



## **Conservation of Endangered Indigenous Seeds through Seed Banks**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.*

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### **Case Study**

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### **ABSTRACT**

In the present study a case study of six community based seed banks established in the six villages viz. Balehalli, Belavaneralu, Hullikere, Hanthanakere, Bellathahalli, Kuriyapalya villages etc. of Tumkur district Karnataka have been presented. These community based seed banks have been established under community based seed bank network project (CSBN). The Self help groups collect seeds from diver's origin. Community seed banks was managed by local self-help groups, the seed banks collect, distribute and multiply local varieties of seeds in an organized manner. Farmers one by one can borrow these seeds, from seed bank which is returned in double the quantity of what they borrowed. In 2003, nearly 50 quintals of different types of local seed varieties including cereals, pulses and spices and dry fruits are collected from six community seed banks of Tumkur district. The quantity of seeds distributed by the community seed banks was 50 tons of local seed varieties. Farmers one by one can have a loan of these seeds, from seed banks which are returned in two fold the quantity of what they borrowed in 2004. Field staff of BIRD-K(BAIF Institute for rural development-K) facilitates the set up of these seed banks by building a strong relationship

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with the community. Endangered local seeds were collected and seed banks were established to preserve them for multiplication. This is to ensure farmers' increase seeds, which reduces their dependence on markets for their supply.

**Keywords:** *Biological diversity; conservation; community seed banks; collection of seeds; endemic seeds; indigenous seeds; federations; management; SHG's; NGO's.*

## 1. INTRODUCTION

Traditional Community based Seed Banks accomplish different purposes of sustainable agriculture for small and marginal village farmers. Community based seed banks are more beneficial for small and marginal farmers who are involved in subsistence agriculture for their self-sustenance rather than commercial agriculture. These community based seed banks serve as focal point in conserving, protecting traditional indigenous seed diversity of farm involving farmers' community. Community based seed banks serve local farmers to form an informal seed distribution system prevailing in villages since ancient time at no or very low cost. Community farmer's participation in managing indigenous biological diversity provides too great self esteem to farmers and sense of belonging for local landraces Pokhara, Nepal. There are amazingly few meticulous scientific studies about community gene or seed banks, their roles and impact (also noted by Engels et al. 2008: 150); [1] an exception is a typology of community based seed banks published in 1997 by Lewis and Mulvany [2], most likely the first attempt to assess community seed banks worldwide. As far as we know, no logical, in-depth comparative investigation has been carried out of community gene or seed banks in their variety of forms. The Food Agriculture organizations "Second global report on the state of the world's genetic resources for food and agriculture" [3] does not have a single reference to either community gene banks or seed banks. Few reports mention community seed banks only in passing [4]. Articles on seed systems follow this astonishing trend, e.g., Tripp [5], Louwaars (2002)[6], and Lipper et al. [7]. There are some references to gene or seed banks in the published literature on the conservation of inherent resources diversity, e.g. Almekinders and de Boef 2000, CIPUPWARD [8], Shrestha et al. [9], de Boef et al. [10].

Community seed banks have the benefit of openhanded, easy access to rural farmers, and are easy to link to regular in-situ conservation. In-situ conservation where rural community keenly

maintains seeds in their on farm is vital in order to continue the local genetic diversity and its allied skills knowledge and culture. Community seed banks draw much attention as they can be used as a platform for community institutions to strengthen the roles of the farmer seed systems described above. Purposes of such community seed banks are not only saving and exchanging local seeds and keeping them under the control of the farming community for easy access and use for seed security at the community level but also consolidating community roles in promoting conservation, sustainable use and improvement of important local genetic resources/traditional knowledge [11]. Objectives include conservation of plant genetic resources, community or women empowerment, seed security, Farmers' Rights (recognition, access, participation in decision making and benefit sharing), food sovereignty, and community resilience. It is a community mechanism/institution or seed repository with specialized functions: to collect, store, multiply and distribute seeds, depositing and transaction of seed similar to money, seed multiplication, and Linkage community seed banks with farmers.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The Community Based Seed Network (CSBN) Project was initiated by Bharathiya agro-industries foundation (BAIF) in Tumkur district of Karnataka. The CSBN Project was implemented from 2001 to 2005 as a partnership with NGO's (nongovernmental organizations). The entire project was implemented with the funding support of the Norwegian agency for development (NORAD). Day and night cannot dwell together, the human strand in the web of life Community interventions as good practice in biodiversity conservation [12].

### 2.2 Social Survey

CSB's provides a very good hope for local farming community through the following: Provide good quality seeds, provide farmers with free and easy access to indigenous seeds under

the condition that a farmer returns double of the quantity of seeds he or she borrowed. It will not only reduce farmer's dependence on agri seed agencies but also help conserve the biodiversity of their rural villages. A survey of all accessible CSB's and their handling was conducted in 2004. A questionnaire was prepared and the results evaluated to at six project sites.

### **2.3 Establishment of Community Seed Banks**

Community based seed banking system is run, maintained and promoted by SHG'S(self help groups) to facilitate good quality seeds. These farmers very well understand the importance and qualities of their land races as they are growing these for centuries for their home consumption. Community based Seed banks are places of storage where indigenous, endangered seed varieties are conserved and managed by community members. These external conservation places provide farmers with free and easy access to indigenous seeds under the condition that a farmer returns double of the quantity of seeds he or she borrowed. It will not only reduce farmer's dependence on agri seed agencies but also help conserve the biodiversity of their rural villages.

Storage of seed in mud pots or in granaries or in containers made of ropes and plastered with mud or in well baked clay pots, are the some specific practices found in use during these periods. Community based seed banks are established by BIRD-K (BAIF institute for rural development, Karnataka) efforts for biodiversity conservation through community training, awareness and empowerment. The community seed banks are managed mostly by women, community seed banks have successfully harnessed the role of women in Indian agriculture as curator of biodiversity. Traditionally, it has been women who collect and store seeds after every harvest. Field staff of BIRD-K(BAIF institute for rural development, Karnataka) facilitates the set up of these seed banks by building a strong relationship with the community. Beneficiaries are trained on seed selection, collection, mode of transport, keeping storing seeds in the proper manner, lending seeds to those who request them and keeping records of seeds returned.

A very important duty of community based seed bank members is promoting traditional agro based practices through the use of locally

available seeds. These members are responsible for maintaining the quality of seeds by monitoring the farming techniques of members who contribute to the seed bank and ensuring that they employ non chemical farming method. They are, therefore, trained in seed selection, collection and storage methods and other aspects of seed bank management. After setting up a seed bank, members of existing women's SHG's within a community are invited to a meeting. A group is then selected from among these members to manage the seed bank. Meetings are held regularly in order to carry out the seed bank functions. The federations have also organized' seed mela's to promote awareness and practices for diverse seed protection and conservation. With setting up the first seed bank by the people's organizations at Balehalli in Tumkur district in early 2001- 2005 it has been replicated in many villages like Belavaneralu, Hullikere, Hanthanakere, Bellathahalli, and Kuriyarapalya villages etc. of Tumkur district.

There are no strategies obtainable to set up and run community seed banks as they structure an important part of informal seed supply method in villages since ancient time. Local agricultural community as per their conveniences has developed this method and the same is being sustained by the farmers. Though, under the present project six community based seed banks established in six clusters of Tumkur district of Karnataka are expected at gathering more than 50 percent of the seed requirement of farmer produced seeds in the targeted villages. Most important aspire of these seed banks, as envisaged under this project was to keep up the immense diversity of the local crops in farmer's crop lands, make available excellence seeds to farmers and save local landraces with their constant usual development. To attain these goals and to set up community seed banks, subsequent strategies have been followed.

- a. Survey of the project area to realize the requirement of local farmers and landraces being grown.
- b. Field staff visited the SHG groups (self help groups) and farmer's communities regularly to conduct discussions and provided guidance. Interaction with farmers to understand the current seed quality, seed prerequisite, difficulties in receiving superior quality and extent of seed, and their prospect requirements.

- c. Selection of suitable site, which is suitable, amicable safe and sound for storage of seeds. Place of seed bank should be accessible to the majority of the farmers of village and it may preferably belong to local village panchayat, government building or a common place or community hall developed by any nongovernmental organization (NGO) for village activities. Such site might need consent of most of the farmers of that village to develop as community seed bank.
- d. Improvement of infrastructure such as hygienic, dry and eminent space, storage bins of special sizes, weighing balance, seed drier, seed grader, documentation registers, display board, temperature and humidity recorder, display containers, open metal shelf, cloth bags for supply of seeds, sitting arrangement etc.
- e. Formation of SHG's (self help groups), having understanding of seed production as per the requirement of harvest to maintain seed purity as far as possible.
- f. Identifying the nodal person to look after the seed bank, daily function and maintenance, and encourage the SHG's (self help groups), to connect with this system to obtain utmost benefit of the seed bank.
- g. Encourage the community for participatory seed management practices and storing up of their tradition for future. First informal discussions with farmers and the community and self-help groups were held to find out and revive the endangered and vanishing local varieties. From which the village showed an interest in conserving them, a formal discussion was held to do seed mapping that is, determining seed variety that grow vigorously in the region. Endangered crop seeds were collected and seed banks were created to preserve them for multiplication. Community seed banks was managed by local self-help groups, the seed banks collect, distribute and multiply local varieties of seeds in an organized manner. This is to ensure farmers' increase seeds, which reduces their dependence on markets for their supply. From the above a Seed Management Committee, which is a federation of community seed banks, was created, which meets regularly to share information and discuss various issues. After project withdraws from the area, this community seed bank will take over the

management of the community seed banks. Periodical interaction and training of associated farmer families and farmer members of Seed Bank monitoring committee to make them aware of latest innovations in informal seed system and to get their input to improve on going system.

## 2.4 Training for Self-help Groups

During the project work in the villages, BIRD-K (BAIF Institute for rural development, Karnataka) has consistently promoted organic farming, and has held workshops periodically on seed banks, vermi composting, green manure and bio-pesticide preparation to self-help groups in managing the seed banks especially in the area of seed viability assessment, seed storage methods, importance of seed moisture content and humidity, fumigation techniques, seed grading, maintaining seed purity and quality, packaging and data recording. To maintain transparency in supervision the community seed banks, show of information and regular updating of all data as well as relevant information pertaining to seed bank in its location on black board. Assessing the excellence of seed at the time of supply and while taking it back from the farmers for storage. Linking the seed banks with farmer producer and marketing company for generating the marketplace for the excess seeds available in the seed banks to extend economic support to the farmers and seed banks.

## 2.5 Community Seed Mela's

Community seed mela's or Annual festivals are also held at certain times of the year according to the agricultural seasons which is easily disseminate information, seeds, and spread the messages, believes.

## 2.6 Management Monitoring Seed Quality and Health

Seeds stored for the long term should be regularly monitored for their moisture levels, safe storage without any external damage to containers and most importantly it should not be infected with pest or pathogen during storage. Separation of inert material, weeds and seeds of other crops from the seed lot is known as cleaning. Removal of smaller and wrinkled seeds from the well filled healthy seeds. After cleaning and grading seeds moisture content of seeds in the community seed banks can be accessed



through touching or chewing the seed. In container of high humidity, the seeds require to be absolutely dried up under the sunlight. Once entire exposure to air the seed must to be stored in the hygienic and dried out containers. In case of unfavorable weather conditions, drying must be done artificially. Seed obtained from the threshing floor is dried to the appropriate moisture level. Traditional method of seed storage is use of outer casing of gourd vegetables are used to store the seeds of vegetable crops. Community seed banks store the cereals in tall mud pots or bins, which is known as Vaade or Kanaja in Kannada. These are made up of clay soil and plant fibers. The mud pot of about 1-2 m height has a narrow opening at the top and covered with a tight lid. In some villages earthen pots made of clay to a convenient size are used from olden days for storage purpose. The mouth of the pot is closed with cow dung paste. Tall earthen pots are set perpendicularly one over the other depending upon the dimension of the vessel. In some villages gunny bags are used for storing seeds which is durable and inexpensive. Take required amount of neem, pongamia and vitex leaves and shade dry till it becomes dry. Seeds are filled up to quarter of a storage bin and covered with a clean leaves. Mix the above leaves and spread a hand full on the surface of the seeds in the storage bag or bin. This technique can also be followed in larger storage containers. Place unripe papaya fruit pieces in the corner of the storage go down. Once mice eat these fruits, the oral cavity tissues get injured due to the chemical substance in the papaya fruit. For one room, we can keep 3-4 pieces of the fruit.

### 2.7 Functioning of a Seed Bank

Once setting up a seed bank, members of existing women's SHG's (Self Help Groups) within a community are invited to a meeting. A group is then selected from among these members to manage the seed bank. Meetings are held regularly in order to carry out the community seed bank functions. Functions of a community based seed banks include: storing seeds in the appropriate manner, lending seeds to those who request them and keeping records of seeds returned. A very important duty of Community based seed bank members is promoting conventional farming practices from beginning to end the use of local seeds. These members are in charge for maintaining the wholesomeness of seeds by monitoring the farming methods of members who contribute to

the seed bank and ensuring that they employ organic farming method. They are, therefore, trained in seed selection and storage techniques.

### 3. RESULTS AND DISCUSSION

The study reveals that the community based seed banks store the cereals and pulses in tall mud pots or bins, which are known as Vaade or Kanaja in Kannada. Seeds are filled up to quarter of a storage bin and covered with a clean leaves of neem, vitex and cloth. Mix the above leaves and spread a hand full on the surface of the seeds in the storage bag. Rodents are control through using unripe papaya fruit pieces in storage go down to control rats. More than 70% storage bins are made up of mud pots and rest are made of gunny bags. The seed or grain protection measures are applied at two stages by the community seed banks. In the first stage, the storage bins made up of plant material are plastered with the help of cow dung and cow urine. The cow urine is acts as a repellant of storage insect pests. This is one of the oldest indigenous practices of seed storage in Tumkur. This have identified and learnt from their ancestors. The important methods of storage grain or seed protection local farming communities of Tumkur district are described in (Table 1). The BIRD-K (BAIF Institute for rural development-Karnataka) has helped establish close to 6community based seed banks across Tumkur, some of which contain as many as a 100 different varieties of indigenous seeds. Over 2500 households have been directly and indirectly impacted through these community based seed banks. These seed banks formed a Community Seed Bank Network (CSBN) developed to address the dire need for agro biodiversity conservation in Tumkur district. By working and developing strong links with community members and NGO (Non Governmental Organizations) aimed to meet the core objective of the community based seed bank Network: strengthening the livelihood of small scale and marginal farmers through biodiversity conservation and sustainable agricultural practices that would also safeguard the ecology of their land for future generations. In 2003, nearly 50 quintals of different types of local seed varieties including cereals, pulses and spices and dry fruits are collected from six community seed banks of Tumkur district. The quantity of seeds distributed by the community seed banks was 50tons of local seed varieties. Farmers one by one can have a loan of these seeds, from seed banks which is returned in twofold the

**Table 1. Summary of community seed banks (CSB) and local seed diversity accessible by community seed banks, 2003-2004 in Tumkur district**

Name of site	Organization/ Nongovernmental organizations (NGO)	Maintained by	No. Of CSB's	District	Plant parts and other materials used for seed /grain protection	Major cereals and pulses crop varieties	Vegetable seed varieties	Spices and dry fruits	Total quantity of seeds stored (in Quintal's)	Double the seed quantity in the year 2004
Balehalli	BIRD-[K] Tiptur	Self Help Groups	1	Tumkur	Neem, vitex papaya leaves and Cow urine	<b>Maize:</b> Bili jola  <b>Sorgum:</b> Mekke jola Kempu jola  <b>Fingermillet:</b> Doddaragi  <b>Paddy:</b> Hamsa Basumathi Byranellu	Coconut Gourd Green gram Red gram Pigeon pea, Horse gram Chickpea Potato Garlic Zinger Chilli Brinjol Tomato Sesamam Sun flower, Field bean Drumstick Papaya etc	Tamarind coconut	10	20
Kuriyarapalya	BIRD-[K] Tiptur	Self Help Groups	1	Tumkur	Neem, vitex papaya leaves and Cow urine	<b>Maize:</b> Bili jola  <b>Sorgum:</b> Mekke jola Kempu jola  <b>Fingermillet:</b> Doddaragi  <b>Paddy:</b>	Coconut Gourd Green gram , Red gram Pigeon pea, Horse gram Chickpea Potato Garlic Zinger Chilli	Tamarind coconut	6	12

Name of site	Organization/ Nongovernmental organizations (NGO)	Maintained by	No. Of CSB's	District	Plant parts and other materials used for seed /grain protection	Major cereals and pulses crop varieties	Vegetable seed varieties	Spices and dry fruits	Total quantity of seeds stored (in Quintal's)	Double the seed quantity in the year 2004
Balavanerlu	BIRD-[K] Tiptur	Self Help Groups	1	Tumkur	Neem, vitex papaya leaves and Cow urine	Hamsa Basumathi Byranellu  <b>Maize:</b> Bili jola  <b>Sorgum:</b> Mekke jola Kempu jola  <b>Fingermillet:</b> Doddaragi  <b>Paddy:</b> Hamsa Basumathi Byranellu	Brinjol Tomato Sesamum Sun flower, Field bean Drumstick Papaya etc Coconut Gourd Green gram , Red gram Pigeon pea, Horse gram Chickpea Potato Garlic Zinger Chilli Brinjol Tomato Sesamum Sun flower, Field bean Drumstick Papaya etc	Tamarind coconut	9	18
Hullikere	BIRD-[K] Tiptur	Self Help Groups	1	Tumkur	Neem, vitex papaya leaves and Cow urine	<b>Maize:</b> Bili jola  <b>Sorgum:</b> Mekke jola Kempu jola	Coconut Gourd Green gram , Red gram Pigeon pea, Horse gram	Tamarind coconut	10	20

Name of site	Organization/ Nongovernmental organizations (NGO)	Maintained by	No. Of CSB's	District	Plant parts and other materials used for seed /grain protection	Major cereals and pulses crop varieties	Vegetable seed varieties	Spices and dry fruits	Total quantity of seeds stored (in Quintal's)	Double the seed quantity in the year 2004
Belavathahalli	BIRD-[K] Tiptur	Self Help Groups	1	Tumkur	Neem, vitex papaya leaves and Cow urine	<b>Fingermillet:</b> Doddaragi  <b>Paddy:</b> Hamsa Basumathi Byranellu  <b>Maize:</b> Bili jola  <b>Sorgum:</b> Mekke jola Kempu jola  <b>Fingermillet:</b> Doddaragi  <b>Paddy:</b> Hamsa Basumathi Byranellu	Chickpea Potato Garlic Zinger Chilli Brinjol Tomato Sesamum Sun flower, Field bean Drumstick Papaya etc Coconut Gourd Green gram , Red gram Pigeon pea, Horse gram Chickpea Potato Garlic Zinger Chilli Brinjol Tomato Sesamum Sun flower, Field bean Drumstick Papaya etc Coconut	Tamarind coconut	7	14
Hanthanakere	BIRD-[K] Tiptur	Self Help	1	Tumkur	Neem,	<b>Maize:</b>	Coconut	Tamarind	8	16



Name of site	Organization/ Nongovernmental organizations (NGO)	Maintained by	No. Of CSB's	District	Plant parts and other materials used for seed /grain protection	Major cereals and pulses crop varieties	Vegetable seed varieties	Spices and dry fruits	Total quantity of seeds stored (in Quintal's)	Double the seed quantity in the year 2004
		Groups			vitex papaya leaves and Cow urine	Bili jola  <b>Sorgum:</b> Mekke jola Kempu jola  <b>Fingermillet:</b> Doddaragi  <b>Paddy:</b> Hamsa Basumathi Byranellu	Gourd Green gram , Red gram Pigeon pea, Horse gram Chickpea Potato Garlic Zinger Chilli Brinjol Tomato Sesamum Sun flower, Field bean Drumstick Papaya etc	coconut		
Total			6						50	100

quantity of what they borrowed (double the seed quantity in 2004 (Table 1). The collection of total quantity of local vegetable seed varieties spices and dry fruits seems to low, but collection of cereals and pulses are more quantity because they require high quantity transactions. Farmers are encouraged to take up seed production by being provided with seeds for this specific purpose. Most often, these seeds are sourced from the community seed bank. Interested farmers then multiply these seeds to return to the bank, which distributes them to members outside the community or village, with profits from the Endeavour being used to expand the seed bank. Community Seed Banks (CSBs) are places of storage where indigenous seed varieties are conserved and managed by community members. These ex-situ conservation sites provide farmers with free and easy access to traditional seeds under the condition that a farmer returns twice the amount of seeds he or she borrowed. They not only reduce farmers' dependence on seed companies but also help conserve the agro-biodiversity of their villages. Details of the quantity of seeds collected in all the community seed banks in 2003 are presented in Table 1.

#### 4. CONCLUSION

The study release that the local methods of seed conservation are very effective and eco-friendly. Detailed survey of these six villages was establishment of Community seed banks based on existing informal seed system, farmers families involved, diversity of crops, number of landraces available, infrastructure available at village level etc. In the present publication a case study of six community seed banks established in the six villages of Tumkur district. Detailed interaction with farmers and SHG's (self help groups) was undertaken during the survey and suitable location was identified, in most of the cases Non Governmental Organizations, village resource centers were preferred for establishing the seed banks. The role of NGO's (non governmental organizations) and local community bodies functioning in village is very important in organization, function and supervision of community seed banks. These organizations provide desired support in the form of established community seed bank centers self help groups, infrastructure such as human resources, where ever required. The existing trained individual resource was of immense help in encouraging the small and marginal farmers to contribute in this community seed share system.

Moreover, community seed banks as a stage of community based management of farming biodiversity can guarantee the efficient achievement of farmers' Rights. This besides provides an chance tolerate and incorporate formal and informal seed systems for addressing local evils, promote in-situ and ex-situ linkages to back up heritable resources locally as building block of crop improvement and food security, and ensure community development in a sustainable way. There are many challenges and opportunities to use the stage of the community seed bank as an unlock source seed system in order to support multi-functionality of farmer seed systems, safeguard and rest or conventional crop varieties, make stronger farmer ability in selection of qualities, plant breeding and seed production, produce data for value for cultivation, and advance access to and ease of use of local crop diversity. Seed multiplication is important in that it helps enrich the biodiversity of a local area by making available many indigenous seed varieties to farmers who hitherto had no access to the seeds. It is also an income generating scheme where individual farmers are compensated for their efforts in seed production. Therefore, the farmers have keenly participated and supported the association of community seed banks in the targeted villages to take highest benefit out of this scheme.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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