the CSBs resources.

Seed distribution

A CSC or a CSB has to possess sufficient quantities of seeds as to satisfy the demand of their members and non-members. How to distribute is a matter of agreement between the members. The only concern should be that the distribution is efficient and effective and corresponds to the defined goals, objectives and values.

The CSBs and CSCs try to satisfy their members, first. The approach could be the first-come first-served, or equal, or targeted distribution. The repayment or the return rate of seeds received from the bank should be decided between members. The rules and the approaches should be assessed with the time and adjusted if necessary. The documentation on the distributed variety, the receiver, membership or non-membership, village/location, amount of seed, and the way of the deal should be carefully recorded. This will allow to assess the performance of the CSC or a CSB over time.

The document is prepared by LP - UBBSLA in the frame of BSB00450 SEEDGUARD: Seed Guardians for Biodiversity, Agrobiodiversity, Ecosystem Services and Climate Adaptation

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