Strengthening Seed System through Community Seed Banks

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Background

Community-managed seed conservation has been in practice with the objective to save, reinstate, strengthen and advance local seed systems. A special focus of these practices is the conservation and use of traditional and locally-grown crop varieties, which tend to get lost in more intensive agricultural systems. With community seed banks (CSB), farmers in one village or in an area, store seeds of different crops and varieties for agrobiodiversity conservation and cultivation purposes.

The traditional and farmers' saved varieties could have lower yield potential compared to improved high-yielding varieties (HYVs). However, traditional varieties are preferred for specific traits such as taste, medicinal properties, resistance to pest and diseases, etc. Under optimum climatic conditions, HYVs provide more returns with higher productivity but under testing climatic conditions, they fail to perform. In such a scenario, traditional varieties perform better since they are often well adapted to local conditions.

On-farm conservation of local varieties in CSBs is an effective way of preserving agrobiodiversity as well as supplying adequate quantity of seed for use. They also help farmers to acquire seeds of varieties adapted to local conditions that may not be otherwise available through formal seed systems[1].

Bioversity International has started to establish CSBs with the ambitious plan of creating a network of CSBs in every state of India, in partnership with the Krishi Vigyan Kendras (KVKs – farm science centres of the Indian Council of Agricultural Research, ICAR). The basic plan is to streamline a scientific method of low-energy seed storage and to create an information system linking all CSBs that displays the diversity conserved in all CSBs in real time. The use of Information Technology (IT) in linking these seed banks will come at a later stage when the seeds banks are functioning in full capacity. Adding GIS information to this database will provide a new dimension to the available information. This system will serve as a model/prototype for the national system which can further expand this network.

Our Progress

Bioversity International, India has collaborated with KVKs in setting up 11 CSBs to conserve local plant biodiversity and establish a viable seed supply system for sustainable farming. We not only support the establishment of CSBs but also strengthen the community's capacity to evaluate landraces, producing quality seed and managing the seed banks.

Top image credit: Bioversity International/ C. Zanzanaini

[1] Vernooy, R., Shreshtha, P and Sthapit, B (2015): The Rich but little known chronicles of community seed banks. In: Community Seed Banks: Origin Evolution and Prospects. Vernooy, R., Shreshtha, P and Sthapit, B. (Eds). Routlege. ISBN: 978-1-315-88632-9

There are now **seven community seed banks in Chitrakoot and Satna districts under total farmers' ownership and maintenance.** Two seed banks are under the direct supervision of Deendayal Research Institute (DRI) KVKs and one central repository is in the DRI campus. Together, they are conserving 500 different varieties of 21 crops. Further, the CSBs have become the storage centres for all new varieties that are being introduced in the *Seeds for Needs* programme. An important purpose of having a seed bank located in farmer communities is to increase awareness of how seeds need to be correctly conserved and stored to remain viable. The central repository hosts duplicates of seed accessions in the CSBs and act as a guard accession store in case of any loss of seed genotypes.

To guarantee the viability of the stored material, these seed banks use **zeolite beads** to reduce moisture and store seeds under near hermetic conditions in polyethylene (PET) containers or large PVC drums. The CSBs also serve as centres of knowledge sharing and community farm activities like:

- Seed collection and on-farm conservation of local landraces
- Capacity building for variety evaluation, seed production and seed bank management
- Evaluation of accessions by farmers through Participatory Variety Evaluation (PVE)
- Identification of farmers' varieties suitable to normal and sub optimum climate conditions
- Production of quality seed of selected varieties for individual or commercial use
- Provide a sustainable seed supply system for the community.

Fig 1: Map of India showing the seed banks at Chitrakoot and Satna

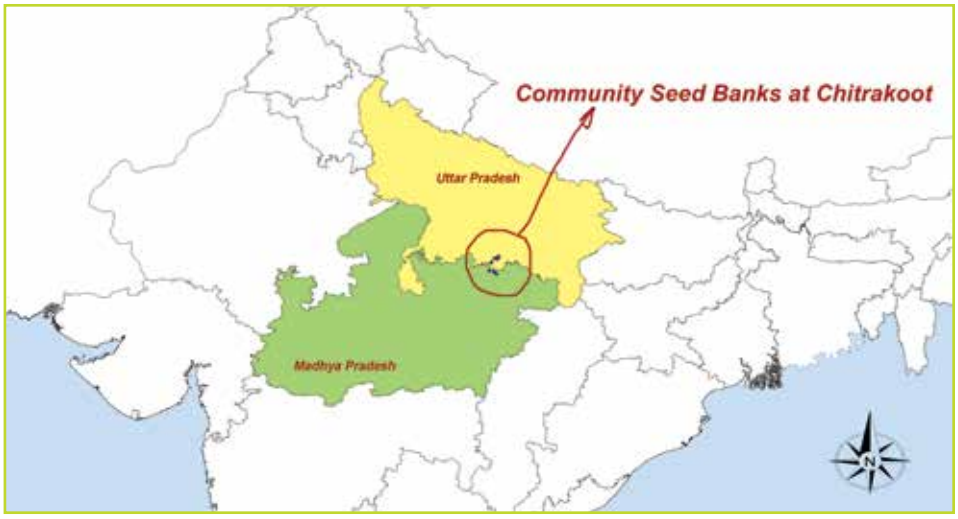


Fig 2: The Location of CSB in Chitrakoot and Satna districts

New Innovative Technique to Prolong Seed Shelf Life in CSBs

Genebanks traditionally keep seeds under cold temperatures to prolong their shelf life. But this can be costly to run, and can be unreliable when power supplies fluctuate.

In community seed banks, dry storage is used, which offers a much cheaper and more reliable alternative. The most serious threat to seed longevity is the high level of seed moisture content. This enhances deterioration and attracts various insects and fungi. To avoid that, seeds must be dried and stored under low seed moisture content (<6%).

Our innovative solution entails the use of desiccants (zeolite beads) to dry the seeds and of airtight drums or PET bottles for storage. There is in-depth research supporting the use of this technology and the importance of desiccated storage[2,3,4].

[2] Cromarty A.S., Ellis R.H. and Roberts E.H. 1982: The Design of Seed Storage Facilities for Genetic Conservation, IBPGR, Rome.

[3] Ellis, R.H. and Roberts, E.H., (1980), Improved equations for the prediction of seed longevity, Annals of Botany 45, 13-30

[4] Timsina, K, Dahal, P., Bradford, K. J., Kunusoth, K, Van Asbrouck, J, Pandey, I, Bajracharya, J., Shivakoti, G. (2014): Impacts of a new post-harvest drying technology on the horticultural seed value chain in Nepal. Selected paper presented at the 29th International Horticultural Congress 2014, 17- 22 August 2014, Brisbane Convention & Exhibition Centre, Queensland, Australia.

Methodology for Using Beads in Community Seed Banks

Sun-drying the seeds properly for 2-3 days
Photo courtesy TNAU.edu

Either mix the beads with seeds or use a cloth/mesh bag to keep the beads

Store seeds hermetically (under total air-tight conditions) during drying as well as storage. Use bigger drums for large quantity seeds (left) or smaller airtight containers (right) for small quantity storage

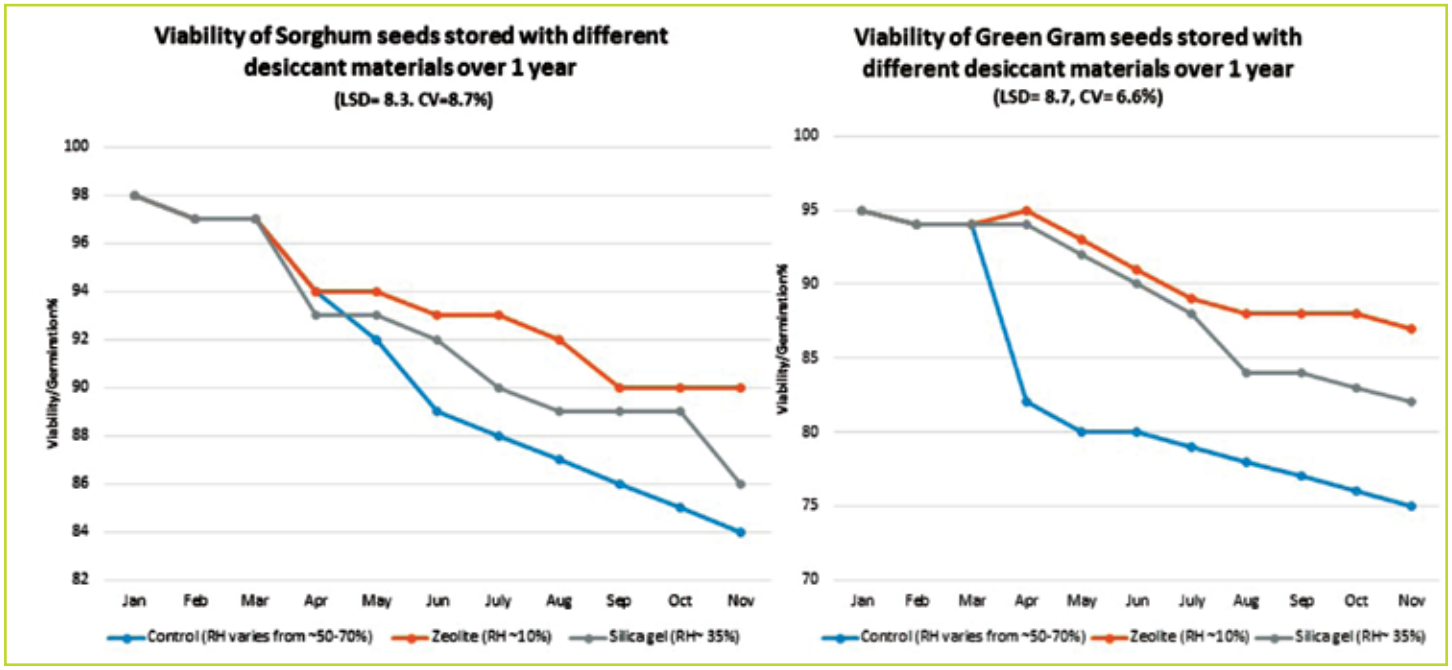
Take out the beads after a few weeks as the required moisture is already removed from the seeds. Quickly remove the beads pouch from the containers and re-seal again. Recharge the beads again for drying fresh batches of seeds

Monitor the moisture content of seeds using Moisture Meters (right) and the relative humidity inside the containers using humidity strips. Correlate seed moisture content with RH using Cromarty's equation [2]

Advantages of Zeolite Beads Technology

The use of zeolite beads to dry seeds, which in turn enhances seed longevity. A study conducted by the National Horticulture Research Development Foundation (NHRDF) on onion seeds indicates that seed viability drops from 85% to 40% in a year at ambient conditions of storage. If seeds are dried using zeolite beads and stored under the same temperature regimes, the viability of seeds is maintained at 85%. In another study by Bioversity International in collaboration with the University of Agricultural Sciences, Dharwad, Karnataka, storing seeds of sorghum and greengram seeds, after drying them with zeolite beads, significantly slowed down the reduction in viability (Fig. 3).

Fig 3: Seeds stored under desiccated conditions using silica gel and zeolite beads



To summarize, the advantages of this technology are:

- Cost-effective (beads can be re-used)
- Easy to handle
- Does not depend on power
- Minimises pest and disease incidence
- Beads are non-toxic

Greengram seeds stored under dry-hermetic conditions using beads

Bruchid infestation occurs in moist seeds

Management of Community Seed Banks

The community is free to establish its own rules for management. The management is responsible for deciding on members, meetings, maintenance, quality control, etc. The basic steps involved in operating a seed bank are:

- Forming a committee of 5-10 motivated persons to start a seed bank. The committee should have one general secretary, two joint treasurers and operational committee members;
- Training of the CSB operation committee conducted by Bioversity International/national partners;
- Drafting of management rules about meetings, operations, seed collection, distribution and regeneration;
- Setting up the seed bank and storing facilities;
- Performing quality checks and inventory reconciliation every month;
- Maintaining the documentation on registration, quality, stock and movement;
- Initial hand-holding of the seed bank management team by KVK and Bioversity International to plan the sustainability of seed bank operations through sale of seeds, service charges, membership fees, etc.

Community seed bank at Balapur, Chitrakoot
Credit: Ashok Tiwari

The Way Forward

- Overlaying the collection-specific information in the CSBs with GIS data to get location specific information or simply, by adding a 'geotag' to the accessions;
- Online database of the varieties in all the CSBs to capture the characters and traits;
- Integrating databases from different seed banks to e-link with the **'Seeds for Needs e-Platform'** being developed by Bioversity International.

Bioversity International

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