Community Seed Banks: Operation and Scientific Management

SK Malik, PB Singh, Archna Singh,
Arvind Verma, Niranjan Ameta
and IS Bisht

National Bureau of Plant Genetic Resources
Pusa Campus, New Delhi-110 012 India
www.nbpgr.ernet.in

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The National Bureau of Plant Genetic Resources (NBPGR), is a nodal organization under the aegis of Indian Council of Agricultural Research (ICAR) for the management of plant genetic resources in India. Global Environment Facility (GEF) funded sub-project "Harmonizing biodiversity conservation and agricultural intensification through integration of plant, animal and fish genetic resources for livelihood security in fragile ecosystems" Under Component 3 (SRLS), operational at NBPGR as lead centre, is aimed at identifying indigenous landraces and farmers varieties of crops and their intensification and conservation at farmer's field in three tribal districts namely Udaipur, Adilabad and Chamba. It has been envisaged to enhance the income of farmers by adding value to these local landraces through increasing production by better farming practices, value addition to the produce and by developing market value chain to provide better returns and enchanced livelihood to farmers. Strengthening of informal seed distribution system through the concept of Community Seed Banks has been, therefore, taken up under this project to facilitate farmers with quality seed of local landraces at almost no cost and also serving the purpose of "on farm" dynamic conservation and sustainable utilization of these indigenous landraces with farmer participation.

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Dr. K.C. Bansal
Director

Foreword

Conservation and use of plant genetic diversity has become an inevitable task to accomplish the goals of sustainable agriculture. Enormous genetic diversity of crop plants exists on the farmers' field in the form of traditional landraces and farmers varieties throughout the World. India being one of the centres of crop genetic diversity is rich in diverse plant species having importance to agriculture. This enormous plant genetic wealth needs to be conserved using diverse conservation approaches both *in situ* and *ex situ*. *Ex situ* conservation in seed gene banks have been found to be the most reliable and safe conservation method for safeguarding the germplasm for long term. However, recently the focus has been completely diverted to the *in situ* on farm conservation which have been advocated as a dynamic conservation method with the active participation of famers. National Bureau of Plant Genetic Resources, a nodal organization in India for management of plant genetic resources strongly advocates the use of complimentary conservation approaches to achieve the comprehensive conservation of diverse germplasm. In this context conservation of traditional landraces of crop plants using *in situ* on-farm conservation by farmers and tribal communities' is the key to achieve the sustainable agriculture as envisaged by our eminent agriculture scientist and thinker, Prof. M.S. Swaminathan. In achieving these tasks, importance of community seed distribution system becomes inevitable where farmers should be facilitated with quality seed of desired landraces. Community Seed Banks (CSBs) are playing very important role in this direction by facilitating small and marginal farmers with ensured supply of seed in developing and under- developed part of the World. These efforts are enhancing farmers livelihood and ensuring community based conservation. The role of community seed banks and conservation of local landraces through such approaches becomes important and has been rightly taken up under the ongoing GEF funded sub-project "*Harmonizing biodiversity conservation and agricultural intensification through integration of plant, animal and fish genetic resources for livelihood security in fragile ecosystems*" operational at NBPGR as the lead centre.

I congratulate the authors for developing this highly informative publication in the form of a technical bulletin enumerating the guidelines for establishing Community Seed Banks and also putting forth several important aspects of scientific management of CSBs. I am confident that this publication would be a useful source of information for CSB Nodal Persons, farmers, students and researchers.

(K.C. Bansal)

Preface

India is endowed with vast genetic diversity of crop plants and known as one of the mega centre of biodiversity as well as one of the centre of diversity of agriculture. Several indigenous farmers' varieties and landraces have been cultivated by the farmers since the ancient time in India. These landraces have been evolved, refined, conserved and used by local people for their specific agronomic, nutritional and other diverse economic traits. In the recent times aggressive promotion of monoculture and intensive agriculture through the use of high yielding varieties, even in the stressed and fragile agro-eco-systems to increase production and productivity of crops, have threatened the native plant genetic resources. National Bureau of Plant Genetic Resources (NBPGR) has been advocating the immense importance of these local landraces and undertaking all out efforts for their long-term conservation and sustainable utilization. Conservation of these crop landraces can be undertaken using various available approaches including traditional seed gene banks. However, the best method of conservation along with their sustainable use is to conserve these resources at farmers' field as "On-farm" dynamic conservation. Sustainable agriculture which has become a key to the development of agriculture in recent times cannot be fully attained without the active involvement of local farming communities. Therefore, under the GEF funded sub-project "*Harmonizing biodiversity conservation and agricultural intensification through integration of plant, animal and fish genetic resources for livelihood security in fragile ecosystems*" NBPGR has envisaged to enhance the livelihood of small and marginal farmers by adding value to these farmers varieties. This could only be achieved by motivating, educating and supporting the farmers in all possible ways and increasing the production of these indigenous landraces by using better farming practices and the supply of best quality seed of these landraces. Strengthening of informal seed distribution system through the concept of community deed banks has, therefore, been taken up as one of the important activity under this project to facilitate farmers with quality seed of local landraces at almost no cost. Involvement of farmers in cultivation of these landraces, production of seeds, its distribution to communities and maintenance in seed banks also serves the purpose of conservation of these indigenous landraces with farmers' participation. Further, the development of value chain, market support systems and adding values to these landraces would provide vital support to back-end operation and in turn increase income of farmers through use of indigenous plant genetic resources.

In the present Technical Bulletin authors have provided the importance of community seed distribution system for small and marginal farmers and elaborated the guidelines to establish community seed banks (CSBs). Scientific management of CSBs using simple methods of seed cleaning, grading, maintenance of seed purity, processing seeds for storage, seed quality and health testing and various methods of assessing seed germination have been provided. Along with the management of CSBs a case study of establishing fifteen CSBs at three blocks of district Udaipur has been enumerated along with the technical details and general information about each CSB. We believe that this publication would be of immense importance and use for CSB Nodal Persons (farmer's representatives responsible for maintenance of CSB), local farmers, students and researchers interested in the basics of seed storage and maintenance in the CSBs.

Authors

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CHAPTER 1

Introduction

Community Seed Banks (CSBs)

Community Seed Banks fulfills diverse purposes of sustainable agriculture for small and marginal farmers. These seed banks serve as focal point in maintaining indigenous genetic divesity on farm involving farmers community. CSBs serve local farmers to form an informal seed distribution system prevailing in villages since ancient time at no or very low cost. Community participation in maintaining local genetic diversity provides pride to farmers and sense of belonging for local landraces. This system is run, maintained and promoted by farmers to facilitate good quality seeds and input. Wherever in the world community seed bank system is operational farmers are immensely benefited and local landraces are protected from extinction. 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. These farmers very well understand the importance and qualities of their Inadraces as they are growing these for centuries for their home consumption.

District Udipur is situated in the southern part of Rajasthan between 23° 46' to 26° 20' N north latitude and 73° to 74° 35' E longitude. This district falls under agro-cliamtic zone IV (a) "Sub-humid Southern Plain and Aravalli Hills" . The district receives an annual rainfall of 645 mm. It has hilly, rocky, undulated and marginal lands occupying more than 22 per cent uncultivable wastelands. The district has human population of 2633312 of which 2142995 belongs to rural area and major share goes to ST and SC population which are largely illiterate, resource poor belonging to category of cultivators and agricultural labourers. In such areas importance of informal seed system is enormous to protect indigenous genetic diverstiy and to facilitate farmers with seeds of local landraces, other agriculture inputs and indigenous traditional knowledge at their doorstep. Keeping this in view, tribal population dominated fifteen villages in three blocks of district Udaipur were selected for establishing commuinty seed banks under the ongoing GEF funded project *"Harmonizing biodiversity conservation and agricultural intensification through integration of plant, animal and fish genetic resources for livelihood security in fragile ecosystems"* operational in this area by National Bureau of Plant Genetic Resources, New Delhi, as a lead centre of this project. The aim was to strengthen informal seed system prevailing in these villages especially of indigenous cultivars through supply of quality seed and sustainable farming practices and to enhance framers livelihood through diversification of these local cultivars. Maharana Partap University for Agriculture and Technology (MPUA&T) and Seva Mandir a non-governmental organisations are other two

important partners in this project located at Udaipur to facilitate NBPGR in this important activity. Seva Mandir a recognized non-governmental organization with a substantial presence in the remote villages of this tribal dominated district is already involved in the activities of benefiting famers through management of various natural resources and pursuing informal seed distribution system in traditional agriculture in some selected villages. However, there emphasis was more on the facilitating farmers with various livelihood support options to increase their income. MPUA&T have strong extension network in the villages of this district and small and marginal farmers are being benefited by several technologies generated and brought up by staff of this University.

CSB: Description, aims and objectives

Community seed banks are collections of seeds of local landraces that are maintained and administered by the communities themselves. Seeds can be stored by a community either in large quantity to ensure that planting material is available, or in small samples to ensure that genetic material is available even if varieties become endangered or extinct. The main aim of community seed bank is to increase local seed security and contributing to the possibilities to continued utilisation of locally important genetic diversity. Community seed banks, therefore, play a vital role in ensuring seed security and improving farmers' access to seeds, conserving agricultural biodiversity and the associated traditional knowledge, providing options for adapting to climate change, as well as can contribute to the realization of Farmers' Rights. Community seed banks have the advantage of giving easy access to farmers, and are easy to link to constant on-farm conservation. In situ or on-farm conservation where farmers actively maintain diversity in their fields is crucial in order to continue the dynamic evolutionary process of local genetic diversity and its associated knowledge and culture. Specific objectives, therefore, include:

- Maintain diversity and sustainable conservation of farmer landraces.
- Link community seed banks and Farmers' Rights.
- Link community seed banks with Farmers' Rights and sustainable agricultural production.

CHAPTER 2

Establishment of Community Seed Banks: Procedures and Guidelines

There are no set guidelines available to establish and manage community seed banks as they form an important part of informal seed distribution system in villages since ancient time. Farming community as per their convienience has developed this system and the same is being continued by the farmers. However, under the present project fifteen community seed banks established in three blocks of Udaipur district of Rajasthan are aimed at meeting more than 60 percent of the seed requirement of farmer produced seeds in the targeted villages. Prime aim of these seed banks, as envisaged under this project was to maintain the vast diversity of the indigenous crops in farmers fields, provide quality seeds to farmers and conserve indigenous landraces with their continueous natural evolution.

To achieve these goals and to establish community seed banks, following procedures and guidelines have been followed:

1. Survey of the area to understand the need of farmers and landraces being grown.
2. Interaction with farmers to understand the prevailing seed quality, seed requirement, difficulties in getting good quality and quantity of seed, and their future needs.
3. Selection of suitable site which is convenient, approachable and safe for storage of seeds. Location of seed bank should be accessible to most of the farmers of village and it may preferably belong to local panchyat, government building or a common place developed by any non-governmental organization (NGO) for village activities. Such site might need consent of most of the farmers of that village to develop as CSB.
4. Development of infrastructure such as clean, dry and elevated space, storage bins of different 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.
5. Formation of farmer groups having understanding of seed production as per the requirement of crop to maintain seed purity as far as possible.
6. Indentifying the nodal person to look after the seed bank, day-to-day operation and maintenance, and motivate the farmers to associate with this system to derive maximum advantage of the seed bank.
7. Motivate the community for participatory seed management process and conservation of their heritage for future

generations. Regularly organizing community seed bank awareness camps in the cluster covering 3-4 village seed banks.

8. Training of nodal farmers 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.
9. To maintain transparency in managing the CSBs, display of information and regular updating of all data including relevant information pertaining to seed bank in its premises on black board/register.
10. Nominating five member Seed Bank Monitoring Committees with two members from farmers, one seed bank nodal person and one member from Seva Mandir and NBPGR to regularly suggest improvements and innovations in CSBs.
11. Assessing the quality of seed at the time of distribution and while taking it back from the farmers for storage.
12. Linking the seed banks with farmer producer and marketing company for generating the market for the surplus seeds available in the seed banks to extend financial support to the farmers and seed banks.
13. Periodical interaction and training of associated farmer families and farmer members of Seed Bank Monitoring Committee (SBMC) to make them aware of latest innovations in informal seed system and to get their input to improve on going system.

Conditions leading to success of CSBs

- Willingness of farmers to participate in community seed bank interventions.
- Large scale cultivation of local landraces as component of subsistence farming.
- Majority of local landraces have an important incentive of fetching premium prices in markets after some add-value interventions particularly through processing or packaging.

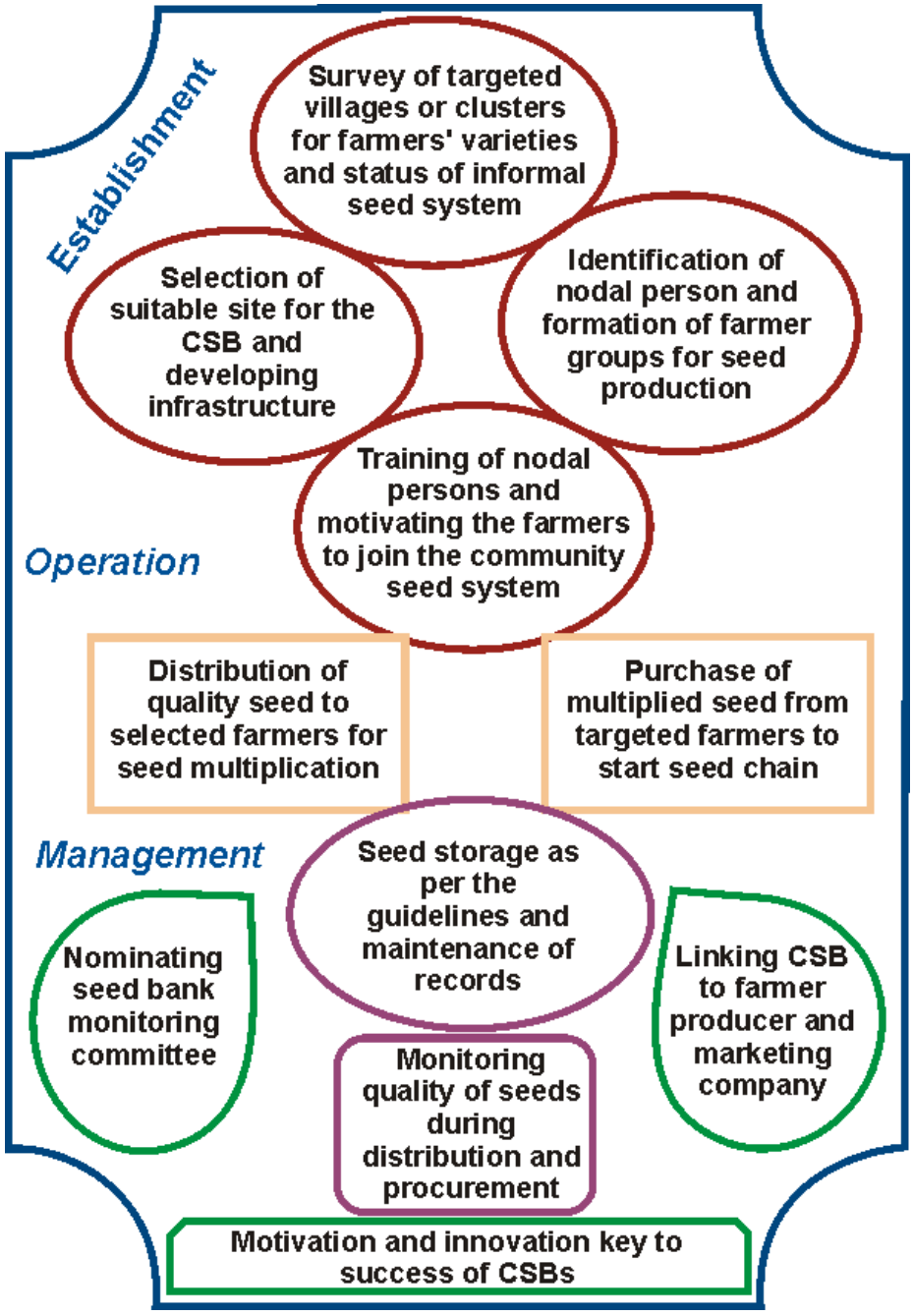

Fig. 1 Establishment, operation and management of CSBs

CHAPTER 3

Scientific Management of CSBs

In the present scenario of intensive agriculture and looking to commercial interest of seed suppliers, such traditional seed distribution systems are under threat. National Bureau of Plant Genetic Resources under this GEF funded project has taken up this challange with the active support of Seva Mandir, Udaipur and MPUA&T, Udaipur to stregthen community seed distribution system by establishing community seed banks. Scientific management of CSBs have been emphasized and nodal farmers were trained in managing seed banks following established guidelines.

1. Maintenance of seed purity at farmers field and at CSBs

This is an important exercise to maintain the physical and genetic purity of seed in the farmers' field and at the seed bank. In landraces or farmers varieties very high purity levels are not excepted as the concept of landraces itself is their development and evolution on farm. For this farmers have developed several check and balances since generations to maintain the desired genetic purity levels. However, for ideal seed distribution system best quality seed of particular landrace should be produced and distributed to farmers to realize good production and quality of crop. Each crop as per its breeding behaviors needs some precautionary measures to be followed in the field especially when grown for seed production. Some of these are discussed briefly.

Precautions at farmers field

(a) *Maintaining isolation*

The crop raised for seed production should be separated from other fields of the same crop species by a minimum distance, which varies from one crop to the other. This distance is known as isolation distance. Isolation is essential to prevent pollination from unwanted pollen in the case of cross-pollinated and often cross-pollinated species and to avoid mechanical mixture and chance cross-pollination in self-pollinated species. The isolation distance varies from 3 m in self-pollinated crops like wheat, rice, etc., and minimum 200 m in the case of maize, bajra and jowar. Similarly, all other crops require minimum isolation distance for better seed production.

(b) *Rouging*

Rouging is the removal of plants, which are off-type, that is, phenotypically different from the plants of the variety or cultivar under certification or production. It is an important aspect of seed production and is necessary to prevent out crossing and mechanical mixture. The off-type plants are regularly removed from seed fields either by uprooting or by cutting at the ground level.

Precautions at seed banks

(a) *Physical purity*

Physical purity implies freedom of seed from

inert matter and from defective seeds. Inert matter consists of nonliving materials, such as, sand, pebbles, soil particles, straw etc. Defective seeds are those seeds that are broken, diseased, insect infested, shriveled and unfit for germination. A broken seed larger than half of the normal seed is not considered defective provided its embryo is not damaged.

(b) *Freedom from weed seeds*

Freedom from weed seeds is necessary to prevent weeds from spreading through seed and to reduce losses caused by weeds. The maximum amount of weed seeds permitted is very low; it varies from zero percent in crops like maize and tomato to 0.2 percent in cauliflower, onion, carrot etc. For certain crop species, some weeds are classified as objectionable or noxious weeds. Physical removal of weed seeds is desirable before distributing it to farmers.

2. Seed handling, cleaning and grading

Seeds received from the farmers' field are to be cleaned, graded and processed for storage. This process can be accomplished using small commercial seed graders or manually if seed is in small quanity. First through air cleaning dust and chaff is removed from the seed lot and by seed size and shape, based on specific gravity, small and light weight seeds are removed. Sand and small stones and other impurities are also removed from the seeds manually or by using commercial seed graders cum cleaner.

(a) *Cleaning*

The seed from threshing floor is mixed with seeds of other crops and of weeds, pieces of straw, gravel, soil etc. Further, the seed is not of uniform size, but it contains seeds of several sizes some of which are undersized, shrivelled and unfit for use as seed. Separation of inert matter, weed seed and seeds of other crops from the seed lot is known as cleaning.

(b) *Grading*

Removal of smaller and shrivelled seeds from the well filled healthy seeds. In India, air and screen machine is extensively used for cleaning and grading of seed. This machine uses air current for separating seeds on the basis of their resistance to air stream and uses sieves to separate seeds on the basis of their size and shape. Commonly, the air and screen machine has either two or three screens; the size of screens varies depending upon the crop. Dried seed is passed through the air and screen machine for simultaneous cleaning and grading. However, at CSBs this activity can also be undertaken mannually for small quantity of seeds using wooden seives.

3. Seed storage procedures for CSBs

After cleaning and grading seeds are ensured for its optimal moisture content which plays important role in determing storage period. Moisture content of seeds in the community seed banks can be accessed through touching or chewing the seed. In case of high moisture, the seeds need to be completely dried under the sunlight or small seed driers can be used for uniform and fast drying. For better seed viability and longevity, seeds should be brought to the optimum moisture content of 7-10% before storage. After complete drying the seed need to be stored in the clean and dry containers, preferably of steel or aluminum. Seed containers

should be air tight and match the quantity of seed to be stored. Very large containers are to be avoided for air tight storage and for the ease of handling the seed bins on regular basis. Storage containers must be kept at dry, cool and elevated place to avoid any damage to containers and seeds. Drying of seeds in seed banks can be undertaken using following methods:

(a) *Natural drying*

Natural drying is done by spreading the seeds in trays, on floors or field in the open sunlight. Air movement and heat generated by sun rays would dry the seeds provided weather conditions are favourable. In case of unfavourable weather conditions, drying must be done artificially.

(b) *Artificial drying*

Artificial drying of seeds is attempted using heated air method involving passing of hot air through the seed lot. This method is quicker, faster and requires less drying space than the natural drying method. Drying is not affected by weather conditions as is the case with the unheated air method. The disadvantages of this method are high initial equipment cost, recurring cost of fuel or electricity and possibility of overheating the seed, which may reduce seed germination. However, in the CSBs espcially designed small seed dryers can be used for regularly drying the seeds.

(c) *Seed processing*

Seed obtained from the threshing floor is dried to the appropriate moisture level, cleaned to remove inert matter, seeds of other crops and of weeds, graded to separate oversized and under-sized seeds of the same crop, treated with disinfectants and/or protectants and finally filled in storage containers of an appropriate size.

(d) *Seed storage*

Seed produced in current season would be used

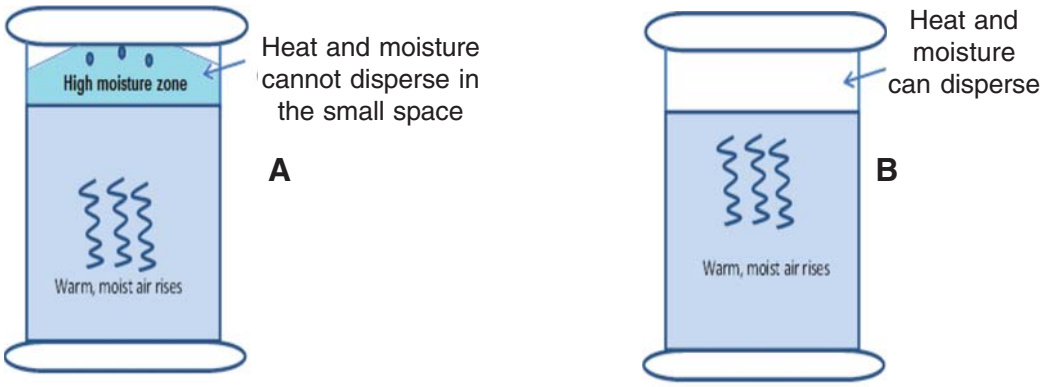

Fig 2. Storage of seeds in the metal bins **A.** Fully filled bin where upper part becomes high pressure zone unable to disperse heat and moisture. **B.** Upper part of bin is kept empty which would facilitate dispersal of heat and moisture generated from the grain /seed filled area

for crop production in the next cropping season only. Till that time, it must be stored in a clean, dry storage space to protect it from damage due to storage pests and adverse weather. For a longer storage, seeds must be stored in a room with low temperature and relative humidity.

Seeds should be stored in the suitable containers preferably made of steel or aluminium and airtight with lock and key facility for safety of stored seed. Containers size should be appropriately chosen as per the seed quantity to be stored. Storage bins should not be very large or small, as very large containers would be occupying lot of unwanted space while small containers would be fully filled and may cause damage to the stored seeds. Storage bins may not be fully filled with seeds, some upper part of container should be kept empty to enable the moisture and heat to disperse in this empty space as shown in fig. 2 A and B.

4. Treatment of seeds and storage containers

Seeds when harvested from the farmers' field are bound to several infections due to the exposure to external conditions which may infect seeds with disease causal organisms. Seeds procured from the farmers field may be infected or infested with external or surface borne pathogens such as common bunt of wheat, soil borne pathogens or with internal seed borne pathogens such as loose smut of wheat (fig. 4). Treatment of seeds and storage containers provide a protection against diseases, soil-borne organisms which enable even the weak seeds to germinate optimally. Seed and storage container treatment is must with appropriate fungicide and insecticide or with a combination of both to disinfest and disinfect them from seed-borne or soil-borne pests and storage insects. Exposure of seeds and containers to sun light reduces the moisture content and disinfect these to some extent. However, for long-term storage

Fig. 3 Commercially available Aluminium phosphide pouch

of seeds in CSBs seed treatment is must using recommended fungicides and insecticides in optimal dosages. Surface treatment of seeds with powdered fungicides and insecticides is recommended to protect the seed in storage. Following seed treatments are recommended using various commercially available fungicide, insecticide and antibacterial formulations.

- The seed to be stored for use in next season may be treated with fungicides (Bavistin or Captan or Thiram or Dythan M-45 or Vitawax) and insecticide (Malathion) in addition with Streptocyclin and Agral-90 or Nu-film-P. Recommended quantity for seed treatment is 2-5 % powder @100- 250 g/100 kg of seeds.
- Seed may also be fumigated using commercially available Aluminium Phosphide (fig. 3) @ 3g tablet/tonne of grain for seven days exposure period for the effective control of stored grain insect pests.

The storage receptacle should be air tight. The treated grains should be aerated properly before use.

a. *Steps to be followed for treatment*

While several procedures to manage pests and pathogens are used at CSBs before storage of seeds, those that minimize pest invasion into storage structures include:

- Cleaning of storage bins before the seed storage and after the seed distribution by applying insecticides to the inside of the structures,
- Sealing the bins and surrounding wall gaps,
- Regular cleaning up of grain spills on the grounds and other organic waste near the bins
- Regular monitoring of temperature and humidity of CSBs since higher moisture can encourage fungal and insect development.
- Close monitoring of grain temperature and insect populations.

b. *Precautions during seed treatment:*

Treatment of seeds is always done by chemicals which are harmful to human and animal health. Some of these chemicals if treated heavily may harm the seed viability. It is therefore, ensured that treated seeds should never be used for human and animal consumption in any form. Containers in which seeds are stored and seed bags which are supplied to farmers from the CSBs should be properly labelled as "Treated seeds not for consumption". Seeds and storage containers must be treated as per the recommended dosages of chemicals. Under or over treatment with these chemicals would not serve the right purpose of seed treatment as seed would be spoiled at the end of season. Seed moisture content at the time of storage is highly crucial which may make the seed susceptible to diseases and injury.

5. Monitoring seed quality and health

Seeds stored for the long-term or one season

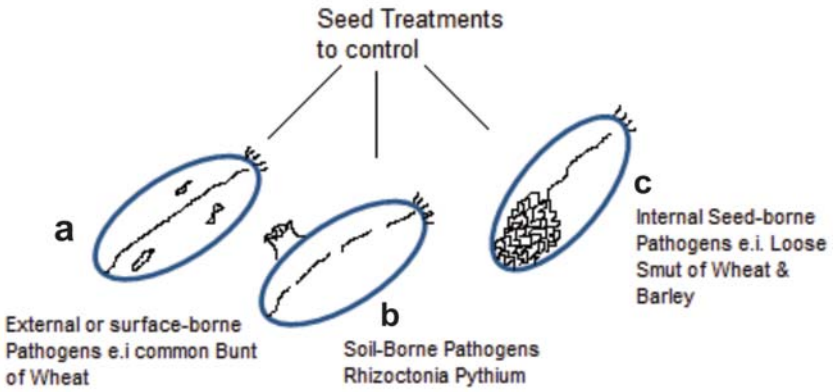

Fig. 4 Seeds procured from farmers field may be infected with **(a)** surface borne, **(b)** soil borne and **(c)** internal seed borne pathogens.

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. To avoid all this it is better to make a monthly physical inspection of containers surrounding environment and quaterly physical inspection of seeds stored in these containers. In case of oil seeds and seeds with low longevity, viability test can also be conducted periodically.

6. Monitoring seed germination, viability and vigour before seed distribution

It is desirable to ascertain seed quality parameters before distributing seed from the CSBs. For this nodal person should have the knowledge of some simple scientific terms and procedures to ensure the viability and germination of seed.

Seed viability in simple terms means the ability of seed to germinate. It means viable seeds may not always germinate due to some or other reason. Viable seeds of each crop may require some specific conditions to fully germinate. Most of the cereals, millets and pulses have good viability when stored for one season at normal temperature and humidity. Oilseeds and seeds of some vegetables and fruits lose seed viability within few months and need to be stored at low temperatures.

a. *Seed germination requirements*

- Viable seed: Seed must be alive (embryo)
- Correct environmental conditions including:
  - Water
  - Temperature
  - Oxygen
  - Light
- Lack of dormancy or dormancy released

b. *Categorization of seeds based on germination*

- **Viviparous:** seeds may not dry or become dormant resulting in precocious germination. Maturation is not complete; often germinate while still attached to plant. Post harvest sprouting. Example-Jackfruit, Mahua.
- **Normal:** seed dries and matures but seed (embryo) dormancy is either absent or reduced and will readily germinate under proper conditions. Example-cereals, millet and pulses etc.
- **Dormant:** requires a resting period after ripening process before it can germinate. Dormancy imposes a restriction on seed ability to readily germinate. Example-vegetables, cucurbits and some legumes.

c. *Process of seed germination*

- Begins with the imbibitions or uptake of water.
- Increase in fresh weight due to the uptake of water
  - Phase I—water uptake by imbibition
  - Phase II—short lag phase, if any increase in FW (Fresh Weight)
  - Phase III—radical emergence

d. *Methods of seed germination*

Simple methods of seed germination with minimum requirement can be practiced in CSBs.

These are described below:

- Choose a sample of seeds representative to the whole lot from the test crop. Select a random sample from seed lot, not only good looking seeds should be selected. Seed sample should be quite large for accurate result. Minimum ten seeds in replicate of two should be considered an absolute minimum for checking germination percentage.
- If the stored seeds are not already treated these can be rinsed in a bleach or fungicide solution 1 part bleach/fungicide (may be Bavastin) to 10 parts of water. This would help in preventing fungal and/or bacterial growth during seed germination test.

Petri-plate method

- Stored or fresh seeds in CSBs can be germinated in the plastic petri-plates (11cm diameter) as top of paper (TP) fig. 5A and between the paper (BP) method fig. 5B where in TP seeds are put on the paper disc while in BP seeds are germinated between two paper disces.
- Cleaned plastic petri-plates are to be lined with filter paper discs.
- Seeds are placed on filter paper, number of seeds may be minimum ten and may go up to twenty depending upon the size of seeds in one petri-plate (fig. 5C).
- Rinse the filter paper with clean water using sprayer till it gets completely moistened, however, no surplus water should be visible on the surface of filter paper.
- For BP cover the seeds with another disc of filter paper (fig. 5B) and again rinse the water till cover paper disc be moistened fully and in case of TP cover paper disc is not used.
- Place the cover of pteri plate and write the date and name of crop on the top of cover using permanent marker before keeping these at clean, cool and dry place.
- Regularly (daily or alternate days) check the seeds for observation on seed germination (radicle emergence is generally treated as seed germination fig. 5H), it may take 2-5 days till the seeds start germinating, however, number of days for initiation of germination would depend on crop and seed quality. In case of hard seed coat seed germination period may be more.
- Regularly rinse the water on filter papers to keep it moist and take observation on number of seeds germinated on that particular date. Also note down the seeds which are soft or rotten and seeds which are very hard. Such seeds are to be discarded and treated as non-germinating.
- Note down the total number of seeds, number of seeds germinated during every examination at alternate days till all the seeds are germinated or for maximum 10-15 days.
- If all of the seeds germinated, then the germination rate is treated as 100%. If it was less than perfect then divide the number of seeds that germinated by the number we started with and determine the percentage germination rate. For example,

if we started with ten seeds and only nine seeds germinated, then 9/10 = 0.9 or 90% seed germination.

- If the germination rate is low but still vigorous, we can still go ahead and distribute it to farmers. It just means that sow extra seeds to get a good stand. For example, if the germination rate is 50%, sow twice as much seed. However, if the seeds are slow to germinate on top of a low germination rate, it is probably best to replace this seed lot with fresh seed lot.

Paper towel method:

For this germination method paper towels, wax paper or plastic bags are required.

- Moisten a paper towel till it reaches to saturation point. It should be wet but not dripping. Using a misting spray bottle is useful (fig. 5D).
- Place seeds to be tested on one half of the damp paper towel and fold the other half over the seeds (fig. 5E).
- Place the paper towel with the seeds into a plastic bag or wax paper and partially close the bag or fold the two ends. Using the marking pen, write the name of the sample, the date you are starting and the number of seeds placed for germination. Also write this information into a notebook.
- Keep the bag/towel paper in a cool and dark place. It is better to place these in a tray and keep this tray at clean place in the cupboard or shelf.
- On a daily or alternate day basis, remove the towel and check on the seeds germinated. Keep the paper towel evenly moist and note the number of seed germinated during every reading. Seed germination times vary by crop to crop.
- After few days, seeds start germinating, seed which are soft or infected or rotten may be treated as dead and discarded. If it is growing into a seedling (fig.5F), count it as germinated and discard it later. Keep a record and running count of the good and bad seeds in the note book.
- Refold the towel, place it back into the polythene bag and check again. At the end of an acceptable amount of time (10-15 days), or if all of the seeds have germinated, count the total number of good seeds. Calculate the seed germination percentage as explained earlier.

Sand and moss grass method:

Seeds can also be germinated in the sand either in small pots or in petri-plates (fig. 5G, H). Large seeds requiring high moisture can also be germinated in the peat moss or moss grass (fig. 5 I, J).

TTC method

If seed gemination is to be avoided as this is time consuming a simple method of TTC test can be undertaken. Simple method of confirming viability is to keep dissected seed in 0.1 percent solution of 2,3,5-triphenyl tetrazolium chloride (TTC) at pH 7-8, and kept dark for 12 to 24 hours. The cut seeds are then examined for red staining in embryo which indicates viable (fig. 5 K, L) and nonviable seeds remained unstained (fig. 5 M).

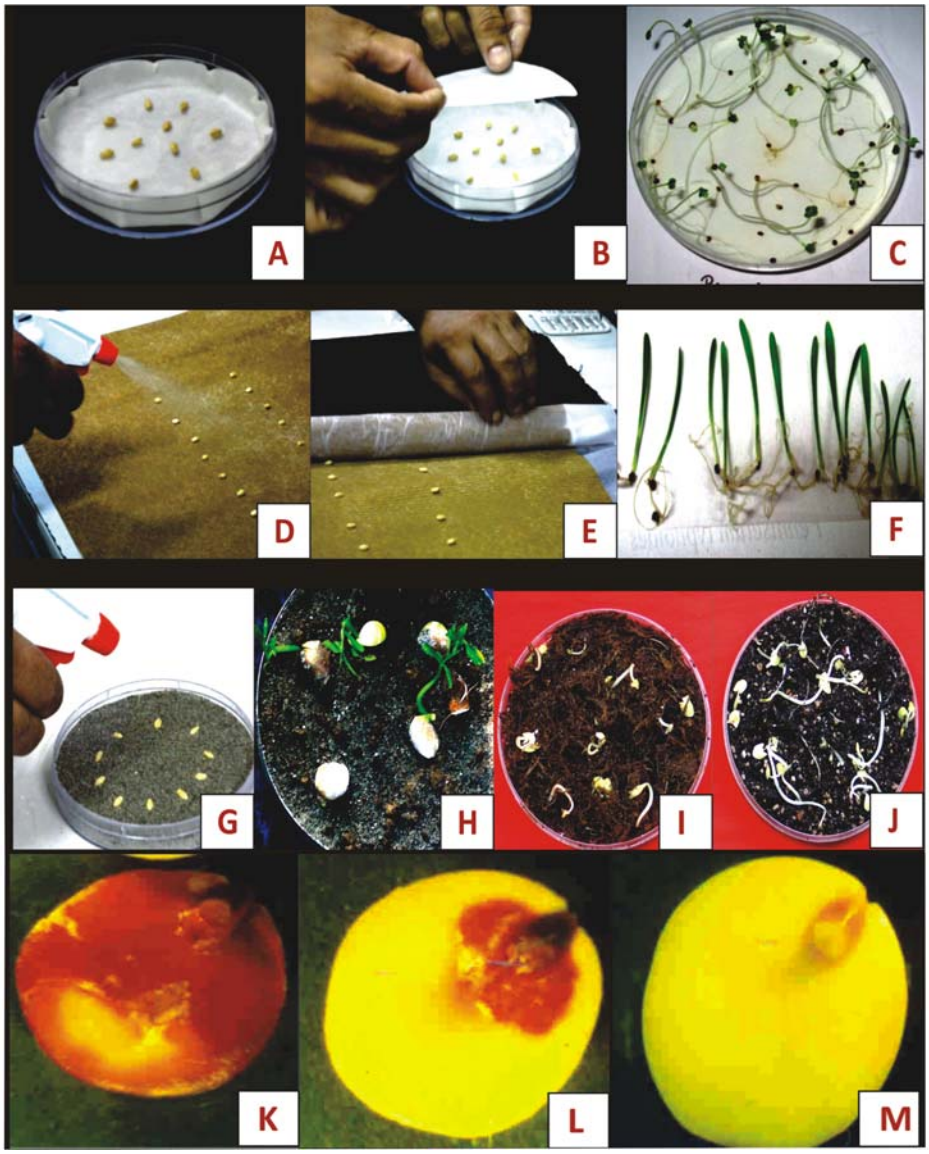

Fig. 5 A-M. Various simple methods of seed germination and viability testing. **A.** Top of paper method in petri-plate. **B.** Between the paper method of seed germination in petri -plate. **C**. Germinated seed in petri-plate. **D.** Paper towel method of seed germination showing putting of seeds and water spray using spraying bottle. **E.** Rolling of paper towel with wax paper. **F.** Seedlings raised in the paper towel. **G.** Seed germination in sand filled in the petri plate. **H.** Germinated seed in sand. **I**. Seed germinated in moss grass. **J.** Seed germination in peat moss. **K.** Seed viability testing using TTC showing red colour indicating viable seed. **L.** Only embryonic axis showing red colour and not cotyledons. **M.** Non-viable seed not indicating red colour in TTC staining.

CHAPTER 4

Community Seed Banks at Udaipur: A Case Study

In the present publication a case study of fifteen community seed banks established in the three tribal dominated blocks *viz*. Jhadol, Girwa and Vallabhnagar of district Udaipur, Rajasthan have been presented. These CSBs have been established under the ongoing GEF funded project "***Harmonizing biodiversity conservation and agricultural intensification through integration of plant, animal and fish genetic resources for livelihood security in fragile ecosystems***". Detailed survey of these three blocks was undertaken and fifteen villages have been identified at initial stages for the establishment of CSBs based on existing informal seed system, farmers families involved, diversity of crops, number of landraces available, infrastructure available at village level etc. Detailed interaction with farmers was undertaken during the survey and suitable location was identified, in most of the cases panchyat bhavans and NGO's village resource centres were preferred for establishing the seed banks. Role of non-governmental organizations and local civic bodies working in village is very important in establishment, operation and management of community seed banks. These organizations provide desired support in the form of established farmers groups, self help groups, infrastructure such as farmers resource centres and human resources, where ever required. In district Udaipur Seva Mandir a non-governmental organization with a mandate to enhance livelihood of small and poor farmers through exploiting local natural resources has been a partner in this project. In the present case of establishment, operation and management of fifteen CSBs in villages of Udaipur district close association of Seva Mandir and its existing ground work force in the form of self help groups and natural resource management teams was of enormous support. The pre-existing trained human resource was of great help in motivating the small and marginal farmers to participate in this community seed distribution system. Therefore, the farmers have enthusiastically participated and supported the establishment of community seed banks in the targeted villages to take maximum benefit out of this venture. For operation and maintenance of each CSBs one nodal farmer was identified and trained on various technical aspects of seed handling, cleaning, grading, storage, treatments, distribution, germination tests and several other aspects. Beside the nodal farmers, farmer families involved with each seed bank was motivated and community seed bank awareness camps were organised in each clusters to interact with the farmers and to explain them

the need and benefits of community seed system and importance of seed banks. Detailed data on crops being grown in these areas, their breeding behaviour, farmers families involved with particular seed bank and tentative quantity of seed to be maintained at each seed bank were provided. Name of village, panchayat, block, name of nodal person with contact details and total famers families benefited from the particular seed banks have been mentioned for all the fifteen seed banks in annexure 1 to 15. Locations of these CSBs in district Udaipur are given in fig.6 and table 1 provide detailed list of CSBs, important crops being handled and approximate seed quantity being distributed to farmers in each CSB. Botanical name and name of local landraces of important crops of Udaipur district with their representative photographs are provided in table 2 and fig. 7-12.

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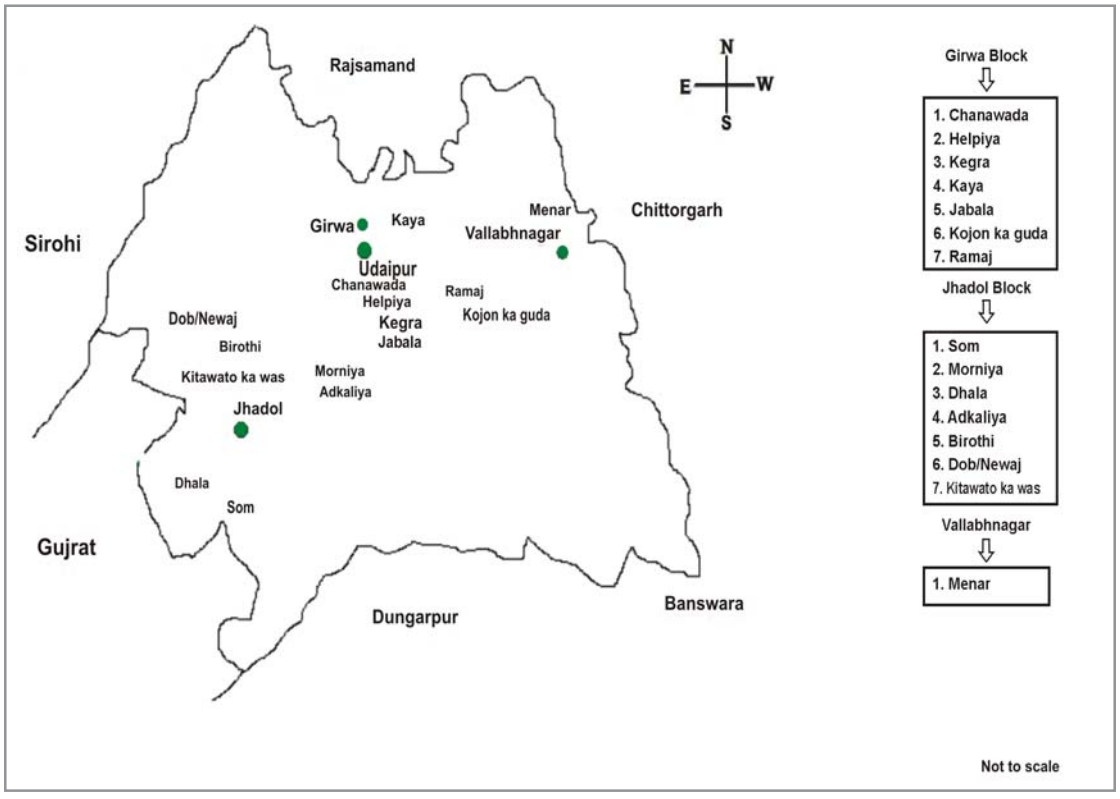


Fig. 6 Locations of 15 Community Seed Banks in 3 Blocks of District Udaipur

Table 1. List of 15 Community Seed Banks in Three Blocks of Udaipur District

S.N.	Name of Villages	Panchayat	Block	Major crops and landraces being maintained	Approx. quantity of seed in distribution (q)
1	Som	Som	Jhadol	Maize (Malan and Sathi), Sesame, Black gram, Green gram, Rice, Pigeon pea, Horse gram	25-30
2	Birothi	Birothi	Jhadol	Maize (Malan and Sathi), Sesame, Black gram, Green gram, Pigeon pea, Chick pea, Cluster bean, Horse gram	20-25
3	Kitawato Ka Was	Gejvi	Jhadol	Maize (Malan and Sathi), Sesame, Black gram, Green gram, Pigeon pea, Cluster bean, Horse gram	25-30
4	Morniya Fala (Pargiya Pada)	Madri	Jhadol	Maize (Malan and Sathi), Sesame, Sorghum, Black gram, Rice, Horse gram, Chick pea	20-20
5	Dhala	Amiwara	Jhadol	Maize (Malan and Sathi), Sesame, Sorghum, Black gram, Rice, Horse gram, Chick pea	20-25
6	Dob/ Nevaj	Nevaj	Jhadol	Maize (Malan and Sathi), Sesame, Rice, Horse gram, Cluster bean, Chick pea	20-25
7	Adkaliya	Kanthriya	Jhadol	Maize (Malan and Sathi),	15-20

				Sesame, Rice, Horse gram, Sunhemp, Chick pea	
8	Chanawada	Chanawada	Girwa	Maize (Malan and Sathi), Sesame, Sorghum, Black gram, Green gram, Rice, Horse gram, Chick pea	20-25
9	Kojon Ka Guda	Lalpura	Girwa	Maize (Malan and Sathi), Sesame, Cluster bean, Horse gram, Chick pea	15-20
10	Ramaj	Paramda	Girwa	Maize (Malan and Sathi), Sesame, Cluster bean, Horse gram, Chick pea, Green gram	20-25
11	Helpiya (Krishanpura)	Singatwara	Girwa	Maize (Malan and Sathi), Sesame, Cluster bean, Horse gram, Chick pea, Black gram	25-30
12	Kegra	Paduna	Girwa	Maize (Malan and Sathi), Sesame,Cluster bean, Horse gram, Chick pea, Green gram	15-20
13	Kaya	Kaya	Girwa	Maize (Malan and Sathi), Sesame, Cluster bean, Horse gram, Chick pea, Green gram	20-25
14	Jabala	Paduna	Girwa	Maize (Malan and Sathi), Sesame, Cluster bean, Horse gram, Chick pea, Green gram	25-30
15	Menar	Menar	Vallabhnagar	Maize (Malan and Sathi), Sesame, Cluster bean, Rice, Methi, Chick pea, Green gram, Sorghum	35-40

Table 2. Local Landraces of Important Cereals, Millets and Vegetables in District Udaipur

S. No.	Crop name	Botanical name	Name of Landrace	Fig
1	Maize	*Zea mays var. indentata*	Malan Makka	7
2	Maize	*Zea mays var. induranta*	Sathi Makka	7
3	Rice	*Oryza sativa*	Hejni	8
4	Rice	*Oryza sativa*	Mauriya	8
5	Rice	*Oryza sativa*	Kalawari	8
6	Rice	*Oryza sativa*	Doodhmogar	8
7	Black gram	*Vigna mungo*	Khakhariya	9
8	Green gram	*Vigna radiata*	Mung	9
9	Gram	*Cicer arietinum*	Chana	9
10	Pigeon pea	*Cajanus cajan*	Safed Tuar	9
11	Mustard	*Brassica campestris*	Sarson	10
12	Sesame	*Sesamum indicum*	Dhauli Talli	10
13	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	11
14	Ridge gourd	*Luffa acutangula*	Aara Taroi	11
15	Kakora	*Momordica dioica*	Kinkoda	11
16	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	11
17	Pumpkin	*Cucurbita moschata*	Kola	11
18	Sorghum	*Sorghum bicolor*	Gugali Malan	12
19	Sorghum	*Sorghum bicolor*	Nani Makki	12
20	Proso millet	*Panicum miliaceum*	Cheena	12
21	Finger millet	*Eleusine coracana*	Mal	12
22	Ajwain	*Trachyspermum ammi*	Ajwain	13
23	Fenugreek	*Trigonella foenum-graecum*	Methi	13

Malan

Sathi

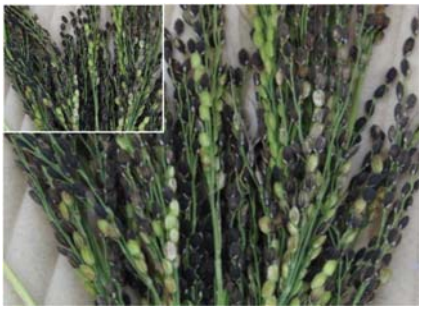
Malan

Sathi

Fig. 7 Maize Landraces

Hejni

Mauriya



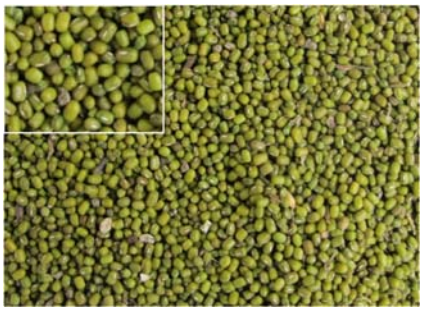
Kalawari

Doodhmoger

Fig. 8 Paddy Landraces

Chickpea (Chana)

Black gram (Urd Khakhariya)

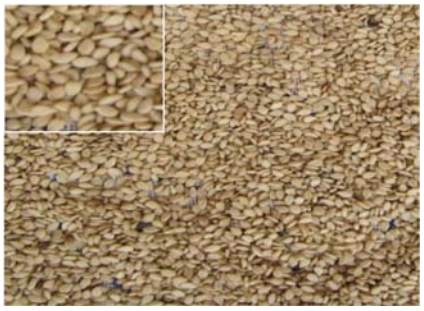


Green gram (Mung)

Arhar (Safed Tuara)

Fig. 9 Pulse Crop Landraces

Black mustard (Sarson)



Sesame (Dhauli Talli)

Fig. 10 Oil Seed Landraces

Bitter gourd (Karela)

Ridge gourd (Aara Taroi)

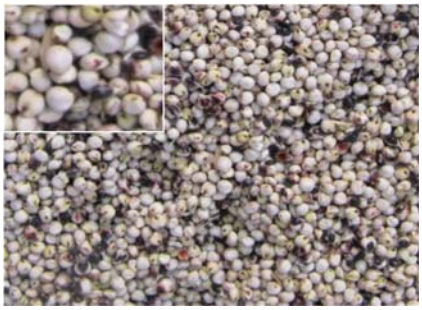
Kakora (Kinkoda)

Okra (Chaumasi Bhindi)

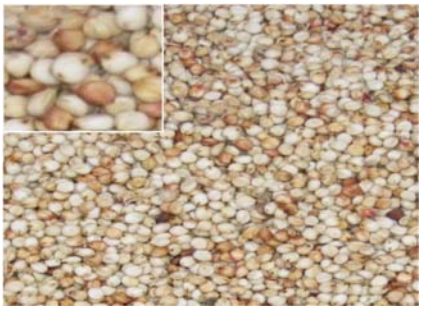
Pumpkin (Kola)

Wild bitter gourd (Jangli Karela)

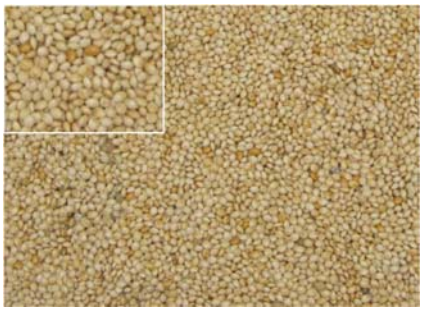
Fig. 11 Vegetable Landraces



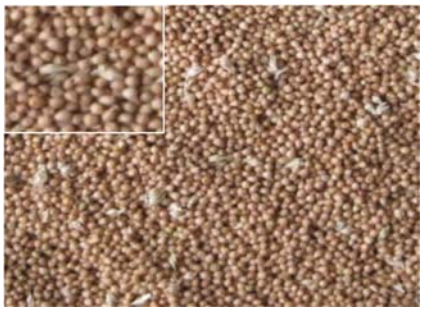
Sorghum (Jowar-Gugali Malan)



Sorghum (Jowar-Naani Makki)



Proso millet (Cheena)



Finger millet (Mal)

Fig. 12 Minor Millet Landraces

Ajwain

Methi

Fig. 13 Ajwain and Methi Landrace

ANNEXURE: I

Community Seed Bank at Village Som (Jhadol)

Village: Som Panchayat: Som

Block: Jhadol District: Udaipur (Rajasthan)

Nodal person: Laxmi Lal S/o Vagha ji M – 08290087630

Total Households: 500

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	500	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	500	Cross-pollinated	10-12
3	Sesame	*Sesamum indicum*	Talli	20	Self-pollinated	0.10
4	Black gram	*Vigna mungo*	Arad Khakhariya	100	Self-pollinated	6.00
5	Green gram	*Vigna radiata*	Mung	50	Self-pollinated	5.00
6	Rice	*Oryza sativa*	Hejni	50	Self-pollinated	1.00
7	Rice	*Oryza sativa*	Mauriya	30	Self-pollinated	1.00
8	Rice	*Oryza sativa*	Kalawari	10	Self-pollinated	1.00
9	Rice	*Oryza sativa*	Doodhmogar	50	Self-pollinated	1.00
10	Rice	*Oryza sativa*	Dangar	20	Self-pollinated	1.00
11	Arhar	*Cajanus cajan*	Safed Tuara	200	Often cross pollinated	2.00
12	Arhar	*Cajanus cajan*	Safed Tuari	200	Often cross pollinated	2.00
13	Sorghum	*Sorghum bicolor*	Nani Makki	20	Often cross-pollinated	1.00

14	Amaranth	*Amaranthus tricolor*	Segar Kangni	10	Self & Cross pollinated	0.05
15	Sunhemp	*Crotalaria juncea*	Han	05	Self-pollinated	0.05
16	Jute	*Corchorus tridens*	Ambadi	20	Often cross-pollinated	0.05
17	Horse gram	*Macrotyloma uniflorum*	Kulath	05	Self-pollinated	2.00
18	Cowpea	*Vigna unguiculata*	Chawla	05	Self-pollinated	0.50
19	Purple yam	*Dioscorea alata*	Ratalu	150	Vegetatively propagated	-
20	Turmeric	*Curcuma longa*	Haldi	50	Often cross-pollinated	-
21	Arvi	*Colocasia esculenta*	Arvi	50	Vegetatively propagated	-
22	Zinger	*Gingiber officinale*	Adrak	50	Often cross-pollinated	-
23	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	450	Self-pollinated	0.01
24	Chilli	*Capsicum annum*	Mirchi	200	Self-pollinated	0.01
25	Ridge gourd	*Luffa acutangula*	Aara Taroi	300	Cross-pollinated	0.01
26	Bottle gourd	*Lagenaria siceraria*	Aal	400	Cross-pollinated	0.01
27	Pumpkin	*Cucurbita moschata*	Kola	300	Cross-pollinated	0.01
28	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.01
29	Balam Kheera	*Cucumis sativus*	Balam Kakari	400	Cross-pollinated	0.01
30	Kakora	*Momordica dioica*	Kinkoda	-	Cross-pollinated	0.01
31	Potato	*Solanum tuberosum*	Aalu	05	Self-pollinated	-
32	Sweet potato	*Ipomoea batatas*	Sakarkandi	05	Cross-pollinated	-
33	Tomato	*Lycopersicon esculentum*	Tamatar	20	Self-	0.05

					pollinated	
34	Dolichos bean	*Dolichos lablab*	Sem fali	05	Self-pollinated	0.01
35	Brinjal	*Solanum melongena*	Bengan	20	Self-pollinated	0.005
36	Onion	*Allium cepa*	Pyaz	10	Cross-pollinated	0.0025
37	Garlic	*Allium sativum*	Lehsun	50	Cross-pollinated	-
	Rabi crops					
1	Wheat	*Triticum aestivum*	Gahun	250	Self-pollinated	20.00
2	Gram	*Cicer arietinum*	Chana	60	Self-pollinated	4.00
3	Mustard	*Brassica campestris*	Sarson	80	Cross & Often cross pollinated	1.00
4	Lucerne	*Medicago sativa*	Rajka	30	Cross-pollinated	0.50

Community seed bank in Udaipur district

ANNEXURE: II

Community Seed Bank at Village Birothi (Jhadol)

Village: Birothi Panchayat: Birothi (Near Oda area)
Block: Jhadol District: Udaipur (Rajasthan)
Nodal person: Bhero Singh S/o Lala Singh M-09680222295
Total H.H.: 250

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	250	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	250	Cross-pollinated	10-12
3	Cluster bean	*Cyamopsis tetragonoloba*	Guar	50	Self-pollinated	1.00
4	Horse gram	*Macrotyloma uniflorum*	Kulath	10	Self-pollinated	2.00
5	Sesame	*Sesamum indicum*	Talli	10	Self-pollinated	0.10
6	Arhar	*Cajanus cajan*	Safed Tuara	100	Often cross pollinated	4.00
7	Black gram	*Vigna mungo*	Arad Khakhariya	10	Self-pollinated	3.00
8	Black gram	*Vigna mungo*	Arad Belawala	10	Self-pollinated	3.00
9	Rice	*Oryza sativa*	Mauriya	50	Self-pollinated	1.00
10	Rice	*Oryza sativa*	Doodhmogar	50	Self-pollinated	1.00
11	Cowpea	*Vigna unguiculata*	Chawla	10	Self-pollinated	0.50
12	Arvi	*Colocasia esculenta*	Arvi	50	Vegetatively propagated	-
13	Purple yam	*Dioscorea alata*	Ratalu	50	Vegetatively propagated	-
14	Zinger	*Gingiber officinale*	Adrak	60	Often cross pollinated	-

15	Turmeric	*Curcuma longa*	Haldi	50	Often cross pollinated	-
16	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	150	Self-pollinated	0.01
17	Chilli	*Capsicum annum*	Mirchi	70	Self-pollinated	0.01
18	Ridge gourd	*Luffa acutangula*	Aara Taroi	100	Cross-pollinated	0.01
19	Bottle gourd	*Lagenaria siceraria*	Aal	10	Cross-pollinated	0.01
20	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.01
21	Pumpkin	*Cucurbita moschata*	Kola	100	Cross-pollinated	0.01
22	Balam Kheera	*Cucumis sativus*	Balam Kakari	200	Cross-pollinated	0.01
23	Little gourd	*Cocccinia cordifolia*	Tinduri	10	Cross-pollinated	0.01
24	Kakora	*Momordica dioica*	Kinkoda	-	Cross-pollinated	0.01
25	Petha	*Benincasa hispida*	Bhoorkola	10	Cross-pollinated	0.01
26	Dolichos bean	*Dolichos lablab*	Sem fali	10	Self-pollinated	0.01
27	Safed musli	*Chlorophytum borivilianum*	Musli	5	Asexually propagated	-
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	150	Self-pollinated	10.00
2	Barley	*Hordeum vulgare*	Dhan	50	Self-pollinated	5.00
3	Gram	*Cicer arietinum*	Chana	100	Self-pollinated	2.00
4	Mustard	*Brassica campestris*	Sarson	150	Cross & often cross pollinated	1.00
	Zaid crops:					
1	Green gram	*Vigna radiata*	Mung	50	Self-pollinated	1.00

ANNEXURE: III

Community Seed Bank at Village Kitawato Ka Was (Jhadol)

Village: Kitawato Ka Was **Panchayat:** Gejvi (Near Ongna)
Block: Jhadol District: Udaipur
Nodal person: Arjun Singh S/o Samrath Singh M-09166055463
Total H.H.: 190

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	190	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	190	Cross-pollinated	10-12
3	Cluster bean	*Cyamopsis tetragonoloba*	Guar	50	Self-pollinated	1.00
4	Sesame	*Sesamum indicum*	Talli	30	Self-pollinated	0.10
5	Black gram	*Vigna mungo*	Arad Khakhariya	20	Self-pollinated	3.00
6	Black gram	*Vigna mungo*	Arad Belawala	20	Self-pollinated	3.00
7	Rice	*Oryza sativa*	Mauriya	30	Self-pollinated	1.00
8	Rice	*Oryza sativa*	Hejni	30	Self-pollinated	1.00
9	Cowpea	*Vigna unguiculata*	Chawla	10	Self-pollinated	0.50
10	Arvi	*Colocasia esculenta*	Arvi	50	Vegetatively propagated	-
11	Purple yam	*Dioscorea alata*	Ratalu	50	Vegetatively propagated	-
12	Zinger	*Gingiber officinale*	Adrak	60	Often cross-pollinated	-
13	Turmeric	*Curcuma longa*	Haldi	40	Often cross-pollinated	-

14	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	150	Self-pollinated	0.01
15	Chilli	*Capsicum annum*	Mirchi	40	Self-pollinated	0.005
16	Dolichos bean	*Dolichos lablab*	Sem fali	10	Self-pollinated	0.01
17	Ridge gourd	*Luffa acutangula*	Aara Taroi	80	Cross-pollinated	0.01
18	Bottle gourd	*Lagenaria siceraria*	Aal	90	Cross-pollinated	0.01
19	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.01
20	Pumpkin	*Cucurbita moschata*	Kola	100	Cross-pollinated	0.01
21	Balam Kheera	*Cucumis sativus*	Balam Kakari	150	Cross-pollinated	0.01
22	Kakora	*Momordica dioica*	Kinkoda	-	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	140	Self-pollinated	10.00
2	Barley	*Hordeum vulgare*	Dhan	40	Self-pollinated	5.00
3	Gram	*Cicer arietinum*	Chana	100	Self-pollinated	2.00
4	Mustard	*Brassica campestris*	Sarson	125	Cross & often cross pollinated	1.00

Visit of farmers to gene bank at MPUAT, Udaipur

ANNEXURE: IV

Community Seed Bank at Village Morniya Fala (Jhadol)

Village: Morniya Fala (Pargiya Pada)
Block: Jhadol
Nodal person: Nana Lal S/o Minka Meena
Total Households: Approx. 300

Panchayat: Madri
District: Udaipur (Rajasthan)
M - 09929432627

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	300	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	250	Cross-pollinated	10-12
3	Sesame	*Sesamum indicum*	Talli	20	Self-pollinated	0.10
4	Black gram	*Vigna mungo*	Arad	90	Self-pollinated	6.00
5	Rice	*Oryza sativa*	Dangar	10	Self-pollinated	1.00
6	Rice	*Oryza sativa*	Hejni	30	Self-pollinated	1.00
7	Rice	*Oryza sativa*	Mauriya	30	Self-pollinated	1.00
8	Rice	*Oryza sativa*	Wankli	10	Self-pollinated	1.00
9	Rice	*Oryza sativa*	Kalawari	10	Self-pollinated	1.00
10	Rice	*Oryza sativa*	Kamod	10	Self-pollinated	1.00
11	Rice	*Oryza sativa*	Doodhmogar	40	Self-pollinated	1.00
12	Foxtail Millet	*Setaria italica*	Kangni	15	Self-pollinated	0.05
13	Kodo Millet	*Paspalum scrobiculatum*	Kodra	10	Self-pollinated	0.05
14	Horse gram	*Macrotyloma uniflorum*	Kulath	25	Self-pollinated	2.00

15	Cowpea	*Vigna unguiculata*	Chawla	30	Self-pollinated	0.50
16	Okra	*Abelmoschus esculentus* Chaumasi	Bhindi	200	Self-pollinated	0.01
17	Chilli	*Capsicum annum*	Mirchi	80	Self-pollinated	0.005
18	Purple yam	*Dioscorea alata*	Ratalu	70	Vegetatively propagated	-
19	Turmeric	*Curcuma longa*	Haldi	80	Often cross-pollinated	-
20	Arvi	*Colocasia esculenta*	Arvi	75	Vegetatively propagated	-
21	Ridge gourd	*Luffa acutangula*	Aara Taroi	50	Cross-pollinated	0.01
22	Bottle gourd	*Lagenaria siceraria*	Aal	150	Cross-pollinated	0.01
23	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.01
24	Pumpkin	*Cucurbita moschata*	Kola	100	Cross-pollinated	0.01
25	Balam Kheera	*Cucumis sativus*	Balam Kakari	200	Cross-pollinated	0.01
26	Kakora	*Momordica dioica*	Kinkoda	-	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	175	Self-pollinated	10.00
2	Gram	*Cicer arietinum*	Chana	150	Self-pollinated	2.00

Demonstration of seed processing to farmers

ANNEXURE: V

Community Seed Bank at Village Dhala (Jhadol)

Village: Dhala Panchayat: Amiwara
Block: Jhadol District:Udaipur (Rajasthan)
Nodal person: Kalu Lal S/o Thawraji bhagora M – 09461200368
Total Households: Approx. 300

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	300	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	250	Cross-pollinated	10-12
3	Sorghum	*Sorghum bicolor*	Nani Makki	80	Often cross-pollinated	1.00
4	Sesame	*Sesamum indicum*	Talli	20	Self-pollinated	0.10
5	Black gram	*Vigna mungo*	Arad Teliya	25	Self-pollinated	2.00
6	Black gram	*Vigna mungo*	Arad Khakhariya	30	Self-pollinated	3.00
7	Black gram	*Vigna mungo*	Arad Belawala	20	Self-pollinated	1.00
8	Rice	*Oryza sativa*	Hejni	40	Self-pollinated	1.00
9	Rice	*Oryza sativa*	Mauriya	50	Self-pollinated	1.00
10	Rice	*Oryza sativa*	Kalawari	10	Self-pollinated	1.00
11	Rice	*Oryza sativa*	Doodhmogar	40	Self-pollinated	1.00
12	Arhar	*Cajanus cajan*	Safed Tuara	150	Self-pollinated	4.00
13	Foxtail Millet	*Setaria italica*	Kangni	15	Self-pollinated	0.05

14	Kodo Millet	*Paspalum scrobiculatum*	Kodra	15	Self-pollinated	0.05
15	Finger millet	*Eleusine coracana*	Mal	15	Self-pollinated	0.05
16	Cowpea	*Vigna unguiculata*	Chawla	20	Self-pollinated	0.50
17	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	200	Self-pollinated	0.01
18	Chilli	*Capsicum annum*	Mirchi	100	Self-pollinated	0.005
19	Horse gram	*Macrotyloma uniflorum*	Kulath	25	Self-pollinated	2.00
20	Purple yam	*Dioscorea alata*	Ratalu	80	Vegetatively propagated	-
21	Turmeric	*Curcuma longa*	Haldi	50	Often cross-pollinated	-
22	Arvi	*Colocasia esculenta*	Arvi	70	Vegetatively propagated	-
23	Ridge gourd	*Luffa acutangula*	Aara Taroi	150	Cross-pollinated	0.01
24	Bottle gourd	*Lagenaria siceraria*	Aal	200	Cross-pollinated	0.01
25	Pumpkin	*Cucurbita moschata*	Kola	100	Cross-pollinated	0.01
26	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.01
27	Balam Kheera	*Cucumis sativus*	Balam Kakari	250	Cross-pollinated	0.01
28	Kakora	*Momordica dioica*	Kinkoda	-	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	200	Self-pollinated	10.00
2	Barley	*Hordeum vulgare*	Dhan	60	Self-pollinated	5.00
3	Gram	*Cicer arietinum*	Chana	150	Self-pollinated	2.00
4	Mustard	*Brassica campestris*	Sarson	150	Cross-pollinated	1.00

ANNEXURE: VI

Community Seed Bank at Village Dob/Nevaj (Jhadol)

Village: Dob/ Nevaj Panchayat: Nevaj
Block: Jhadol District: Udaipur (Rajasthan)
Nodal person: Laxman Lal M-08107785282
Total H.H.: 250

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	200	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	175	Cross-pollinated	10-12
3	Cluster bean	*Cyamopsis tetragonoloba*	Guar	40	Self-pollinated	2.00
4	Horse gram	*Macrotyloma uniflorum*	Kulath	25	Self-pollinated	2.00
5	Sesame	*Sesamum indicum*	Talli	20	Self-pollinated	0.10
6	Arhar	*Cajanus cajan*	Safed Tuara	150	Self-pollinated	4.50
7	Black gram	*Vigna mungo*	Arad Khakhariya	50	Self-pollinated	3.00
8	Black gram	*Vigna mungo*	Arad Belawala	50	Self-pollinated	3.00
9	Rice	*Oryza sativa*	Mauriya	40	Self-pollinated	1.00
10	Rice	*Oryza sativa*	Doodhmogar	40	Self-pollinated	1.00
11	Cowpea	*Vigna unguiculata*	Chawla	40	Self-pollinated	0.50
12	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	175	Self-pollinated	0.01
13	Chilli	*Capsicum annum*	Mirchi	50	Self-pollinated	0.005
14	Dolichos bean	*Dolichos lablab*	Sem fali	50	Self-pollinated	0.01

15	Foxtail millet	*Setaria italica*	Kangni	30	Self-pollinated	0.05
16	Purple yam	*Dioscorea alata*	Ratalu	70	Vegetatively propagated	-
17	Arvi	*Colocasia esculenta*	Arvi	80	Vegetatively propagated	-
18	Zinger	*Gingiber officinale*	Adrak	50	Often cross-pollinated	-
19	Turmeric	*Curcuma longa*	Haldi	100	Often cross-pollinated	-
20	Air Potato yam	*Dioscorea bulbifera*	Aareta	-	Asexually propagated	-
21	Ridge gourd	*Luffa acutangula*	Aara Taroi	150	Cross-pollinated	0.01
22	Bottle gourd	*Lagenaria siceraria*	Aal	160	Cross-pollinated	0.01
23	Pumpkin	*Cucurbita moschata*	Kola	150	Cross-pollinated	0.01
24	Bitter gourd	*Momordica charantia* var. *muricata*	Karela	-	Cross-pollinated	0.01
25	Balam Kheera	*Cucumis sativus*	Balam Kakari	200	Cross-pollinated	0.01
26	Little gourd	*Cocccinia cordifolia*	Tinduri	20	Cross-pollinated	0.01
27	Kakora	*Momordica dioica*	Kinkoda	-	Cross-pollinated	0.01
28	Petha	*Benincasa hispida*	Bhoorkola	10	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	175	Self-pollinated	10.00
2	Gram	*Cicer arietinum*	Chana	150	Self-pollinated	2.00
3	Barley	*Hordeum vulgare*	Dhan	50	Self-pollinated	5.00
4	Mustard	*Brassica campestris*	Sarson	125	Cross-pollinated	1.00
	Zaid crops:					
1	Green gram	*Vigna radiata*	Mung	50	Self-pollinated	1.00

ANNEXURE: VII

Community Seed Bank at Village Adkaliya (Jhadol)

Village: Adkaliya Panchayat: Kanthariya
Block: Jhadol District: Udaipur (Rajasthan)
Nodal person: Bhagvati Lal M-08107480170
Total H.H.: 450

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	400	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	350	Cross-pollinated	10-12
3	Horse gram	*Macrotyloma uniflorum*	Kulath	30	Self-pollinated	2.00
4	Sunhemp	*Crotalaria juncea*	Han	25	Self-pollinated	0.05
5	Sesame	*Sesamum indicum*	Talli	20	Self-pollinated	0.10
6	Black gram	*Vigna mungo*	Arad	40	Self-pollinated	6.00
7	Rice	*Oryza sativa*	Hejni	50	Self-pollinated	1.00
8	Rice	*Oryza sativa*	Mauriya	80	Self-pollinated	1.00
9	Rice	*Oryza sativa*	Doodhmogar	100	Self-pollinated	1.00
10	Cowpea	*Vigna unguiculata*	Chawla	30	Self-pollinated	0.50
11	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	350	Self-pollinated	0.01
12	Dolichos bean	*Dolichos lablab*	Sem fali	20	Self-pollinated	0.01
13	Chilli	*Capsicum annum*	Mirchi	100	Self-pollinated	0.01
14	Purple yam	*Dioscorea alata*	Ratalu	80	Vegetatively propagated	-

15	Turmeric	*Curcuma longa*	Haldi	70	Often cross-pollinated	-
16	Arvi	*Colocasia esculenta*	Arvi	60	Vegetatively propagated	-
17	Zinger	*Gingiber officinale*	Adrak	75	Often cross-pollinated	-
18	Ridge gourd	*Luffa acutangula*	Aara Taroi	200	Cross-pollinated	0.01
19	Bottle gourd	*Lagenaria siceraria*	Aal	200	Cross-pollinated	0.01
20	Pumpkin	*Cucurbita moschata*	Kola	225	Cross-pollinated	0.01
21	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.01
22	Balam Kheera	*Cucumis sativus*	Balam Kakari	400	Cross-pollinated	0.01
23	Kakora	*Momordica dioica*	Kinkoda	-	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	400	Self-pollinated	10.00
2	Gram	*Cicer arietinum*	Chana	300	Self-pollinated	2.00
3	Barley	*Hordeum vulgare*	Dhan	100	Self-pollinated	5.00
4	Mustard	*Brassica campestris*	Sarson	200	Cross-pollinated	1.00

Demostration of seed processing to farmers

ANNEXURE: VIII

Community Seed Bank at Village Chanawada (Girwa)

Village: Chanawada Panchayat: Chanawada
Block: Girwa District: Udaipur (Rajasthan)
Nodal person: Chunni Lal S/o Minka Meena M- 08107504649, 09649770266
Total Households: 250

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	250	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	250	Cross-pollinated	10-12
3	Sesame	*Sesamum indicum*	Talli	20	Self-pollinated	0.10
4	Black gram	*Vigna mungo*	Arad Khakhariya	30	Self-pollinated	6.00
5	Green gram	*Vigna radiata*	Mung	20	Self-pollinated	5.00
6	Rice	*Oryza sativa*	Doodhmogar	20	Self-pollinated	1.00
7	Cluster bean	*Cyamopsis tetragonoloba*	Guar	20	Self-pollinated	1.00
8	Bajra	*Pennisetum glaucum*	Bajara	05	Cross-pollinated	0.50
9	Sorghum	*Sorghum bicolor*	Nani Makki	100	Often cross-pollinated	1.00
10	Amaranth	*Amaranthus tricolor*	Segar Kangni	10	Self & cross-pollinated	0.05
11	Horse gram	*Macrotyloma uniflorum*	Kulath	05	Self-pollinated	2.00
12	Cowpea	*Vigna unguiculata*	Chawla	05	Self-pollinated	0.50
13	Arvi	*Colocasia esculenta*	Arvi	05	Vegetatively propagated	-
14	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	200	Asexually propagated	0.01

15	Chilli	*Capsicum annum*	Mirchi	10	Asexually propagated	0.01
16	Ridge gourd	*Luffa acutangula*	Aara Taroi	150	Cross-pollinated	0.01
17	Bottle gourd	*Lagenaria siceraria*	Aal	200	Cross-pollinated	0.01
18	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.01
19	Pumpkin	*Cucurbita moschata*	Kola	100	Cross-pollinated	0.01
20	Balam Kheera	*Cucumis sativus*	Balam Kakari	200	Cross-pollinated	0.01
21	Brinjal	*Solanum melongena*	Bengan	05	Self-pollinated	0.05
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	100	Self-pollinated	15.00
2	Gram	*Cicer arietinum*	Chana	50	Self-pollinated	2.00
3	Mustard	*Brassica campestris*	Sarson	50	Cross & often cross pollinated	1.00
4	Fenugreek	*Trigonella foenum-graecum*	Methi	30	Self-pollinated	1.00
5	Garlic	*Allium sativum*	Lehsun	10	Cross-pollinated	-
6	Radish	*Raphanus sativus*	Mooli	10	Cross-pollinated	0.025
7	Sweet potato	*Ipomoea batatas*	Sakarkandi	05	Cross-pollinated	-

Demonstration of seed dressing to farmers

ANNEXURE: IX

Community Seed Bank at Village Kojon Ka Guda (Girwa)

Village: Kojon Ka Guda Panchayat: Lalpura
Block: Girwa District: Udaipur (Rajasthan)
Nodal person: Logar Lal S/o Bheema ji M-09587963623
Total Households: 130

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	130	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	130	Cross-pollinated	10-12
3	Cluster bean	*Cyamopsis tetragonoloba*	Guar	20	Self-pollinated	1.00
4	Horse gram	*Macrotyloma uniflorum*	Kulath	10	Self-pollinated	1.00
5	Sesame	*Sesamum indicum*	Talli	10	Self-pollinated	0.10
6	Finger millet	*Eleusine coracana*	Mal	10	Self-pollinated	0.02
7	Amaranth	*Amaranthus tricolor*	Segar Kangni	5	Cross-pollinated	0.05
8	Zinger	*Gingiber officinale*	Adrak	50	Often cross-pollinated	-
9	Turmeric	*Curcuma longa*	Haldi	50	Often cross-pollinated	-
10	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	100	Self-pollinated	0.01
11	Chilli	*Capsicum annum*	Mirchi	40	Self-pollinated	0.01
12	Ridge gourd	*Luffa acutangula*	Aara Taroi	100	Cross-pollinated	0.01
13	Bottle gourd	*Lagenaria siceraria*	Aal	100	Cross-pollinated	0.01

14	Pumpkin	*Cucurbita moschata*	Kola	100	Cross-pollinated	0.01
15	Balam Kheera	*Cucumis sativus*	Balam Kakari	110	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	100	Self-pollinated	10.00
2	Gram	*Cicer arietinum*	Chana	80	Self-pollinated	4.00
3	Mustard	*Brassica campestris*	Sarson	75	Cross & often cross pollinated	1.00
	Zaid crops:					
1	Green gram	*Vigna radiata*	Mung	40	Self-pollinated	1.00

Demonstration of solar heat seed treatment to farmers

ANNEXURE: X

Community Seed Bank at Village Ramaj (Girwa)

Village: Ramaj **Panchayat:** Paramda
Block: Girwa District: Udaipur (Rajasthan)
Nodal person: Khum Raj S/o Kanna ji M-09649019308
Total Households: 252

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	180	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	250	Cross-pollinated	10-12
3	Cluster bean	*Cyamopsis tetragonoloba*	Guar	50	Self-pollinated	1.00
4	Horse gram	*Macrotyloma uniflorum*	Kulath	20	Self-pollinated	2.00
5	Sesame	*Sesamum indicum*	Talli	20	Self-pollinated	0.10
6	Black gram	*Vigna mungo*	Arad	40	Self-pollinated	6.00
7	Zinger	*Gingiber officinale*	Adrak	70	Often cross-pollinated	-
8	Turmeric	*Curcuma longa*	Haldi	80	Often cross-pollinated	-
9	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	200	Self-pollinated	0.01
10	Chilli	*Capsicum annum*	Mirchi	50	Self-pollinated	0.01
11	Ridge gourd	*Luffa acutangula*	Aara Taroi	200	Cross-pollinated	0.01
12	Bottle gourd	*Lagenaria siceraria*	Aal	200	Cross-pollinated	0.01
13	Pumpkin	*Cucurbita moschata*	Kola	200	Cross-pollinated	0.01

14	Balam Kheera	*Cucumis sativus*	Balam Kakari	250	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	170	Self-pollinated	10.00
2	Gram	*Cicer arietinum*	Chana	100	Self-pollinated	2.00
3	Mustard	*Brassica campestris*	Sarson	150	Cross & often cross pollinated	1.00
	Zaid crops:					
1	Green gram	*Vigna radiata*	Mung	75	Self-pollinated	1.00

CSB awareness camp at village level in Udaipur district

ANNEXURE: XI

Community Seed Bank at Village Helpiya Fala (Girwa)

Village: Helpiya Fala (Krishanpura) Panchyat: Singatwara
Block: Girwa District: Udaipur (Rajasthan)
Nodal person: Limba Ram S/o Dharma Ram Meena M – 09680203986
Total Households: Approx. 250

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	225	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	250	Cross-pollinated	10-12
3	Cluster bean	*Cyamopsis tetragonoloba*	Guar	80	Self-pollinated	1.00
4	Sesame	*Sesamum indicum*	Talli	30	Self-pollinated	0.10
5	Black gram	*Vigna mungo*	Arad	50	Self-pollinated	6.00
6	Cowpea	*Vigna unguiculata*	Chawla	15	Self-pollinated	0.50
7	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	200	Self-pollinated	0.05
8	Chilli	*Capsicum annum*	Mirchi	100	Self-pollinated	0.005
9	Ridge gourd	*Luffa acutangula*	Aara Taroi	225	Cross-pollinated	0.01
10	Bottle gourd	*Lagenaria siceraria*	Aal	200	Cross-pollinated	0.01
11	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.01
12	Pumpkin	*Cucurbita moschata*	Kola	230	Cross-pollinated	0.01
13	Balam Kheera	*Cucumis sativus*	Balam Kakari	240	Cross-pollinated	0.01

14	Kakora	*Momordica dioica*	Kinkoda	-	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	200	Self-pollinated	10.00
2	Barley	*Hordeum vulgare*	Dhan	100	Self-pollinated	5.00
3	Gram	*Cicer arietinum*	Chana	125	Self-pollinated	2.00
4	Mustard	*Brassica campestris*	Sarson	150	Cross & often pollinated	1.00

Horse gram (Kulath)

Cluster bean (Guar)

Cowpea (Chawla)

ANNEXURE: XII

Community Seed Bank at Village Kegra (Girwa)

Village: Kegra Panchayat: Paduna
Block: Girwa District: Udaipur (Rajasthan)
Nodal person: Savji Ram S/o Kalu Ram Meena M – 09460082915, 09166667010
Total Households: Approx. 200

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	175	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	200	Cross-pollinated	10-12
3	Cluster bean	*Cyamopsis tetragonoloba*	Guar	50	Self-pollinated	1.00
4	Sesame	*Sesamum indicum*	Talli	30	Self-pollinated	0.10
5	Black gram	*Vigna mungo*	Arad Mandora	40	Self-pollinated	3.00
6	Black gram	*Vigna mungo*	Arad Teliya	40	Self-pollinated	3.00
7	Horse gram	*Macrotyloma uniflorum*	Kulath	20	Self-pollinated	2.00
8	Cowpea	*Vigna unguiculata*	Chawla	20	Self-pollinated	0.50
9	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	150	Self-pollinated	0.05
10	Chilli	*Capsicum annum*	Mirchi	60	Self-pollinated	0.005
11	Ridge gourd	*Luffa acutangula*	Aara Taroi	150	Cross-pollinated	0.01
12	Bottle gourd	*Lagenaria siceraria*	Aal	150	Cross-pollinated	0.01
13	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	Wild	Cross-pollinated	0.01

14	Pumpkin	*Cucurbita moschata*	Kola	160	Cross-pollinated	0.01
15	Balam Kheera	*Cucumis sativus*	Balam Kakari	175	Cross-pollinated	0.01
16	Kakora	*Momordica dioica*	Kinkoda	-	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	150	Self-pollinated	10.00
2	Barley	*Hordeum vulgare*	Dhan	70	Self-pollinated	5.00
3	Gram	*Cicer arietinum*	Chana	100	Self-pollinated	2.00
4	Mustard	*Brassica campestris*	Sarson	125	Cross & often cross pollinated	1.00

Balam Kakari

Aal (Bottle Gourd)

ANNEXURE: XIII

Community Seed Bank at Village Kaya (Girwa)

Village: Kaya
Block: Girwa
Nodal person: Bhanvar Lal
Total Households: Approx. 150

Panchayat: Kaya
District: Udaipur (Rajasthan)
M – 09571215380

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	125	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	150	Cross-pollinated	10-12
3	Sesame	*Sesamum indicum*	Talli	15	Self-pollinated	0.10
4	Black gram	*Vigna mungo*	Arad	40	Self-pollinated	6.00
5	Horse gram	*Macrotyloma uniflorum*	Kulath	20	Self-pollinated	2.00
6	Cowpea	*Vigna unguiculata*	Chawla	15	Self-pollinated	0.50
7	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	125	Self-pollinated	0.02
8	Chilli	*Capsicum annum*	Mirchi	40	Self-pollinated	0.005
9	Tomato	*Lycopersicon esculentum*	Tamatar	10	Self-pollinated	0.002
10	Brinjal	*Solanum melongena*	Bengan	12	Self-pollinated	0.002
11	Coriander	*Coriandrum sativum*	Daniya	5	Cross-pollinated	0.002
12	Purple yam	*Dioscorea alata*	Ratalu	40	Vegetatively propagated	-
13	Turmeric	*Curcuma longa*	Haldi	50	Often cross-pollinated	-

14	Arvi	*Colocasia esculenta*	Arvi	30	Vegetatively propagated	-
15	Zinger	*Gingiber officinale*	Adrak	30	Often cross-pollinated	-
16	Ridge gourd	*Luffa acutangula*	Aara Taroi	100	Cross-pollinated	0.01
17	Bottle gourd	*Lagenaria siceraria*	Aal	110	Cross-pollinated	0.01
18	Pumpkin	*Cucurbita moschata*	Kola	110	Cross-pollinated	0.01
19	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.005
20	Balam Kheera	*Cucumis sativus*	Balam Kakari	125	Cross-pollinated	0.01
21	Elephant yam	*Amorphophallus campanulatus*	Huran/Suran	15	Vegetatively propagated	-
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	120	Self-pollinated	10.00
2	Gram	*Cicer arietinum*	Chana	70	Self-pollinated	2.00
3	Mustard	*Brassica campestris*	Sarson	100	Cross & Often cross pollinated	1.00

***Dioscorea bulbifera* (Aareta) used as vegetable after boiling**

***Sorghum halepense* (Baru) used as fodder**

ANNEXURE: XIV

Community Seed Bank at Village Jabala (Girwa)

Village: Jabala Panchayat: Paduna
Block: Girwa District: Udaipur (Rajasthan)
Nodal person: 1. Savaji Ram M – 09460082915
2. Kalu Lal S/o Hanja Ji M– 09950830302
Total Households: Approx. 600

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	500	Cross-pollinated	10-12
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	600	Cross-pollinated	10-12
3	Sesame	*Sesamum indicum*	Talli	40	Self-pollinated	0.10
4	Black gram	*Vigna mungo*	Arad	100	Self-pollinated	6.00
5	Finger millet	*Eleusine coracana*	Mal	30	Self-pollinated	0.02
6	Horse gram	*Macrotyloma uniflorum*	Kulath	25	Self-pollinated	2.00
7	Cowpea	*Vigna unguiculata*	Chawla	20	Self-pollinated	0.02
8	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	500	Self-pollinated	0.01
9	Chilli	*Capsicum annum*	Mirchi	100	Self-pollinated	0.005
10	Tomato	*Lycopersicon esculentum*	Tamatar	40	Self-pollinated	0.002
11	Purple yam	*Dioscorea alata*	Ratalu	100	Vegetatively propagated	-
12	Turmeric	*Curcuma longa*	Haldi	100	Often cross-pollinated	-
13	Arvi	*Colocasia esculenta*	Arvi	60	Vegetatively propagated	-

14	Zinger	*Gingiber officinale*	Adrak	50	Often cross-pollinated	-
15	Ridge gourd	*Luffa acutangula*	Aara Taroi	350	Cross-pollinated	0.01
16	Bottle gourd	*Lagenaria siceraria*	Aal	400	Cross-pollinated	0.01
17	Pumpkin	*Cucurbita moschata*	Kola	400	Cross-pollinated	0.01
18	Bitter gourd	*Momordica charantia* var. *muricata*	Jangli Karela	-	Cross-pollinated	0.01
19	Balam Kheera	*Cucumis sativus*	Balam Kakari	500	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	450	Self-pollinated	10.00
2	Gram	*Cicer arietinum*	Chana	300	Self-pollinated	3.00
3	Barley	*Hordeum vulgare*	Dhan	100	Self-pollinated	5.00
4	Garlic	*Allium sativum*	Lehsun	40	Cross-pollinated	-
5	Mustard	*Brassica campestris*	Sarson	200	Cross & often cross pollinated	1.00

Traditional system of seed drying

Traditional system of seed cleaning and grading

ANNEXURE: XV

Community Seed Bank at Village Menar (Vallabhnagar)

Village: Menar Panchayat: Menar
Block: Vallabhnagar District: Udaipur (Rajasthan)
Nodal person: Kanheya Lal Menariya M –09928641495
Total Households: 1000

S N	Crop name	Botanical name	Local name	Farmers involved	Breeding status	Seed quantity maintained (q)
	Kharif crops:					
1	Maize	*Zea mays* var. *indentata*	Malan Makka	900	Cross-pollinated	15-20
2	Maize	*Zea mays* var. *induranta*	Sathi Makka	1000	Cross-pollinated	15-20
3	Sesame	*Sesamum indicum*	Talli	100	Self-pollinated	0.10
5	Black gram	*Vigna mungo*	Arad	800	Self-pollinated	6.00
6	Rice	*Oryza sativa*	Doodhmogar	10	Self-pollinated	1.00
7	Cluster bean	*Cyamopsis tetragonoloba*	Guar	850	Self-pollinated	2.00
8	Sorghum	*Sorghum bicolor*	Gugali Malan	900	Often cross-pollinated	2.00
9	Groundnut	*Arachis hypogaea*	Mungfali	80	Self-pollinated	-
10	Cotton	*Gossypium hirsutum*	Kapas	50	Often cross-pollinated	-
11	Zeera	*Cuminum cyminum*	Zeera	100	Cross-pollinated	0.05
12	Ajwain	*Trachyspermum ammi*	Ajwain	100	Cross-pollinated	0.05
13	Okra	*Abelmoschus esculentus*	Bhindi Chaumasi	600	Self-pollinated	0.05
14	Chilli	*Capsicum annum*	Mirchi	100	Cross-pollinated	0.01
15	Ridge gourd	*Luffa acutangula*	Aara Taroi	700	Cross-pollinated	0.01

16	Bottle gourd	*Lagenaria siceraria*	Aal	750	Cross-pollinated	0.01
17	Pumpkin	*Cucurbita moschata*	Kola	700	Cross-pollinated	0.01
18	Balam Kheera	*Cucumis sativus*	Balam Kakari	600	Cross-pollinated	0.01
	Rabi crops:					
1	Wheat	*Triticum aestivum*	Gahun	850	Self-pollinated	20-30
2	Barley	*Hordeum vulgare*	Dhan	300	Self-pollinated	5.00
3	Mustard	*Brassica campestris*	Sarson	800	Cross-pollinated	2.00
4	Fenugreek	*Trigonella foenum-graecum*	Metha	500	Self-pollinated	5.00
5	Garlic	*Allium sativum*	Lehsun	50	Cross-pollinated	-
6	Radish	*Raphanus sativus*	Mooli	50	Cross-pollinated	0.01
7	Onion	*Allium cepa*	Pyaz	60	Cross-pollinated	0.01
8	Tomato	*Lycopersicon esculentum*	Tamatar	75	Self-pollinated	0.01
9	Sugarcane	*Saccharum officinarum*	Hata ganna	10	Cross-pollinated	-
10	Lucerne	*Medicago sativa*	Rajka	100	Cross-pollinated	1.00

Traditional system of maize storage

Traditional seed storage bin used in tribal areas of Udaipur

Suggested Readings

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Notes


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