Revitalising Rainfed Agriculture
The RRA Network

WASSAN

















COMMUNITY MANAGED SEED SYSTEMS (CMSS) FOR RAINFED AGRICULTURE



COMMUNITY MANAGED SEED SYSTEMS (CMSS)

for Rainfed Agriculture

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COMMUNITY MANAGED SEED SYSTEMS (CMSS) for Rainfed Agriculture

INTRODUCTION

Rainfed agriculture refers to farming that relies primarily on rainfall for water, rather than irrigation systems. In India, around 50-55% of the total cultivated land is rainfed, making it highly vulnerable to climate variability. These areas receive limited and erratic rainfall, leading to frequent crop risks, low yields, and uncertainties in farming. Key rainfed regions in India include states such as Rajasthan, Madhya Pradesh, Maharashtra, Odisha, Karnataka, and Andhra Pradesh and Telangana.

Rainfed agriculture is diverse, with farmers cultivating a wide range of crops, including cereals (millets, sorghum), pulses, oilseeds, and legumes, which are more resilient to water stress. However, due to the reliance on rainfall, these areas often face challenges like soil erosion, poor water retention, and nutrient depletion, making productivity less predictable compared to irrigated regions.

Districts with less than 40% of their net sown area without assured irrigation and facing climate risks are considered rainfed areas (NRAA 2012)

What are Traditional Varieties?

Traditional Varieties are public domain extant varieties that have a name, developed by ancient farmers, suitable to an ecosystem and farmer needs where they are cultivated and/or conserved by their successors. Farmer needs are diverse and specific to each ecosystem. resilience to climate and pests, human and domesticated animal nutrition and taste, cultural, religious, social and economic needs determine the selection criteria for these traditional varieties.

CHARACTERISTICS OF TRADITIONAL VARIETIES

Traditional varieties are cultivated by farmers or communities in a specific region for generations. These seeds naturally exhibit diversity in form and genetic composition, making them well-adapted to the local physical, biological, and environmental conditions.

Characteristics of Traditional Varieties

- High genetic variability, enhancing resilience to pests, diseases, and environmental stresses.
- Well-adapted to specific local agro-climatic conditions and traditional farming systems.
- Stable yields even under marginal conditions, though not necessarily high yielding.
- Strong resistance or tolerance to drought, poor soils, and other abiotic stresses.
- Superior nutritional qualities, often richer in proteins, minerals, and antioxidants.
- Maintained through farmer selection and seed-saving practices since long.
- These varieties, passed down through generations with unique local names, hold deep cultural, traditional, and culinary significance.
- Thrive under low-input and organic farming conditions with minimal external inputs.
- Genetically diverse and often open-pollinated, allowing for seed saving and adaptation.
- Continuously evolving through natural selection and farmer-driven improvements.
- The selection and conservation occur naturally over time, largely influenced by geography and human agricultural practices.

Why Traditional Varieties?

Traditional varieties (TVs) have been cultivated for generations, adapting to local environments over time. They carry a rich heritage, shaped by natural selection and farmer innovation. These varieties are deeply embedded in cultural traditions and agricultural practices, making them an essential part of sustainable farming. TVs are crucial for rainfed agriculture as they adapt well to local environments, thriving well in specific climates and ecosystems, and exhibiting greater resilience compared to commercial hybrids. TVs also boast desirable traits such as superior taste, fragrance, and nutritional value, along with resistance to pests and diseases, making them ideal for natural farming practices. Also, several TVs are known for their medicinal properties as well as fodder and soil enrichment value. They fit well in mixed and multi-crop farming systems common in rainfed areas, performing effectively under low-input and organic methods. Beyond agricultural advantages, TVs contribute to food and nutritional security by offering diverse crops that cater to local dietary needs. Conserving and cultivating TVs ensures seed sovereignty, reduces dependence on commercial seed companies and supports the sustainable continuation of local traditional farming practices. The holistic benefits of TVs are presented in *Figure – 1*.

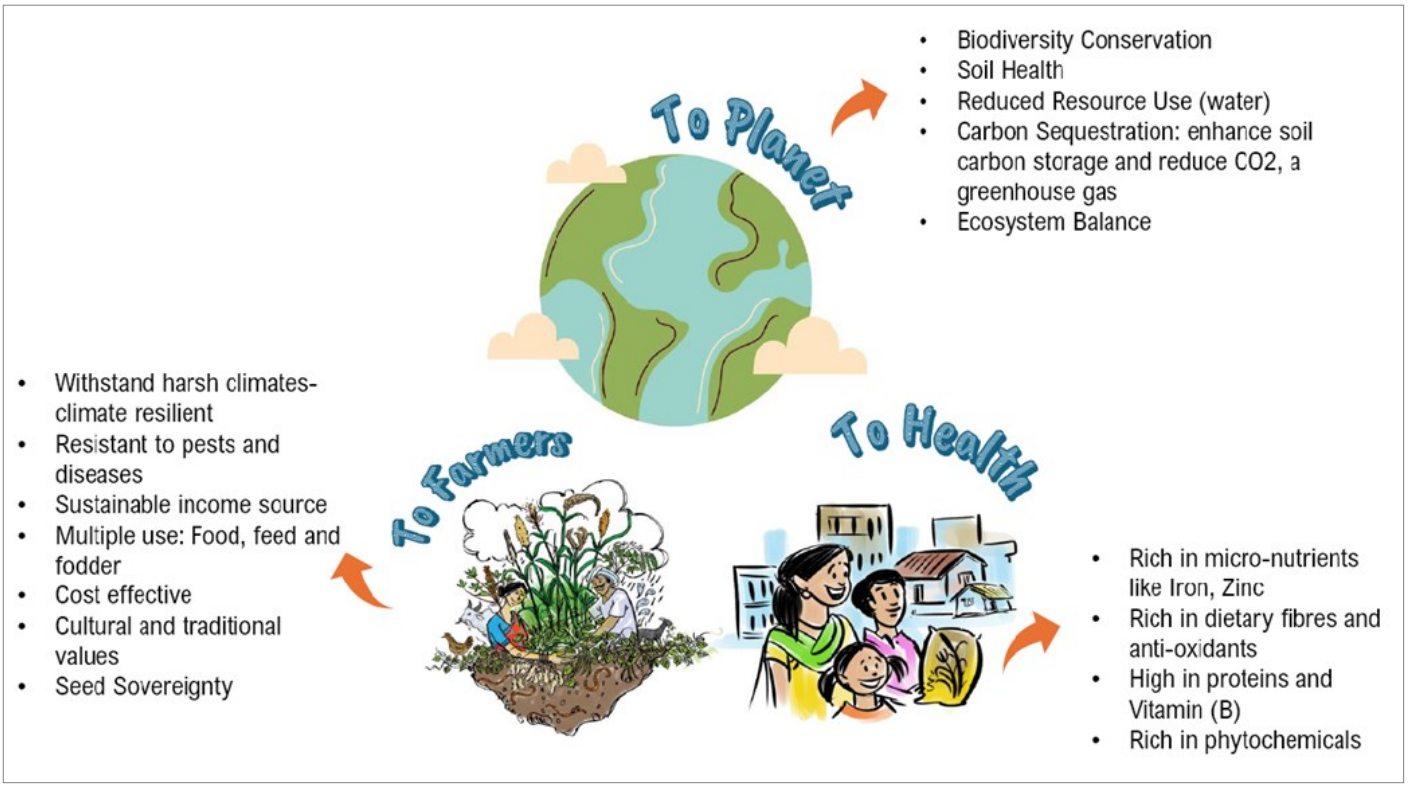


Figure - 1: Holistic Benefits of Cultivation of Traditional Varieties (TVs)



BACKGROUND AND RATIONALE



What is a Seed System?

It is a network of people and activities involved in the production, distribution, and management of seeds of a specific crop.

What is Community Managed Seed System (CMSS)?

The CMSS model is a participatory farmer-led approach for systematically planning and executing interventions towards promoting farmers' seed security and seed sovereignty (or) A CMSS refers to a decentralized approach to seed production, management, and distribution, where local communities take responsibility for these processes rather than relying solely on commercial seed suppliers or government programs.

Key Features of CMSS

Community Managed Seed Systems (CMSS) are characterized by their focus on local adaptation, participatory decision-making, and the conservation of agricultural biodiversity. They empower communities by involving farmers in managing and selecting locally adapted seed varieties, promoting sustainability through the use of traditional practices. CMSS encourages knowledge sharing and collaboration among stakeholders, allowing for dynamic management of seeds that responds to changing environmental and socio-economic conditions. Additionally, these systems are integrated with broader agricultural activities, such as participatory plant breeding and community led seed production, fostering resilience in local food systems. The key features are depicted below in the *Figure – 2*.



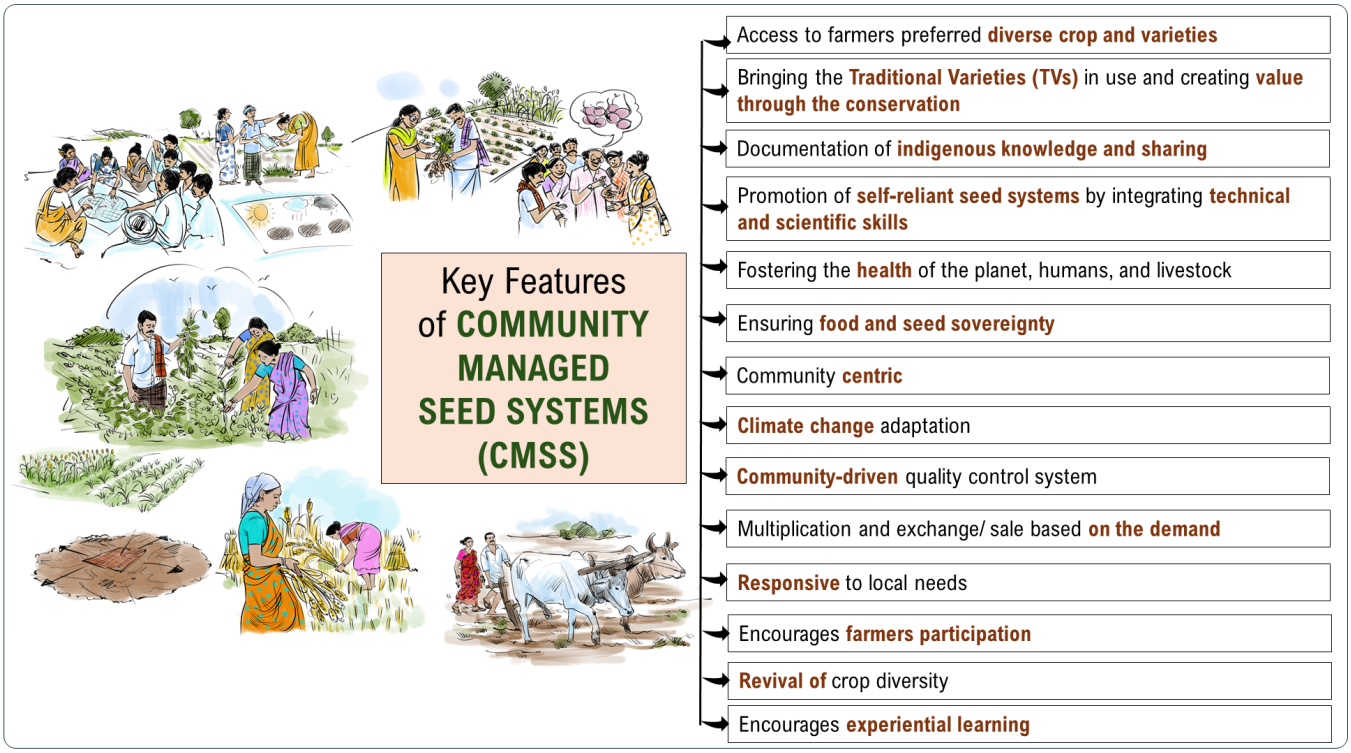


Figure - 2: Key Features of CMSS

Why do We need a Separate Seed System for Rainfed Areas?

Rainfed regions are characterized by their dependence on natural rainfall for agricultural activities, often leading to significant climatic variability. Rainfall in these areas is typically seasonal, unpredictable, and unevenly distributed, making agriculture vulnerable to the risk of dry spells and droughts. The amount and timing of rainfall can vary greatly from year to year, affecting crop yields and productivity. Additionally, intense, short-duration rain events are common, which can lead to water runoff and soil erosion rather than effective absorption. As a result, farmers in rainfed regions often face challenges related to water scarcity, and they rely on drought-resistant crops and adaptive farming techniques to mitigate risks.

Agriculture in rainfed areas is largely done by smallholding farmers and access to quality seed is crucial to ensure food security, improve livelihoods, and adapt to climate change. The use of quality seed increases crop yields. As per FAO (2011) 50% of yield increases over the past 50 years can be attributed to seed quality. Availability of quality seed still remains concern in rainfed areas as there are mixtures in the seeds..

To address this, a dynamic and inclusive seed system is essential, which would ensure timely access to quality, diverse seeds at affordable prices, especially for smallholders in marginal farming areas. Additionally, centralized formal seed systems have not effectively supported traditional crops or local varieties, which are important for resilience. Strengthening community-based seed systems that integrate formal and community-based mechanisms is necessary. This will make seed systems more dynamic and better able to meet the needs of smallholder farmers, ensuring sustainable agricultural productivity and food security.

Type of Seed Systems

Seed system is one of the most vital components of an agricultural system that involves activities associated with seed production, multiplication, processing and marketing to ultimate seed use by farmers. In general, the seed system is composed of mainly two types: formal seed system and community seed system.

(a)Formal Seed System

The formal seed system involves the organized institutional production, certification and distribution of modern crop varieties, with quality control measures in place. It is typically linked to quality standards, high-input farming operations that rely on advanced mechanization and operate according to market principles. This system primarily targets key food staples, cash crops, and high-response varieties, promoting uniformity in large-scale crop production. This approach helps meet consumer demands for price and quality. The emphasis on scientific plant breeding and seed market commercialization has led to a focus on a limited number of uniform crop varieties. As a result, agrobiodiversity within this system is quite low, making it less resilient to climate change, natural disasters, and disease outbreaks.

(b) Community Seed System

The community seed system is rooted in traditional practices of seed saving, production, exchange, and management by farmers and local communities for future sowings. This system primarily supports small-scale, subsistence farmers in rainfed areas that face environmental challenges. According to an analytical survey by the National Institute of Seed Science and Technology (NISST) in 2025, 37% of seeds used across all crops are farm-saved across the country. Specifically, for cereals, 35% are farm-saved, for pulses, 47%, and for oilseeds, 53%. Farm saved seed terms consist of traditional varieties and released varieties that farmers use for farm-saved seed. Farm saved seed consists of traditional varieties and HYVs that farmers have been using for several years.

The Working Group on Seed Systems, RRA Network, and WASSAN have conducted studies in the Sundarbans region of West Bengal and in Western Odisha, which reveal that over 50–60% of farmers in these areas - and nearly 90% of those cultivating green gram - are using traditional varieties (TVs).

In India, over 70% of millets seeds come from such community-based systems *(Figure 3)*.This survey represents farming communities nationwide. However, in rainfed tribal regions, the reliance on community seed systems is even higher; for instance, a survey in Sundarbans, West Bengal found that more than 90% of farmers depend on farm-saved seeds. Community seed systems prioritize local food security and subsistence needs, functioning largely outside formal institutions and regulations. These systems are critical for conserving biodiversity and are often the sole source of Neglected and Underutilized Species (NUS), which are crucial for the food security and nutrition of smallholder farmers.

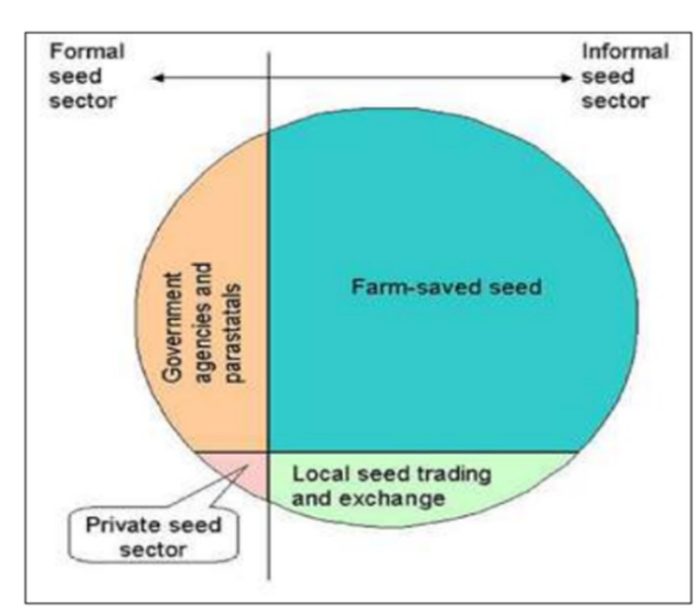


Figure - 3: Scenario of traditional seed source of millets in Rainfed areas

(Source: Sooganna, R et al.,(2023) 'Seed systems in millets', Indian Farming, 73(01), pp. 76-78. ICAR-IIMR.)



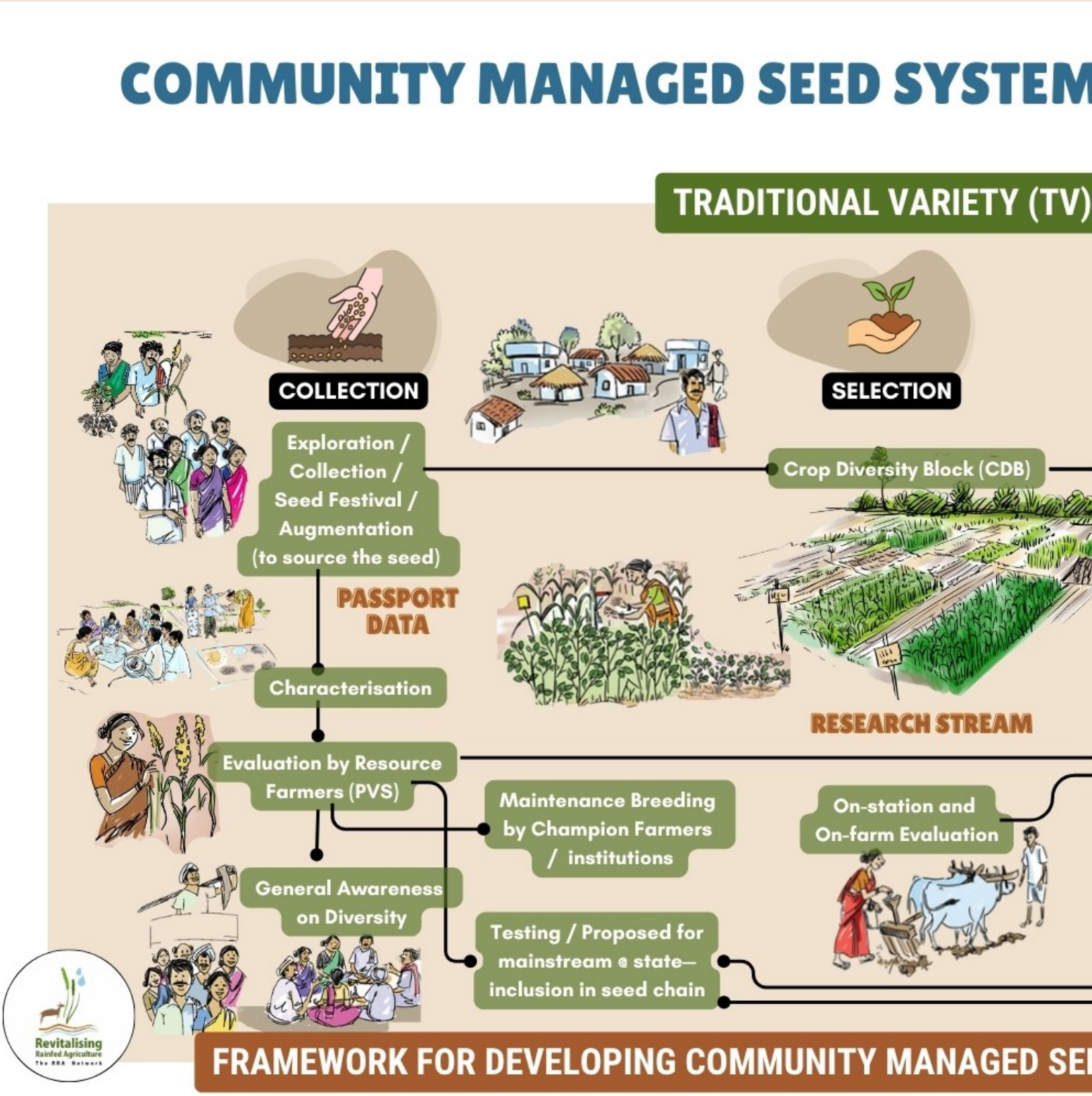
Main Components of CMSS

Reviving traditional crop varieties is crucial for natural farming and requires focused efforts and investments. Based on experiences from various locations, a specific approach emerged. Seed systems for traditional varieties should be developed through partnerships with farmers' organizations and communities, directly in the field (in- situ). The process revolves around 6 key components: collection, selection, multiplication, and selling/exchange, as given below in *Figure - 4*.

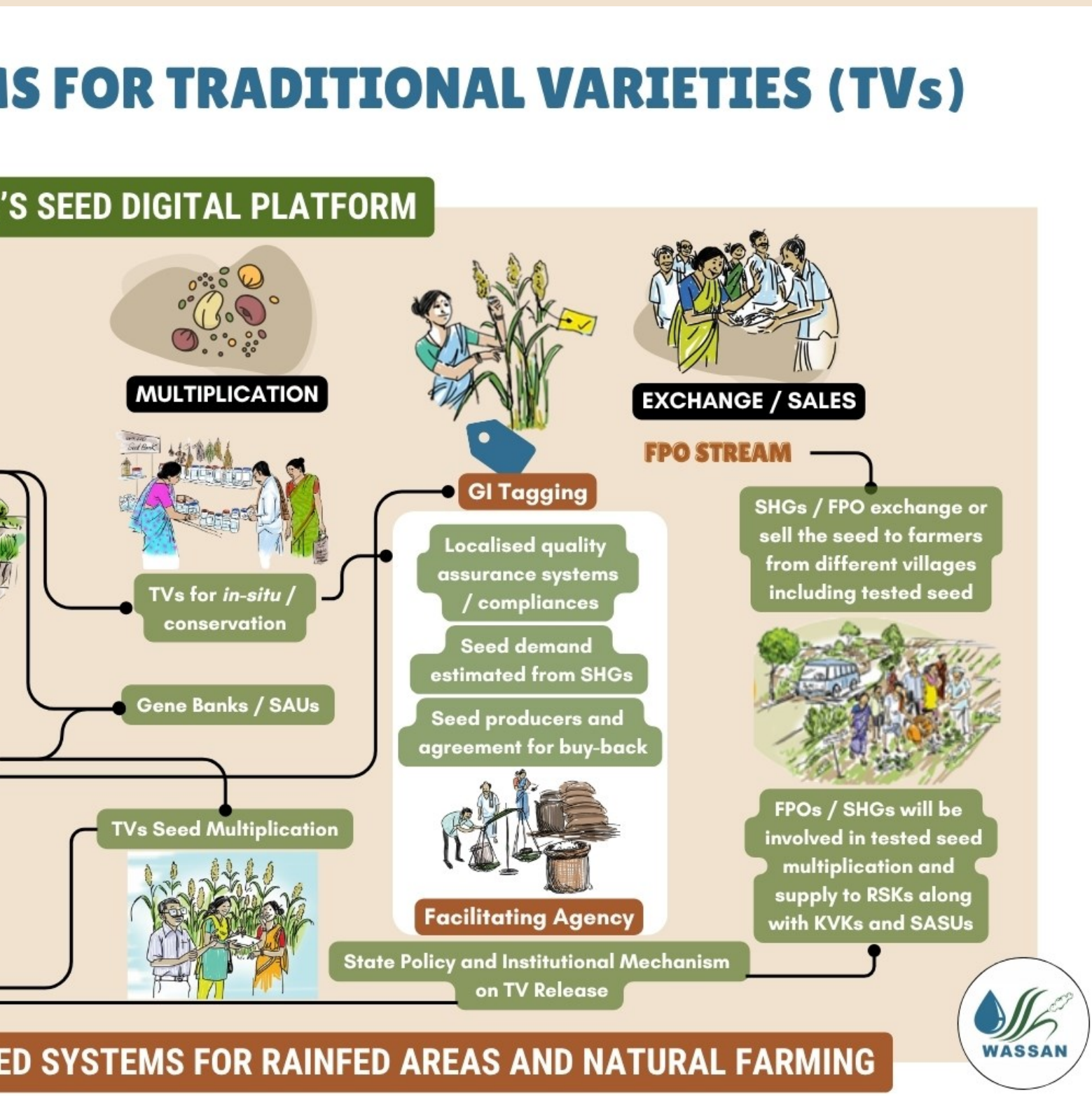
- Exploring, Documenting local diversity, Collection of TVs
- Demonstration, Selection using Crop Diversity Blocks.
- Building Digital Repository Portal of Traditional Varieties
- Multiplication and Exchange through farmers' groups and sales through seed corporations/ SHG/ FPOs/SAUs/Start-ups
- Popularisation of TVs to expand Markets for their Produce.
- Policy Development and Evolving Protocols for Releasing Traditional Varieties.

Note – Point number 1 to 4 action will be done by Farmer Organizations/FPOs and CDB farmers and Research and policy engagement comes under point number 5 & 6.





Biodiversity seed festivals, Crop Biodiversity Blocks, Participatory Varieta
and FPOs) are essential tools for implement



l Selection, Digital Seed Repositories, and farmers' groups (such as SHGs
ting various components of the seed system.

Steps in developing a CMSS

Identification of a facilitating agency (FAs)

Communities may not independently initiate these processes, so it is crucial to identify a facilitating agency to connect with farmers and their organizations. The facilitation should include the following elements:

- Reviving the use of traditional varieties on farms necessitates long-term, intensive engagement. Agencies should be selected based on their deep-rooted presence in the area, genuine interest in the cause (most important), involvement in agriculture, and understanding of rainfed systems and agroecological methods.
- Identifying or forming farmers' groups or organizations that are interested in the seed initiatives and business and willing to participate is essential. The selected areas should have farmers who value traditional varieties and prefer to cultivate them.

Exploring, Documenting local diversity, collection of TVs

Indigenous seed mapping is conducted to understand the availability of various TVs, their growing seasons, and how well they adapt to different agro-ecological conditions. It is conducted in **four steps**:

- **Step 1 – Trend analysis in the village:** Initially, trend analysis is conducted to understand the seed diversity and availability, changing agricultural practices among farmers, particularly with regards to TVs. Farmers will be interviewed about the varieties they currently cultivate and those grown in the past (10, 20, and 30 years ago), helping to identify shifts in preferences and practices over time. This analysis will also uncover the reasons behind the recent extinction of traditional varieties and explore potential sources for obtaining their seeds, which is crucial for assessing the feasibility of revival of these TVs.
- **Step 2 – Crop Calendar/ Fasal Chakra:** A seasonal calendar (Fasal Chakra) is created by dividing a circle into 12 segments, one for each month, with inner circles representing upland, midland, and lowland homestead areas (Figure - 5). Farmers discuss the crops sown and harvested each month, the corresponding land types, allowing for a comprehensive understanding of land diversity, land use pattern, crop varieties, and seasonal agricultural activities in the village. By analyzing these aspects, we can identify opportunities to enhance crop diversification, particularly if the existing diversity is low, or increase land use in areas that are currently left fallow.

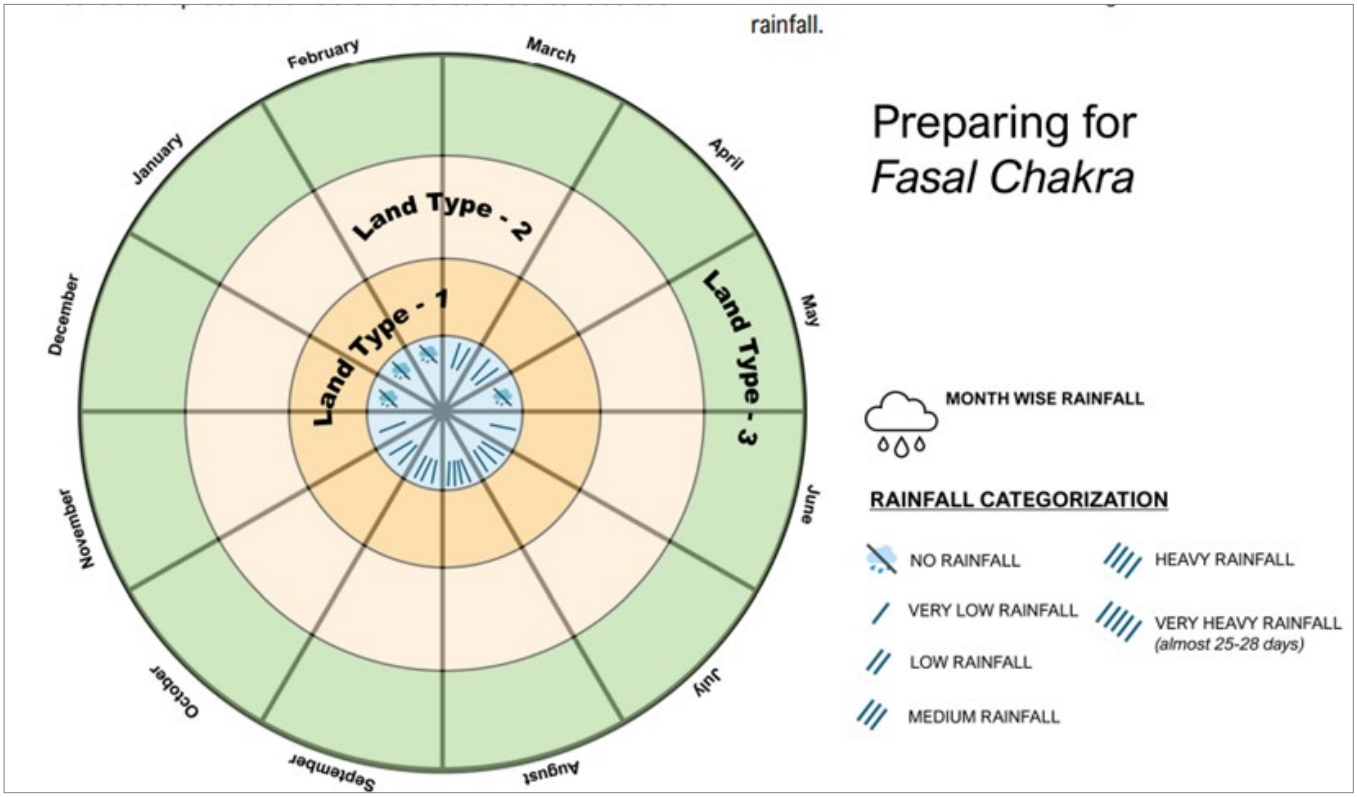


Figure - 5: Fasal Chakra



- **Step 3** – CROPS AND VARIETAL DIVERSITY INDEX: For detailed varietal mapping, a chart paper table (as shown below) is provided to farmers, focusing on major crops to identify key varieties and their characteristics. The matrix helps in identifying unique, common, and rare crop varieties in a community. It also highlights the diversity within a community or farm household (acreage covered) and serves as a useful tool to assess the origin, exchange, and specific uses of varieties and seeds. The prevailing Package of Practices (sowing, seed rate, weeding, cultural practices, post-harvest management etc) will also be discussed. It also explores the reasons behind the popularity of certain traditional varieties, while others are gradually disappearing from cultivation.

Table: format for crops and Varietal diversity index

Name of the crop	Name of the Variety	Season grown	Source of the seed	Purpose- HH consumption / sale / Fodder / others	Special/ Unique Traits of the TV	Market price / kg	% of HH cultivating the TV (rough %)	% area under the TV	Reasons for popularity/ decline of the TV

- **Step 4** - FOUR CELL ANALYSIS: This tool helps identify unique, common, and rare crop varieties in a community. Documents - why certain varieties are declining, and aids in determining conservation interventions for specific crop species. A four-cell analysis (Figure - 6) is used to categorize crop varieties based on the number of Households cultivating them and the land area dedicated to each. Varieties with fewer households in a small area are at risk of extinction and need conservation efforts. Farmers will then be approached to contribute seeds of these endangered varieties to establish Crop Diversity Blocks (CDBs).

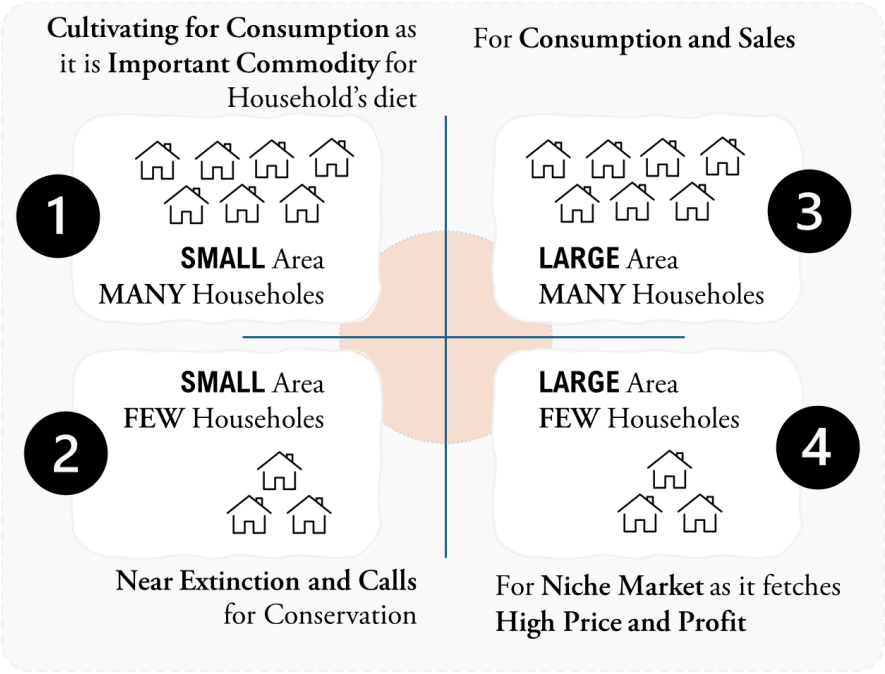


Figure - 6: Four Cell Analysis

REVIVAL OF TRADITIONAL VARIETIES



Identifying TVs involves engaging with farmers through scouting and persuading them to help search for and collect these varieties. Creating an inventory of the traditional varieties within the community, along with their detailed passport data (*refer to Annexure 2*), and collecting them can be achieved through the following methods:

- Conduct participatory exercises where the community helps map out the locations of traditional varieties within their villages.
- Organize seed or biodiversity festivals to collect and exchange traditional varieties.
- The TVs collected from the region available in the state gene bank / ICAR-NBPGR and CGIAR gene banks, universities, and crop-based institutions may also be sourced.
- TVs shall also be sourced from custodian farmers/genome awardees/Padma awardees/seed savers or through Beej Khoj Yatras
- Identified traditional varieties will also be submitted along with passport data to the Sate Gene bank / National Gene bank in NBPGR for long-term conservation with a provision to access them by the communities when needed under some agreement.

Organizing Seed Festivals: Key Elements

Seed festivals are organized at an aggregate level, such as across a cluster of villages, at the block level, or within a district. The preparatory work involves identifying farmers who continue to cultivate traditional varieties, as well as those who are passionate about conservation, often referred to as champion farmers. Utilizing community platforms like Self-Help Group (SHGs) federations or Farmer Producer Organizations (FPOs) is essential for organizing these events. Ideally, the festivals would be organized in the month of February for kharif crops and September for rabi crops.

To encourage participation, it is beneficial to conduct participatory exercises that motivate farmers to collect traditional varieties and bring them to the seed festival. During the festival, the seeds contributed by the farmer would be displayed. Seed quality should be ensured, and if it is poor, farmers should bring fresh seeds without any admixtures. Collecting Passport Data for each seed will be crucial, as it records essential information such as the seed's origin, the farmer's name, the crop type, key characteristics & traits of the variety, medicinal value, and cultural relevance (*Annexure - 3 on detailed process*).

Forming a peer farmers' group for awards

A small committee of farmers can be established to visit all seed displays and award points to those who have collected and brought the quality seeds to the festival.

Seed Display / Exhibits

The seed display should be exhibited spaciously, allowing farmers to easily view different varieties of each crop in one area. Encouraging farmers to identify varieties that are absent from their villages will facilitate seed exchanges and promote diversity.

Plenary Discussion

In addition to emphasizing the need for conservation, discussions should focus on the various crop varieties, their unique features, suitable to which cropping systems, and local adaptations. This will highlight the importance of every village having a diverse selection of seed varieties, including those that could be cultivated in the future. Such discussions can raise awareness among farmers about the diversity present in their fields.

Awarding Farmers

The peer group of farmers will select the best collections to be awarded, creating a competitive spirit for the upcoming season. Additionally, all participants will be acknowledged to encourage their active involvement.

Deciding on the Crop Diversity Block

Finally, discussions should lead to the selection of a specific location or farmer for establishing a Crop Diversity Block, emphasizing the need to observe all varieties within a particular ecosystem. It is also important to determine the crops for which diversity Blocks will be created, ensuring the effective conservation of traditional varieties.



DEMONSTRATION, SELECTION USING CROP DIVERSITY BLOCK (CDB)



The primary objective of the CDB initiative is to consolidate the varieties collected during the seed festival into a single location for thorough observation. This process involves documenting the characteristics of each variety, Participatory Varietal Selection (PVS), and variety purification (removing off-types), thereby facilitating effective seed multiplication.

Crop Diversity Blocks are implemented in farmers' fields, where the various collected varieties are cultivated in rows or small blocks specific to each crop. This arrangement allows for easy observation by farmers and aids in the selection of desirable traits.

Various steps in CDB includes

Agreement with Farmers of the CDBs

Farmers interested in promoting crop biodiversity can voluntarily offer a plot for the CDB.

Farmer selection criteria

- Farmers may participate in the CDB voluntarily.
- A lease agreement may also be established, after the farmers willingness to take up CBD.
- The SHGs/FPO/local organization will decide which crops/crop varieties are to be grown in the CDB.
- The SHGs/FPO or facilitating agency may purchase all produce from the plot at a premium to compensate for the extra effort required to maintain small plots and manage differing harvest times.
- Plots with access to supplemental irrigation should be selected to ensure crop security.
- A Seed Sub-Committee of interested farmers should be created to oversee the CDB. This committee will assess the shortlisted plots for suitability, considering factors like flooding risk, water availability, accessibility (preferably roadside), and the farmer's willingness to participate.
- It is vital to agree on a set of practices that adhere to natural farming principles and avoid chemical inputs.
- An estimated cost should be prepared, with the CDB farmer compensated through either SHGs/FPO cost coverage or a mark-up on produce prices to cover additional expenses. The Memorandum of Understanding (MoU) must clearly outline these terms. (*Annexure - 4: MoU*)
- Once finalized, the SHGs/Farmers' group or FPO must have a signed MoU with the CDB farmer detailing all terms to ensure clarity and prevent future disputes.

Establishment of Crop Diversity Block

The crops and varieties for the CDBs are determined before their establishment. The overall size of the CDB is determined by the number of TVs collected.

The layout and design of the CDB is as follow:

- Each plot will be divided into blocks measuring 5 m x 10 m (50 sq m) for each TV to maintain the minimum population-crops with less spacing for row to row and plant to plant. If land or seed is limited, blocks can be reduced to min of 2.5 m x 5 m.
- An isolation distance of at least 0.75 to 1 m (2 to 3 feet) should be maintained between the beds with barriers if required
- A 0.5acre CDB plot can accommodate approximately 36 TVs, with each TV replicated thrice for performance comparison.
- Name boards of the TV should be placed at each bed.
- Land preparation for the CDB should be completed early in the season, incorporating the necessary quantities of farmyard manure (FYM) and other natural farming inputs, such as Ghanajeevamrut etc.
- Marking should be done according to the design and layout, which can be based on the crops and their mode of pollination. For cross-pollinated crops, the isolation distance between the varieties should be more when compared to self-pollinated crops. Isolation can be maintained by using time, space isolation, or barriers (*Annexure - 5*)
- To maintain time isolation, sowing should be staggered based on flowering dates, with at least a 5-day buffer.
- A minimum plant population per block should be maintained (varies with the crop).
- The block orientation should align with the movement of the sun.
- For cereals, ideally, there should be 2 plants per hill.
- Check Variety is a must in the CDBs.



Types of CDBs

CDBs can be categorized into three types based on the activities conducted in them

1. **Crop Diversity Block:** Diversity of TVs will be demonstrated, characterization data will be collected, and preferred varieties will be identified through Participatory Varietal Selection. Seed multiplication will be done for the preferred varieties and the rest of the seeds of TVs will go to seed-conserving farmers and informal institutions like seed banks and formal institutions like Gene banks, if anyone is interested
2. **Regular CDB -** A specialized form of CDB, an experienced farmer-conservator oversees this category. Established in various agro-ecological zones across the country, these sites will not only carry out conservation activities but also systematically monitor and document crop responses to climate change, including both biotic and abiotic stresses.
3. **Seed Production CDB farmers:** preferred varieties will go into multiplication through SHGs/FPO to seed farmers. The quality ensuring committee will be responsible for ensuring the quality of seed production.

Crop Production / Management of CDB

The key management task in CDB is to remove off-types in each plot, which includes regularly eliminating (roughing) off-type plants, other crop seeds, and weeds. The homogeneity of the TVs depends on the thoroughness of this removal. To attain this, a solid understanding of crop descriptors, along with the specific traits of traditional varieties, is essential for this process. Other key practices include,

- The TVs collected are sown according to the spacing requirements for each crop.
- Standard agronomic practices under natural farming should be followed, using the same inputs across all replications while avoiding chemical inputs, as TVs are less responsive.
- The CDB farmer must receive training and orientation on management practices.
- The seed quality ensuring committee should conduct regular visits to the plots, with at least 3 to 4 inspections by the Farmer Resource Persons (FRPs)/experts of the CDB to ensure the farmer adheres to the necessary practices.
- Post-harvest management, including exclusive TV threshing, cleaning, and proper storage, is crucial to prevent seed admixtures.



CHARACTERISATION OF TRADITIONAL VARIETIES

Traditional varieties often have distinct names, reflecting the ability of farmers to recognize them by specific characteristics or observable features. These traits should first be recorded in the passport data and further detailed in the CDB.

Assigning Code number for TVs

The facilitating agency will provide each traditional variety with a unique Code for easy identification within the database. The Code will follow a specific format, incorporating details such as:

- State : Telangana (Telangana)
- District : Vikarabad (Vikarabad)
- Block/Mandal : Nallacheruvu (Nc)
- FPO Name : Jana Jeevana (JJ)
- Series : 0001 to 1000

An example of a Traditional Variety Code might be: TS/VKB/Nc/JJ/0001

Characterization at field level

Three to five randomly chosen plants, likely to represent the true traditional variety, are selected and tagged for thorough characterization throughout the entire growing season. Plants should be selected from all sides of the block, excluding border ones. These plants will be observed at all the growth stages (*Annexure—6: Example of Finger millet*). Characterization observations are recorded at different stages of crop development, including germination, vegetative, flowering, dough, maturity, and post-harvest phases. WASSAN and the RRA network's Working Group on Seed Systems have consolidated various characterization formats into a practical set for certain crops, categorized into four types based on visual or measured traits, and whether they apply to a single plant or a group of plants:

- **Measurement in Group (MG):** Traits measured on a group of plants, such as days to 50% flowering, days to maturity, grain yield, and fodder yield.
- **Measurement in Single (MS):** Traits measured on individual plants, like finger length, panicle length, leaf width, and plant height.
- **Visual in Group (VG):** Visual traits assessed in a group of plants, including plant growth habit, seed surface, and finger branching.
- **Visual in Single (VS):** Visual traits assessed in individual plants, such as leaf juncture pigmentation and leaf venation.

Data collection will be carried out by the CMSS fellows, who will receive phased training aligned with different crop stages. The entire process of establishing and managing the CDB plots, including data collection, harvesting, and storage, will be overseen by the Farmer Resource Persons (FRPs). Once collected, the data will be reviewed and validated by the scientific team to ensure accuracy and reliability. As of 2024, a total of 60 CMSS fellows have been trained in data collection, with 10 FRPs actively participating in field visits.

Field Day / Farmers visit to CDB

Following Seed/ Biodiversity Festivals, the SHGs or FPO or Seed quality ensuring Committee can organize field days at the CDB, inviting farmers, agricultural officials, and local representatives. During the event, CDB farmers and the Seed quality ensuring committee will guide the visiting farmers in small groups, showcasing traditional varieties.

This event serves multiple purposes:

- Introduces farmers to various traditional varieties.
- Collects and records feedback from visiting farmers.
- Creates demand for specific varieties
- Collects the indent for seed from the farmers for grain production.

Farmers can identify TVs suited to their needs, while the event generates demand for local seeds that the SHGs/ FPO can later multiply and sell. (*Refer to Annexure—6 for the detailed process*).

Participatory Varietal Selection (PVS) at CDB

Participatory Varietal selection will be taken up with farmers from around the villages to see the growing crops and to participate in the Crop Cutting Experiments in the crop diversity blocks. The selected TVs will be designated for multiplication and distribution, while the rest will be gene banks where they can be preserved with accession numbers for longer time.

It is the role of the communities themselves to decide on the crops and varieties to be multiplied. The Crop Diversity Block offers an opportunity to select locally adapted and high-performing varieties. Locally popular varieties (from research institutions or agricultural universities) can serve as check varieties for comparison alongside the TVs. The seed quality ensuring committee can form a group of experienced farmers to evaluate the TVs and identify the best performers based on their criteria.

Harvesting, Procuring and Storage

During harvesting, it is crucial to collect seeds only from plants that match the passport data. Each operation, including manual separate harvesting, drying, threshing, and winnowing, should be conducted separately for each TV to prevent seed mixing (maintaining physical purity). The seed quality assurance committee will record the moisture levels and weights of each TV, signing off on the records. Farmers can then pack the seeds carefully and store them in a safe, dry place. Additionally, a few randomly selected panicles/pods/whole fruits from each bed should be harvested separately for display purposes or for storage. The procuring committee will collect the seed from the farmers, confirming the quality from the seed quality assurance committee.

STORAGE: The collected seeds are stored in a safe dry place. Some of the most important features of good seed storage are:

- Selecting pure, healthy & quality indigenous seeds.
- Physical Purity should be 98% with 2% inert matter; (for most crops) an allowance of 10 other seeds per kg (varies with crop).
- Optimal sun drying to maintain proper moisture level; cereals –12 to 13%; pulses – ~9%; oilseeds–7 to 9% for open storage.
- 1% decline in Seed Moisture doubles the potential of the Seed (Harrington's Thumb Rule– applicable at 5 to 14% moisture range).
- Seed Life is doubled with every 5 degrees Celsius decline in the temperature (range of 0 to 50 degrees Celsius).
- Maintaining DRY & COOL storage space.

Seed Life is doubled with every 5 degrees Celsius decline in the temperature (range of 0 to 50 degrees Celsius).
Maintaining DRY & COOL storage space (Use of Thermohygrometre).

Some of the ITKs used for efficient storage include

ITK/Ingredient	Details
Cinnamon bark	Raw bark in a sack of polished rice attracts weevils
Black Pepper	5% black pepper protects wheat against weevils
Neem	Neem powder made from neem seeds is used to store grains. Powder mixed with wheat @ 10-20 g/kg ensures year-long protection against weevils. 2 to 3 ml of Neem oil mixed with 1 kg of beans protects from Bruchid infestation (upto 6 months)
Red Chillies	Protects rice against weevils
Mint leaves	Powdered leaves mixed with leaves at 5% gives good control over rice weevils
Turmeric	Powder is mixed with rice, wheat and pulses at 2%
Wild Tobacco	Dried, chopped leaves laid over pulses protect from bean weevil
Others	Ash of acacia, Casurina, cowdung, mango bark and leaves, rice husk and tamarind seeds are mixed with grain to give a protective covering

Purchase by SHGs/ FPOs/CBOs from CDB

The acquisition of seeds from the Crop Diversity Block (CDB) farmer depends on the initial agreement established with the Seed Quality Ensuring Committee at SHGs/FPO.

Price fixation process: The Seed quality ensuring Committee will take into account local grain and seed prices (as shown in Table below), along with the additional cultivation costs related to the CDB, to set the purchase price. The SHGs/FPO may opt to purchase all seeds produced in the CDB at this agreed price, ensuring each TV is bagged separately and clearly labelled with TV name/ numbers, and securely stored, given the value of these small seed quantities.

The seeds sourced from the CDB will be divided into two portions: one will serve as mother stock for maintaining the traditional variety- it should be sown once in every two years, while the other will be designated for **multiplication** as needed. Prior to storage, the Seed quality assurance committee will conduct a germination test on all seeds and document the germination percentage (*Refer to Annexure - 7 for the germination testing process*).

Building Digital Repository of Traditional Varieties

Managing data becomes challenging when the number of crops and TVs increases, making comparisons difficult. To address this, a web-based Traditional Seed Information and Exchange Platform has been developed by WASSAN as a digital repository for storing and analysing data on traditional varieties. The Facilitating Agency can maintain detailed records on paper and later upload them to the platform for easier management (*Figure - 7*).

Benefits of using the portal include:

- Data can be securely stored in the repository
- The platform's analysis tools allow for comparison of TVs with similar traits in a given area
- The seed repository can be accessed at https://seedportalapp.wassan.org/

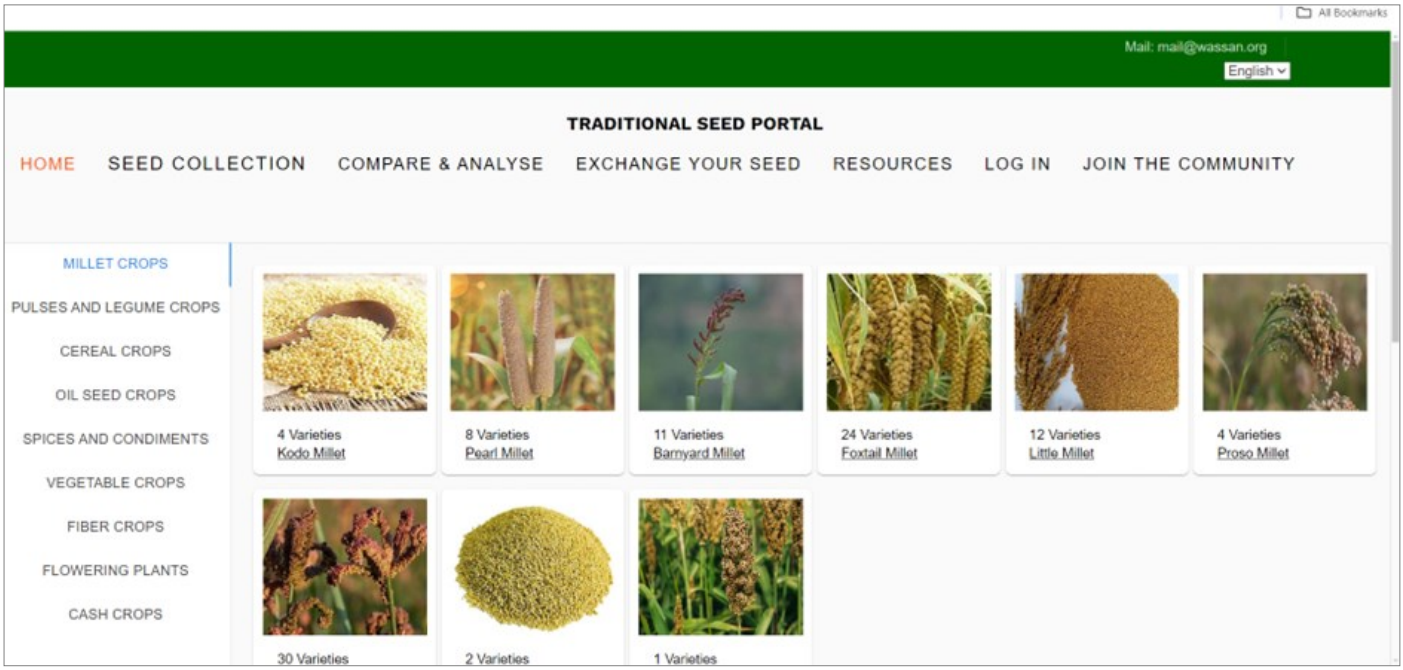


Figure - 7: Home Page of Seed Portal

Multiplication and Exchange through Farmers Groups and Sales through FPOs / SHGs selected TVs

Farmers' field days offer exposure to traditional crop varieties and the selection process, generating demand based on farmers' preferences. The Seed quality assurance committee and SHGs/FPO can then choose to multiply these preferred varieties and provide them to more farmers at a reasonable price.

(a) **Multiplication of Mother Seed:**

- The seed from CDBs is typically low in quantity, often just a few kilograms, making initial multiplication essential for TVs in demand.
- Multiplication progresses faster for crops with high seed multiplication ratios (SMR), like millets, and slower for crops like groundnuts with low SMR.
- In the first round, the SHGs/ FPO/CBO will sign a buy-back agreement with a farmer to multiply the seed. Keeping the price difference between seed and grain minimal reduces risk, allowing seed to be sold as grain with minimal losses if needed.
- Seed quality standards, including germination rates and impurity levels, must be defined and met during seed purchase.

Names of the price fixation committee	Name of the crop	Name of the TV	Price of the produce in near by market (Rs)/kg				Percentage of markup (%)	Purchase price (Rs)
			Market price 1	Market price 2	Market price 3	Average		

(b) Seed Multiplication for Wider Distribution:

- Multiplied seed will be distributed to seed-producing farmers based on demand estimates, following established seed production protocols and under buy-back agreements with the SHGs/ FPO.
- The Seed quality assurance committee will conduct inspections and ensure adherence to seed production standards.
- The SHGs/FPO can promote the availability of traditional seeds during Seed Festivals and farmer meetings, with pricing determined by the seed quality assurance committee.

Setting Seed Quality Standards

INSTITUTIONAL MECHANISM WITHIN FPO

Seed quality standards are established for crops rather than specific varieties, as outlined in the Indian Minimum Seed Certification book. Traditional varieties do not conform to existing quality standards due to their inherent heterogeneity, which contributes to their resilience and stability. Therefore, it is essential to develop seed quality standards specifically for TVs. This can be achieved through participatory exercises to understand farmers' perceptions of seed quality.

The process involves focusing on 2-3 widely cultivated crops and TVs that align with farmers' preferences. This entails documenting field and seed standards derived from their experiences and knowledge. To achieve this, a meeting should be organized with knowledgeable male and female farmers to explain the objectives and assist in selecting popular crops. Following this, group discussions can be facilitated for each crop to further engage farmers and gather insights. Additionally, farmers should be encouraged to bring seed samples for evaluation, where they can count 100 seeds and separate those of high quality.

Identify parameters used for seed separation, including:

- Physical purity: seed colour, size, shape, etc.
- Presence of trash, stones, same crop but different variety seeds, or other crop seeds and weeds.
- Germination percentage and moisture requirements for germination.
- Identification of off-types in standing crops.

FPO - Institutional Mechanism and its role in Seed Production

The Farmer Producer Organization (FPO) is leading the Community Managed Seed System, and it is responsible for ensuring the availability of quality seeds. To fulfil this role, it must establish appropriate structures and mechanisms.

1. **Quality assurance & procurement committee,** consisting of 3 to 5 members, will be responsible for regular visits to CDB to monitor farmers' adherence to timely practices such as sowing, weeding, roughing, and Natural Farming methods. The committee will also oversee quality aspects during harvesting, threshing, drying, weighing, moisture recording, bagging, and conducting germination tests. They will receive support from the Field Assistant's (FA) staff. The seed producers will not be part of this committee.
2. **The Procurement Committee**, consisting of 3-5 members, will purchase seeds from farmers based on recommendations from the Quality Assurance Committee. They will check moisture levels, record weights, and ensure safe storage of the seeds.
3. **The Price Fixation Committee**, including field assistant staff, seed purchasers, seed producers, and SHG/FPO leaders, will consider the farmers' cultivation costs and nearby Mandi prices for various crops. Together, they will determine the purchase and sale prices, ensuring a reasonable margin between the two. It should be ensured that seed purchasers do not find the price per kg too high.

Roles of Community Seed Bank's in seed production and Sales / exchange (Figure - 8).

- Follow CMSS guidelines.
- Identify seed production farmers and supply seeds for multiplication.
- Conduct monitoring visits to seed plots.
- Record quantities procured, packed, and sent to the FPO.
- Provide written acknowledgment of seed quantity and quality delivered to the FPO.

Note: *If FPOs are absent in a specific locations, The activities will be taken up by the CBOs*





Selling / Exchange of TVs

Farmers' groups or SHGs or FPOs can promote traditional seeds by making them available in each village for cultivation. They may establish exchange norms that exist in that region (like where farmers return 1.5 to 2 times the seed they borrow). The additional seed collected can be sold to cover costs or losses.

ROLES OF FPOS

- Collect seed requests from CSBs and plan seed production.
- Source seeds from farmer breeders and provide them to CSBs for multiplication.
- Monitor seed production plots.
- Manage accounts and processing facilities.
- Procure multiplied seeds from CSBs and distribute them to consumers.
- Verify bag weights from CSBs and confirm stock receipt.
- Maintain inventory records of received bags.

INTEGRATING COMMUNITY SEED BANKS (CSBS) INTO FPOS'

WHAT ARE COMMUNITY SEED BANKS (CSBs)?

They are community managed institutions that are primarily focused on conserving seeds for local use. They conserve and improve local seed systems, especially traditional and underutilized crop varieties. They are managed by farmers and handle a wide range of crops in varying quantities. Their goal is to help farmers and communities regain control over seeds, fostering cooperation with researchers, extension workers, and development professionals. As commercial seed companies focus on modern varieties and hybrids, CSBs are increasingly becoming key sources for traditional crop seeds.

Integrating Community Seed Banks (CSBs) with Farmer Producer Organizations (FPOs) offers several advantages for scalability and sustainability. Key benefits include:

lock.

1. Access to government programs for registered farmer organizations.
2. Eligibility for working capital loans.
3. FPOs can serve as umbrella organizations for CSBs, ideally one per block.
4. Risk distribution across members.
5. Easier access to statutory licenses.
6. Simplified management of accounts and processing facilities.

FAO & Bioversity international (2013)

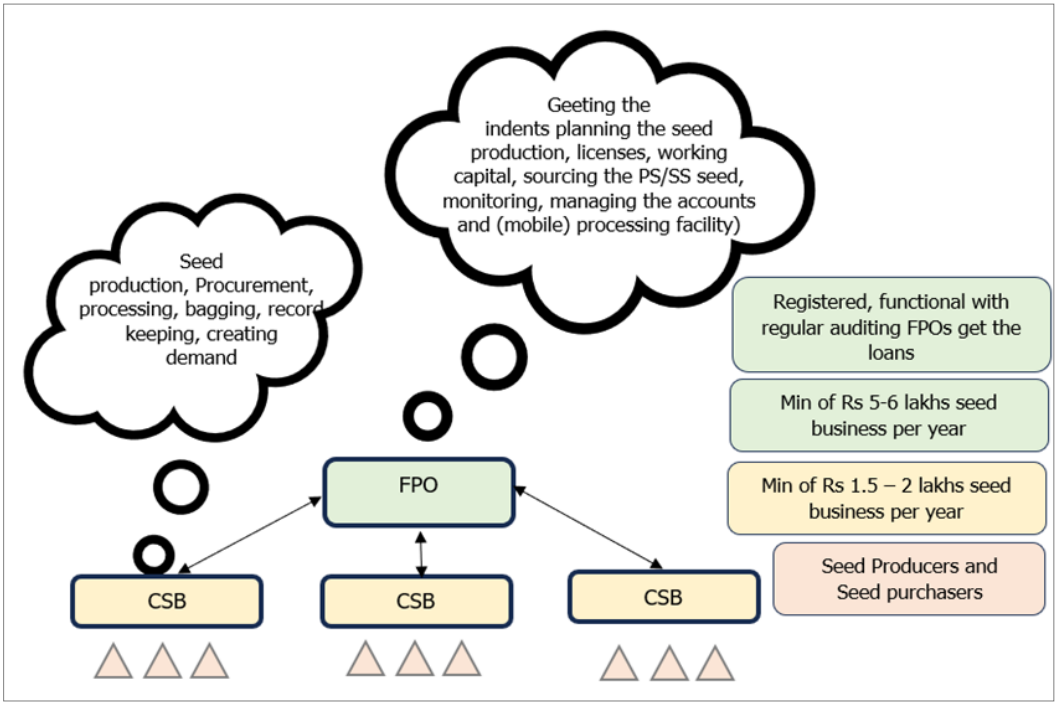


Figure - 8: The role of CSBs in CMSS

Infrastructure

Prior to the start of procurement, the SHGs/FPO must secure essential infrastructure, including moisture, tarpaulins, weighing machines, and three-layered bags. These resources will be overseen and managed by the Procurement Committee to ensure smooth and efficient handling during the procurement process.

Popularisation of TVs to Expand Markets for their produce

There is a need to popularize /commercialize the production of TVs and work on their value chain. Bringing the Consumers and producers on one platform, Buyer – Seller meets with good enterprising FPOs, linking with start-ups who are into organic/natural farming / NUS crops' value chain through organizing a series of workshops/ melas at regional and national levels are some of the methods. Nutrition profiling and recognition of the TVs for their special traits will enhance their marketability at local and export markets

KVKs can also be involved in promotion as they can establish the crop cafeteria and organise mela and participate in melas too. Food festivals, recipe competitions, recipe books, discussions with hospitals like Ayush etc. also help in mainstreaming TVs into the food systems. FPO and FA can take this agenda forward at the field level.

Policy Development and Evolving Protocols for releasing Traditional Varieties

Currently, there are no mechanisms for the inclusion of TVs in formal seed chains, except for registering them in PPV &and FRA. Enabling State Governments/ Departments to release promising (for yield or resilience or special traits) TVs for wider local use is important for realizing the potential of TVs in natural farming/ rainfed farming situations.

- A program needs to support evolving relevant policies and protocols for the release of TVs at the state level meeting all statutory requirements and scientific standards. The identified TVs for mainstreaming will be placed in the public domain for use and multiplication. Protocols will also be developed for the State Governments to release and notification by the Government of India.
- Local KVKs, SAU research stations, and the Department of Agriculture will be involved in the field schools of farmers in the identification and description of the TVs. ICAR-NBPGR also need to be part of the consortium providing technical input along with other partners.

SUSTAINABILITY OF THE CMSS MODEL

To sustain the CMSS model, it is crucial to establish a strong seed system and a value chain for TVs. Mainstreaming CMSS can be done two ways

1) Community managed Seed Systems should be strengthened and supported by Govt to cater the needs of diverse crops varietal seeds to farmers – that helps in bringing the diversity in the fields and plates
2) Bringing TVs into formal seed chain in the mainstream systems – TVs that are performing well or on par with HYVs with agroecological practices, climate resilient like drought tolerant, flood tolerant, salinity tolerant etc and nutritionally rich should be released through alternative seed system for TVs in the mainstream and supply them with subsidy to the farmers

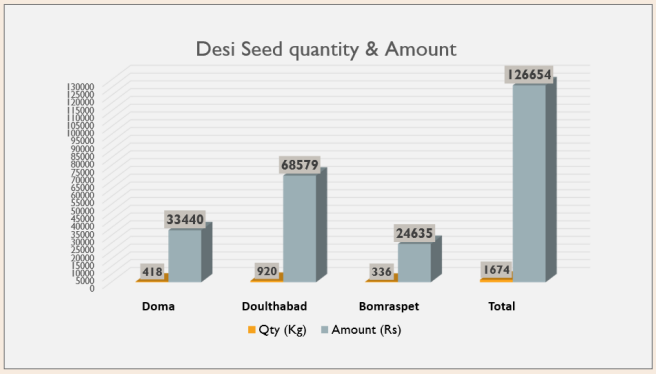
A comprehensive approach that integrates supportive policies for public investments and R & D, scientific characterization, value addition, seed conservation and multiplication, and community-led initiatives is essential to the long-term success of the CMMS model.

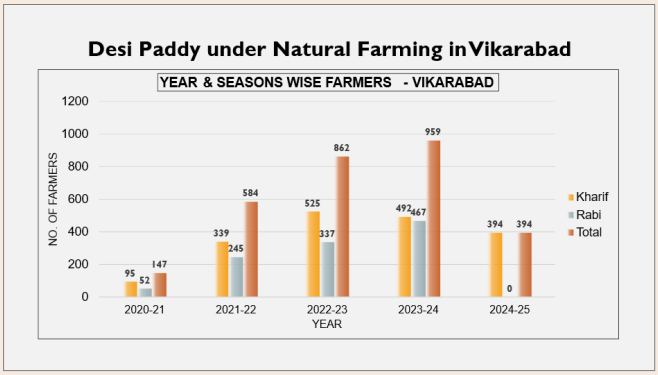
CASE STUDY - PADDY IN DOULTHABAD

During Kharif 2021, 53 rice TVs were collected from local farmers, and some from other states as well. A CDB was established in the fields of two farmers, Viswanatham Netur and Sai Reddy, from the villages of Erlapally and Doulthabad. By 2022, the CDB had grown to include 117 TVs, 45 of which were repeats from the previous year. The TVs were distributed across four farmers' fields viz., Sai Reddy (46 TVs), Viswanatham (25 TVs), Mallesh (20 TVs) from Kosgi Mandal, and Ramireddy from Doma Mandal. In 2023, two farmers maintained CDB fields with 25 new varieties and 22 repeated varieties. CDB continued in 2024 also. Participatory Varietal Selection (PVS) was conducted, where farmers selected 15 TVs based on their preferences. Out of these, seven were the most favoured and were cultivated for household use. Though seed production began in 2022, it was initially limited to farmer exchanges for personal use rather than commercial sales.

By 2024, seed production had expanded significantly, reaching around 900 farmers for cultivation in 2024. To promote awareness of these traditional varieties and emphasize their importance in local diets, a food festival was organized by ARAKA with the support of WASSAN; such events continued in 2024 also. This event attracted hundreds of participants, including farmers, local store owners, and millers, encouraging the conservation of TVs and also enlightening the nutritional value of the TVs.

ARAKA has identified the seed multiplication farmers, and it has agreed with the farmers that seed will be purchased back, for that the farmers have to follow the seed production protocol. ARAKA produced and sold 16.74 Qtls of paddy TVs seed for grain production worth Rs. 12.66 lakhs between till 2024.





One major barrier to the widespread adoption of these varieties was the milling process. Farmers usually milled small quantities of rice for household consumption to avoid pest infestations, but access to single-polish rice milling facilities was limited. This forced farmers to travel long distances, increasing costs. Moreover, single-polished rice caused a loss of bran, which discouraged millers, further limiting the cultivation of these varieties. One entrepreneur established the mini rice mill in Erlapally (Village), Doultabad (M), Vikarabad (D) – HHs can get unpolished/semi-polished/polished rice as per their preference. Farmers have found the consumers in the same mandal (block) and Hyderabad also. ICAR-IIRR is supporting nutrition profiling, which is also helpful for ARAKA to market the rice and encourage farmers to cultivate TVs





Annexure - 1: List of Crops with Isolation Distances for Seed Production from other Varieties of the Same

S. No	Crop Name	Type of Pollination	Isolation distance for seed production from other varieties (in)
1	Rice	Self-Pollinated	3
2	Wheat	Self-Pollinated	3
3	Oats	Self-Pollinated	3
4	Barley	Self-Pollinated	3
5	Sorghum	Often-Cross Pollinated	200
6	Barnyard Millet	Self-Pollinated	3
7	Maize	Cross - Pollinated	400
8	Finger Millet	Self-pollinated	3
9	Foxtail Millet	Self-pollinated	3
10	Kodo Millet	Self-pollinated	3
11	Little Millet	Self-pollinated	3
12	Proso Millet	Self-Pollinated	3
13	Pearl millet	Cross - Pollinated	400
14	Bengal Gram	Self-Pollinated	5
15	Black gram	Self-Pollinated	5
16	Green gram	Self-Pollinated	5
17	Horse gram	Self-pollinated	5
18	Moth bean	Self-pollinated	5
19	Pea	Self-Pollinated	5
20	Peanut / Groundnut	Self-Pollinated	3
21	Cowpea	Self-Pollinated	5
22	Lentil	Self-Pollinated	5
23	Rajmash	Self-Pollinated	5
24	Soybean	Self-Pollinated	3
25	Pigeon pea	Often-Cross Pollinated	100
26	Brinjal	Often-Cross Pollinated	150
27	Okra	Often-Cross Pollinated	250
28	Potato	Self-Pollinated	5
29	Tomato	Self-Pollinated	25
30	Cucumber	Cross - Pollinated	500
31	Pumpkin	Cross - Pollinated	500
32	Ridge Gourd	Cross - Pollinated	500
33	Onion	Cross - Pollinated	500
34	Garlic	Cross - Pollinated	5
35	Spinach	Cross - Pollinated	1000
36	Tobacco	Often-Cross Pollinated	3
37	Turnip	Cross - Pollinated	1000
38	Radish	Cross - Pollinated	1000
39	Cabbage	Cross - Pollinated	1000
40	Mustard	Self-pollinated	50
41	Safflower	Cross - Pollinated	200
42	Sesame	Self-Pollinated	50
43	Castor	Cross - Pollinated	300

Annexure - 2: Basic Passport Details format while sourcing traditional seeds from farmers

S. No	Traits / details	Responses
1	Name of the crop:	
2	Local name of the traditional variety:	
3	Crop category (cereals/ millets / oil Seeds / pulses/ vegetable / others):	
4	Name the place from where seed is collected:	
5	Name of the farmer from whom seed is collected:	
6	Is it registered as a farmers' variety with PPV & FRA?	
7	Did it enter into PBRs of Biodiversity Management Committees	
8	Seasonality (Kharif/ Rabi/ Summer)	
9	Suitable soils (sandy/red/black/saline/ alkali etc.)	
10	Suitable areas (high/ medium/ low / plain lands)	
11	Suitable Rainfall area (high/medium/low rainfall areas)	
12	Crop duration(days)	
13	Can it withstand dry spells?	
14	Can it withstand floods?	
15	Is it resistant to pests?	
16	Is it resistant to disease?	
17	Seed rate/acre (Kg/ac)	
18	Yield (kgs/acre) (based on your experience)	
19	Seed colour	
20	Does it have an aroma? (Yes/No)	
21	Type of the crop (shrub/ Creeper/ Climber/Erect)	
22	Grown under (Mono crop/ intercrop/ mixed cropping systems)	
23	If it's mixed crop -mixes with which crops	
24	Cooking quality (community Claims)	
25	Any known medicinal properties (Community Claims)?	
26	Cultural importance (any particular ritual/ festival etc)	
27	Palatability of Fodder to animals	
28	Germination test results (how many seeds germinated out of 100 seeds?)	
29	Mixture % – (Other crops and same crops seeds got mixed)	
30	Moisture %	
31	Is it a truthfully labelled seed?	
32	Date of harvesting	

Annexure - 3: Steps in organizing a Seed Festival / Seed Mela

Organizing a Seed Festival or Biodiversity Mela is a community-led celebration of traditional seed diversity, cultural practices, and local agricultural knowledge. Below are the steps to be followed for effective planning and execution of the event:

1. **Planning and Preparation**

- The Seed Festival should be scheduled well in advance, ideally before the onset of monsoon or traditional sowing dates as per the local almanac.
- Community-Based Organizations (CBOs) should plan the event, including approval of the festival and finalization of dates. Cultural and seasonal aspects must be taken into consideration.
- Identify a central and accessible location for the event, and finalize arrangements such as date, venue, facilitators, and local coordination mechanisms.

Make necessary logistical arrangements: pandal setup, display tables, sound systems, seating, and lunch arrangements.

2. Outreach and Invitations

- Send invitations to:
  - Experienced and senior farmers
  - Sarpanches, community leaders, and CBOs
  - NGOs working in the region
  - Local agricultural officers (ADA, DDA), KVK scientists, and institutional representatives
  - Local media – both print and electronic, if possible

CBOs should promote the festival within the target communities. Sarpanches may also support public announcements and mobilisation using traditional and modern methods.

3. Farmer Participation and Seed Collection

- Farmers interested in displaying seeds should inform the Community Resource Person (CRP) in advance.
- FAs will provide zip-lock polythene packets, labels, and passport data forms to SHGs or CRPs.
- CRPs or SHGs will:
  - Visit participating farmers or seed banks
  - Fill out passport data in discussion with the farmers or groups
  - Clean seeds and pack approximately 500g of each indigenous variety in zip-lock bags
  - Label each packet with farmer's name, village, crop name, and local variety name
  - Conduct a germination test on the same day with farmer and seed committee participation. After 7–8 days, CRPs should return to record the results.
  - Keep the seed packets and passport data safely with the respective farmer or seed bank. CRPs should complete this exercise across all villages ahead of the event.

4. Organizing the Festival

- Prepare a detailed schedule of the day and ensure timely execution. The schedule may include:
  - Registration
  - Welcome and objectives of the festival
  - Talks by seed conservation champions and felicitation
  - Seed display walkthrough: each woman/farmer who brought seed introduces it to others
  - Seed displays should be organized in tents or huts, with crop-wise arrangement for easy viewing.
  - Encourage farmers to identify varieties not present in their villages and promote seed exchange.
  - If possible, plan a procession where farmers bring seeds to the festival site with music and traditional attire.

A panel of judges (knowledgeable farmers or experts) can go around the stalls come up with best stall based on numbers of varieties they brought. Token appreciation will be given to them

Guest speakers and organizers should highlight the importance of traditional seed conservation, sharing of experiences, and advantages of desi beej in terms of resilience to droughts, floods, pests, taste, and yield.

5. Prioritization and Documentation

- Facilitate a discussion to prioritize commonly grown crops and key varieties for inclusion in Crop Diversity Blocks (CDBs), with guidance from experienced farmers.

Ensure thorough documentation of the event through photos, videos, testimonies, and reports.

6. Post-Festival Activities

- Collect all seed material along with Accession Numbers and ensure proper registration.

Segregate each seed accession into three parts: a) Preferred varieties (based on agreed criteria) to be sown in Crop Diversity Blocks (CDBs) b) Samples to be sent to the National Bureau of Plant Genetic Resources (NBPGR) for gene bank storage c) A backup sample to be retained at the community seed bank

Annexure - 4: Memorandum of Understanding

Memorandum of Understanding (MoU)
Between
CSO / FPO
And
Crop Diversity Block (CDB) Farmer

This Memorandum of Understanding (MoU) is entered into on this ___ day of _____, 2025, by and between:

1. **FPO/CSO** (hereinafter referred to as "the Facilitating Agency"), having its office at _____, which is engaged in the promotion and conservation of traditional varieties and sustainable agriculture practices,

And

1. **Mr./Ms.** _____, son/daughter of _____, residing at _____, hereinafter referred to as "the CDB Farmer."

PURPOSE OF THE MOU:

The purpose of this MoU is to formalize the responsibilities and expectations of both parties for establishing and managing a **Crop Diversity Block (CDB)** on the farmer's field with agreed practices and outcomes.

ROLES AND RESPONSIBILITIES:

Responsibilities of the CDB Farmer:

1. Allocate a plot of land (minimum ___ acre/s) for setting up the Crop Diversity Block as per the guidance of the Facilitating Agency.
2. Ensure availability of irrigation facilities to support the cultivation of the selected traditional crop varieties.
3. Follow the Package of Practices (PoP) shared by the Facilitating Agency for the identified crop(s).
4. Attend the mandatory training(s), workshops, or field demonstrations organized by the Facilitating Agency related to CDB management and willing to share the experience with other farmer
5. Maintain a basic field-level record as suggested (sowing date, inputs, growth observations, pest/disease incidence, etc.).
6. Provide the harvested produce to the Farmer Producer Organization (FPO) as per the agreed terms (quality, quantity, price, etc.).

Follow the quality ensuring committee suggestions:

Responsibilities of FPO/CSO (Facilitating Agency):

1. Provide selected traditional variety seeds and necessary technical support for establishing the CDB.
2. Train the CDB Farmer on the PoP, data recording, seed selection, and other best practices.

3. Quality ensuring committee can do monitoring visits to the CDB periodically and provide timely advisory support.
4. This MOU can be non-financial and Financial. If it is financial, provide a support amount of Rs…… (In words ……..)to the CDB Farmer in two instalments first after completion of sowing and other after harvesting of the crop upon satisfactory implementation and compliance with the agreed terms. Or its non- financial this point is irrelevant
5. Facilitate the procurement and aggregation of produce from the CDB Farmer through the concerned FPO.

TERMS AND CONDITIONS

1. The amount of Rs. …. shall be paid after verification of compliance, including successful crop establishment, if it is a financial MOU. For non-financial, it's not relevant
2. In case of failure to meet the agreed terms, the Facilitating Agency reserves the right to withhold the support amount.
3. The farmer shall not divert the seeds or inputs provided under this initiative for personal or commercial use outside.

This agreement will be valid from the month of _____ to the month of _____. No objections, disputes, or claims shall be entertained during the implementation period.

SIGNATURES

For FPO/CSO (Facilitating Agency): Name: _____ Designation: _____ Signature: _____ Date: _____	**CDB Farmer:** Name: _____ Signature: _____ Date: _____
Witness 1: Name: _____ Signature: _____.	**Witness 1:** Name: _____ Signature: _____
Witness 2: Name: _____ Signature: _____	**Witness 2:** Name: _____ Signature: _____

Annexure - 5: Processes of organizing Field Day/PVS and CCE at Crop Diversity Block (CDB)

WHY PARTICIPATORY VARIETAL SELECTION (PVS)

- Breeders may not be aware of some of the important traits that are needed or preferred by farmers
- Varieties selected on research stations may not perform well under farmer management.
- PVS is a more rapid and cost-effective approach in identifying farmer-preferred cultivars than conventional approach, provided a suitable choice of cultivars exists
- Involving farmers in varietal selection process increases the chances of adoption of these varieties.
- PVS ensures the access to good quality seeds of most preferred varieties by large number of farmers within a short time
- Farmers are losing various cultivars which are of value to them. For climate change related issues, the solution could be adoption of well adapted well performing traditional varieties

Objectives: To popularize the Traditional Varieties - involve the farmers in Participatory Varietal Selection (PVS) - conduct the Crop Cutting Experiments (CCE) - understand comparative experience in the yield of grain and fodder.

Participants: Farmers (women and men, young farmers that includes both women and men farmers), sarpanches', peoples' representatives, village elders, officials from the department of agriculture, scientists and CRPs (Cluster Resource persons) and staff.

MATERIAL REQUIRED AND PREPARATORY WORK

- Participatory Varietal Selection: Three colour ribbons- green (for good), yellow (for ok), red coloured (for not useful), 3 groups – first group with women farmers, second group with men farmers and third group with young farmers (<35 years that consists of both men and women farmers).
- One group lead who understands the process well.

<u>Organizing field day for farmers selection</u>

- Decode the name of the varieties from all the replications and put numerical number.
- Conduct participant registration.
- Invite representatives, officials, scientists and male and female farmers (20 – 60age) from cluster of villages to attend the event.
- Introduce the schedule and explain the purpose of the field day.
- A farmer shares details about the CDB, including soil type, number of TVs, nursery preparation date, transplanting details, quantity and cost of inputs used, and any key observations.
- Prepare three tags: Best variety: Green, Very well: Blue, Poor: Red
- Staff members responsible for coordination will divide the participants into following groups:

  ●Only Male group (5-10), ●Only Female group (5 – 10) ●Mixed Group (5M & 5 F),

  ●Youth female (5 – 10), ●Youth Male (5 – 10), ●Mixed Youth (5F & FM) and guide them through the Participatory Varietal Selection (PVS) and Crop Cutting Experiment (CCE).

Each group will enter the CDB plot along with tags and a CRP. At the plot, the group will discuss and mark each variety as "Good," "OK," or "Poor" using the tags. The CRP will record the following information:

● Which tags were assigned to which varieties and why, ● The reasons for selecting or rejecting each variety,
● The criteria used by the group for ranking the varieties, ● The specific characteristics of each variety,
● Any additional observations or inputs shared by the group

- Each group records the color of ribbons tied to different Traditional Varieties (TVs).
- Compile the collected data and record it on a brown sheet.
- Present the compiled data in a plenary session.
- Facilitate discussions where farmers share their insights and experiences.
- Summarize key takeaways from the discussions.
- Register farmers interested in obtaining seeds of their preferred TVs.
- Conclude the event with a vote of thanks.

PVS traits for TV selection in cereals (varies with crop)

✓ No. of plants per sq.m, ✓ No. of tillers per plant., ✓ No effective tillers per plant., ✓ Length of the panicle,
✓ More grains per panicle, ✓ Good Grain yielder, ✓ Good Fodder yielder, ✓ Pest and disease incidence (L/M/H),
✓ Is it tolerant to dry spells? high rainfall?, ✓ Bold/ medium fine/ finer variety, ✓ Scented/ unscented,
✓ Sticky / non-sticky

Example of Gender wise Major criteria on varietal selection in Finger Millet

Gender	Characters
Aged Male	Finger length, number of fingers, tillering density, long duration Yield, semi-compact fingers
Aged Female	Tall but non-lodging, bold grain, gruel should be little bit sour, Big panicle, , More branching, early mature, reddish seed coat
Youth male	Climate resilient, late duration, bold grain, Resistance to pests & diseases
Youth female	More fingers in a panicle, weighted panicles, Easy thresheablity
Mixed aged Male & Female	Very less responsive to chemical fertilizer, better yield potential, more numbers of productive tillers, tasty to eat, Big panicle
Mixed youth Male & Female	Climate resilient, Late duration, bold grain, Resistance to disease and pests, More yield by adopting improve method of cultivation

Crop Cutting Experiments (CCE)

- Material required: Tape/ meter stick sticks and rope (to separate 1 m x 1 m space), Sickles, scale, Tarpaulin, weighing machine/balance, moisture meter, baskets, sieves.

Procedure

- Install sticks and tie a rope around a 1 sq. meter area for each TV one day before the experiment.
- Divide the participants into groups and assign staff or Community Resource Persons (CRPs) to lead each group.
- Select the sampling area from the center of the plot, avoiding the edges to minimize the edge effect.
- Instruct the same groups involved in PVS to collect data and harvest the 1 sq. meter crop.
- Thresh the harvested crop to separate the grain.
- Weigh the threshed grain.
- Measure the moisture content of the grain.
- Record the final yield for documentation and analysis.
- Assign staff members to compile data from CCE and Participatory Varietal Selection (PVS) and record it on a brown sheet.

Annexure - 6: Data Sheet for Finger Millet Variety Characterization

Location :	Longitude	Latitude
Cropping season		Year
Name of the Biodiversity block		Unique id / TVs id
Local name of TVs		Date of sowing

Source of Seeds: *Farming Community / Released variety / RRA collection/any others, please mention.*

S. No	Traits	Status	Stage of observation	Type of Assessment
1	Plant: Growth habit	Erect	2-4 leaf stage	VG
		Decumbent		
		Prostrate		
2	Plant: Pigmentation at leaf juncture	Absent	Flowering	VS
		Present		
3	Days to 50% flowering	Early (<55 days)	Flowering	MG
		Medium (55-70 days)		
		Late (>70 days)		
4	Glume: Colour	White	Flowering	VG
		Light Green		
		Dark green		
		Light Purple		
		Dark purple		
5	Finger Length (longest finger) without peduncle (cm)	Short (<5 cm)	Dough Stage	MS
		Medium (5 - 7 cm)		
		Long (>7cm)		
6	Finger: Branching	Absent	Dough Stage	VG
		Present		
7	Finger: Multiple Whorl	Absent	Dough Stage	VG
		Present		
8	Finger: Number on main ear	Low (<5)	Dough Stage	MS
		Medium (5-8)		
		High (>8)		
9	Number of productive tillers/ plants	Low (1-3)	Harvest	MS
		Medium (4-6)		
		High (>6)		

S. No	Traits	Status	Stage of observation	Type of Assessment
10	Panicle: Length (cm) from bottom finger	Very short (<10.0)	Dough Stage	MS
		Short (10.1-20.0)		
		Medium (20.1-30.0)		
		Long (30.1-40.0)		
		Very long (>40.1)		
11	Plant height at maturity (cm)	Very Short (<40 cm)	Maturity	MS
		Short (40.1 - 80 cm)		
		Medium (80.1 - 120 cm)		
		Tall (120.1 - 160 cm)		
		Very Tall (> 160 cm)		
12	Seed: Shattering	Absent	Maturity	VG
		Present		
13	Seed Color	White	Maturity	VG
		Light Brown		
		Copper Brown		
		Dark Brown		
14	Seed Shape	Round	After Harvest	VG
		Reniform		
		Ovoid		
15	Seed Surface	Smooth	After Harvest	VG
		Rough		
16	Number of fingers (To be observed from 5 main plants in a plot)		Maturity Stage	MS
17	Grain: yield (3 x 3 m) in Kg/m^2		After harvest	MG
18	Fodder: Yield (3 x 3 m) in kg/m^2		After Harvest	MG
19	Grain: Size	Bold	After Harvest	VG
		Thin		
		any other?		
20	Disease: Blast (neck and finger) (Score 0 - 5) 0 = completely absent and 5 = highly infected	0		VG
		1		
		2		
21	Disease: Brown spot disease (Score 0 - 5) 0= completely absent and 5= highly infected	0		VG
		1		
		2		
22	*Cercospora* Leaf spot (Score 0 - 5) 0= completely absent and 5= highly infected	0		VG
		1		
		2		

Crop Cutting Experiment (CCE) data - measure for 8 plants and take average.

S.No	Trait	Details	Per sq m	Plant Number								
				1	2	3	4	5	6	7	8	Mean
1	No. of plants per sq m	in 1 sq m										
2	No. of tillers per plant	in 1 sq m										
3	No of effective tillers per plant	in 1 sq m										
4	Length of the panicle	Select 8 plants (in a zig zag manner) and measure										
5	No. of grains per panicle	select 8 plants (in a zig zag manner) & measure										
6	100/1000 seeds weight	select 8 plants (in a zig zag manner) & measure										
7	Grain yield / 1 sq m											
8	Fodder yield/ sq m											
9	Pest and disease incidence (L/M/H)	on the whole in 1 sq m										

Annexure - 7: Germination Test

- Soak the seeds in water for 24 hours before conducting the germination test.
- Prepare two carton boxes lined with plastic film and fill them with fine sand or sandy soil.
- Remove any small stones or pebbles from the sand/sandy soil in both boxes.
- Level the surface and create shallow rows, ensuring they are no deeper than an inch.
- Sow 100 seeds in 10 rows (10 seeds per row) in the first carton box, and repeat the same process for the second carton box.
- Water the germination test boxes daily to keep the soil moist.
- Begin counting the seedlings 5 to 7 days after sowing and record the data.
- The number of sprouts on the fifth day indicates seed vigor, while the count on the eighth day determines the germination rate.
- The average germination rate across both test boxes should be at least 85% for millets (Germination percent varies with crops).



Marking lines to sow wheat seeds (10 rows)



Sowing Wheat seeds (10 rows)



Sprinkling water (wetting the soil)



Covering the seeds with soil

Glossary

Breeder seed (BS): Breeder seeds are produced from nucleus seeds in research institutes or universities under the supervision of a breeder. The process is closely monitored by scientists, Seed Certification Agency officials, and National Seed Corporation representatives. Breeder seeds must maintain 100% genetic purity and are identified by a golden yellow tag.

Certified seed (CS): Certified seeds are produced from foundation seeds by Seed Corporations, private companies, and farmers, following standards set by the Department of Seed Certification. These seeds maintain 99% genetic purity and are identified by a blue certification tag.

Characterization: It refers to the process of systematically observing and documenting the various traits and characteristics of plants throughout their growth cycle, from sowing to harvesting, to support their identification and conservation efforts.

Cross-pollination: Cross-pollination is the transfer of pollen from the flower of one plant to the stigma of a flower on another plant or different individual of the same species.

Cultivar: A cultivar is a cultivated variety, selected for desired traits by using selective breeding techniques. As per the Biological Diversity Act (BDA), a cultivar is a variety of plants that have originated and persisted under cultivation or was specifically bred for the purpose of cultivation.

Extant variety: As per Section 2(j) of the Protection of Plant Varieties & Farmers' Rights Act 2001, an "extant variety" is a variety available in India which is – (i) notified under section 5 of the Seeds Act 1966; or (ii) a farmers' variety; or (iii) a variety about which there is common knowledge; or (iv) any other variety which is in the public domain.

Farmer's variety: As per Section 2(l) of the PPV&FR Act 2001, a "farmer's variety" is a variety which – (i) has been traditionally cultivated and evolved by the farmers in their fields; or (ii) is a wild relative or landrace of a variety about which the farmers possess common knowledge.

Folk variety: "Folk variety" is a cultivated variety of a plant that was developed, grown, and exchanged informally among farmers, as per the Biological Diversity Act (BDA).

Foundation seed (FS): Foundation seeds are produced from the breeder seed while maintaining genetic identity and purity up to 99.5%. It is produced at government farms or by private seed producers and is identified by a white colour certification tag.

Genetic purity: Genetic purity refers to the degree to which a plant variety remains uncontaminated by seeds or genetic material from other varieties or species. It evaluates how consistently the plant's traits align with its original variety throughout reproduction.

Germination percentage: It indicates the potential of the seeds for developing and establishing into seedlings.

Germplasm: Germplasm is a collection of plant materials that includes traditional varieties or landraces, as well as other materials like wild species, breeding lines, and cultivars of a crop. It is generally conserved for long-term or medium-term in the farm (*in-situ*) or in cold storage (*ex-situ*) conditions for future use in research.

High Yielding Varieties (HYV's): Varieties with specific traits, especially for seed yield, developed by formal research systems and released after notification for wider use.

Hybrid: A hybrid is the cross (F_1) between two different parents, such as varieties or species with desired traits in a complementary manner, so that the hybrid has a combination of traits from both parents.

Isolation distance: Isolation prevents unwanted cross-pollination and is the primary practice required to keep varieties true to type. Isolation distances vary from crop to crop. Isolation distance can be maintained in three ways: **space isolation**, by keeping adequate physical distance between varieties to prevent cross-pollination; **time isolation**, by staggering the sowing time so that their flowering phases do not overlap; and through **barrier isolation**, by using physical obstructions like tall crops or natural barriers to block or reduce pollen movement.

Landraces: Landraces are ecotypes that are naturally selected without specific human intervention. These are generally genetically diverse, locally adapted, and associated with traditional farming systems. As per the Biological Diversity Act (BDA), a landrace is a primitive cultivar that was grown by ancient farmers and their successors.

Moisture content: It is an important factor influencing the loss of viability during storage. The drier the seed, the better its storability, even at ambient temperature.

Nucleus seed: The basic seed class for seed production wherein a few quantities of seed collected from originally bred individual plants are maintained by the breeder with the highest genetic purity (100%).

Off-types: Crops growing in the seed field of similar species but with differing characteristics compared to the main variety planted.

Physical purity: Physical purity of seeds refers to the absence of inert matter, other crop seeds, weed seeds, and other impurities in a seed lot.

Replication: Replication is the repetition of a variety more than once to reduce experimental error.

Rouging: The practice of removing off-type plants or diseased and pest-infested plants from a seed plot.

Self-pollination: When pollen from the same flower or different flower on the same plant is deposited on the stigma of the same flower, or another flower on the same plant.

Truthfully labelled seed (TL): Truthfully labelled seeds are not regulated by the Department of Seed Certification. They are tested only for physical purity and germination, allowing any farmer to produce and market them under this label. While labelling is mandatory, certification remains voluntary.

Variety: A plant variety represents a more precisely defined group of plants, selected from within a species, either naturally or with human intervention, with a common set of characteristics.







REVITALISING RAINFED AGRICULTURE NETWORK (RRA NETWORK)

C/o Watershed Support Services and Activities Network (WASSAN)

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