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Community Seed Banking and Importance of Germplasm Conservation in North East India

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Abstract

Under the influence of profit-oriented commercial agriculture, cultivation of genetically uniform high yielding varieties and hybrids gets more promotion, which considerably reduces the cultivation of diverse traditional landraces. Several important traditional landraces are even lost or are on the verge of extinction. These traditional landraces harbor the various important resistance genes/alleles against abiotic and biotic stresses, and are also the source of genetic variability for important quality traits. Biodiversity of Northeastern India is also under threat as farmers are moving towards commercial agriculture, which necessitates *in-situ* conservation of all available diversity of various crops by farmers and tribal communities to achieve the goals of sustainable agriculture in the face of changing climate and other impending biotic and abiotic stresses. Community Seed Banking (CSB) is one of the important methods to conserve agro biodiversity. The concept of CSB, its functioning, utility and other associated aspects have been elaborated in this article.

Introduction

Modern-day commercial agriculture is considered a threat to biodiversity. Promotion of genetically uniform high yielding varieties (HYV) and hybrids leads to cultivation of few major improved varieties of a specific crop. As a result, cultivation of diverse traditional landraces has been reduced to considerable extent, and several important traditional landraces are lost and some are on the verge of extinction. Genetic erosion, as a consequence, has taken place up to considerable extents. For instance, number of rice cultivars declined from about 4,00,000 before colonization to 30,000 in mid-19th century, with unknown thousands lost after green revolution. These traditional landraces harbor the various important resistance genes/alleles against abiotic and biotic stresses (Azeez *et al.*, 2018). These landraces are also the source of genetic variability for quality traits such as taste, aroma, softness, high nutrient content. Each traditional landraces have their unique specialty for which they have been grown and maintained by farmers in traditional way from ancient time. In general, landraces are less productive as compared to HYV, but in recent years, importance of traditional landraces has increased owing to their high potential to adapt to specific environment due to the presence of tolerant genes for various biotic and abiotic stresses (Azeez *et al.*, 2018). North-East India is hot spot of biodiversity. Farmers of this region have conserved so many diverse traditional landraces of cereals, vegetables and horticultural crops since time immemorial. Use of HYVs and hybrids of crops in this region also displace locally adapted and valuable landraces of various crops. Biodiversity of North East India is also under threat as farmers are moving towards

commercial agriculture. Therefore there is a need to conserve all available diversity of various crops *in-situ* by farmers and tribal communities to achieve the goals of sustainable agriculture in future.

Indigenous landraces are more compatible with local farming system, economically viable and environmentally sustainable than the high yielding varieties being used today. The availability of the appropriate kind of seed is highly important for agriculture because without viable seed, the survival of rural households is endangered. The ways that farmers obtain seeds are as old as agriculture, and most small-scale farmers routinely save their seed from one harvest to the next. At one time, India was believed to have been home to about 1,10,000 rice varieties. IRRI gene bank preserves nearly 1,00,000 accessions. India alone has 86,330 accessions, of which 42,004 are in the national gene bank. Scented millets were once a popular crop because they are drought-resistant, highly nutritious, and capable of cultivation in poor soil. Therefore, these important landraces have to be preserved and maintained by farming community through *in-situ* conservation method which provides opportunity for further evolution in crops for adaptability according to changes in climatic pattern.

Interventions to strengthen informal seed supply systems, such as establishing seed banks, and seed breeding and multiplication are gaining popularity among non-governmental organizations (NGOs) and public sector institutions engaged in the area of seed supply. Community seed banks are one of the important methods used to provide seed security and conserve agro biodiversity. They also guard against depletion and pollution of water, mono-cropping and farmers' indebtedness which are among the many disadvantages of using high yielding varieties that require the use of large amounts of pesticides. Conservation of all gene pools is a high priority for sustaining food security and coping with current and future climate change effects. This could be accomplished through establishment of community seed banking systems.

Community Seed Bank

Community seed banks (CSBs) are mainly informal institutions, locally governed and managed, whose core function is to preserve seeds for local use. They have existed for about 30 years, conserving, restoring, revitalizing, strengthening, and improving local seed systems, especially, but not solely, focused on local varieties. They are known by a variety of names: community gene bank, farmer seed house, seed hut, seed wealth centre, seed savers group, association or network, community seed reserve, and seed library. The farmers who run community seed banks handle major crops, minor crops, and neglected and underutilized species, sometimes in small quantities of a few hundred grams per accession, sometimes storing hundreds of kilograms.

CSB is an important self-help strategy for maintaining genetic diversity in crop and plant species on farms. It is also a system in the process of community agriculture which includes village level facilities, a garden or field where traditional varieties are safeguarded. Through this system, farmers have played a key role in the creation, maintenance and promotion of genetic diversity. They have developed skills to meet their specific needs such as quality, resistance to pests and pathogens, adaptation to soils, water and climate *etc.* Community seed banks are more beneficial for small and marginal farmers who are involved in subsistence agriculture for their self-sustenance rather than commercial agriculture.

As climate change has a significant impact on agricultural production in north eastern India (Kumar, 2011), growing local varieties, which have a high degree of genetic diversity, is important because they have the ability to better withstand and adapt to environmental stresses and changes. Setting up community seed banks may help farmers to acquire varieties that are adapted to local conditions; these varieties may not be accessible through formal seed systems, may be costly or may suffer from erratic supplies.

CSB helps to preserve seeds of the most adapted varieties for the region, either local varieties or new ones coming from breeding programs. Selection of the most suited varieties for a region needs time and trials, but after the identification of best varieties, CSB plays very important role in maintaining the availability of quality seed. Seed diversity is enhanced and additional income is generated when seeds are exchanged and sold to neighboring communities. Diversification of crops and varieties is also important in terms of people's food security, because it reduces the risk of total production failures and contributes to strengthening communities' resilience.

How CSB Works?

Seeds are given free of cost to members of a seed bank. Any one from the community can become a member by paying a nominal annual fee. The member then sows the seed, harvests the crop, and later returns to the seed bank a particular quantity to replenish the store. The seed bank also works on seed treatment, seed selection, maintaining a record of needs, and planning for the next season. Steps in setting up and maintaining a CSB are shown in Figure 1.

Functions of CSB

Main functions of community seed banks are: (a) renewal of crop and genetic diversity in locations characterized by monoculture of commercial crops; (b) conservation of crop and genetic diversity in locations where diversity still exists but where farmers are facing the threat of excessive use of chemicals and monoculture; (c) periodic mapping of diversity in the village and renewal of varieties that have lost their purity and vigor; (d) participatory

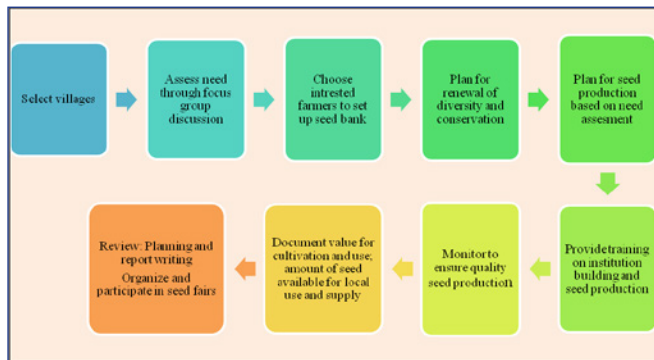


Figure 1: Steps in setting up and maintaining a CSB (Source: Ramanjaneyulu *et al.*, 2015)

varietal selection and participatory plant breeding of specific crops, such as paddy, cotton, groundnuts and vegetables, that are under threat due to erosion of diversity; (e) selection of varieties suited to local conditions through participatory varietal selection; documentation of value for cultivation and use data for each variety and every agro-ecological situation; (f) development, with innovative farmers and seed savers, of an inventory of available seed varieties along with information on their performance; (g) organizing seed sharing and exchange, conservation of crop and genetic diversity and networking with similar bodies at the state and national levels; (h) procuring breeder seeds from cooperatives and universities, mainly commercial crops, and multiplying and supplying them to farmers; (i) assessment (by the seed bank committee) of village seed requirements and planning for seed production; (j) encouraging farmers to produce/save/reuse seed carefully selected from their crops; helping farmers learn how to select and use farm-saved seed; and (k) holding enough stock to meet cropping requirements in case of crop failure or low rainfall, particularly in rainfed areas. Navdanya, Green foundation, Deccan Development Society (DDS), Annadana Seed and Soil Savers *etc.* are some of the NGOs and associations active in the area of community seed banking and germplasm conservation. The Centre for Sustainable Agriculture has established community seed banks in 70 villages in the state of Andhra Pradesh and 20 villages in Maharashtra since 2004. Some of the community seed banks have entered into informal marketing arrangements known as Seed growers’ associations. An SGA is made up of about 15 farmers, 50 percent of whom are women.

Harvest, Storage and Treatment Methods Adopted by Seed Banks

• **Pulses (red, green and black gram):** After healthy seed harvest, seeds are treated with 1% neem oil or mixed with ash and neem leaves. The treated seeds are stored in earthen

pots covered with cow dung. Stored this way, the seeds remain viable and free of pests for a year.

• **Millet:** Healthy seed heads are selected at harvest time, threshed manually and stored in gunny bags. If they become infested with pests, the seeds are sun dried between 11 AM and 3 PM.

• **Cereals (maize/ paddy):** Maize farmers first identify healthy plants with a cob. These cobs are harvested separately and stored by hanging them from the roof at the entrance to the house. Seed for sowing is selected from the mid-portion of the cob.

• **Vegetables:** To prevent cross-fertilization, farmers cover the flower with a paper bag. At maturity, the self-fertilized vegetables are harvested separately, seeds are separated from fruits that have been dried in the sun, ash is added and the seeds are stored in cotton bags.

Conclusion

Cultivation of genetically uniform high yielding varieties and hybrids gets more promotion in the modern-day profit-oriented commercial agriculture, which reduces the cultivation of diverse traditional landraces to considerable extent. Several important traditional landraces are even lost or are on the verge of extinction. These traditional landraces harbor various important resistance genes/ alleles against abiotic and biotic stresses. In order to check such losses of biodiversity in North East India, development of community seed banks is extremely important. This will help in achieving the goals of sustainable agriculture in the face of changing climate and many other impending biotic and abiotic stresses in North-eastern India.

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