Seed and Planting Material in Natural Farming

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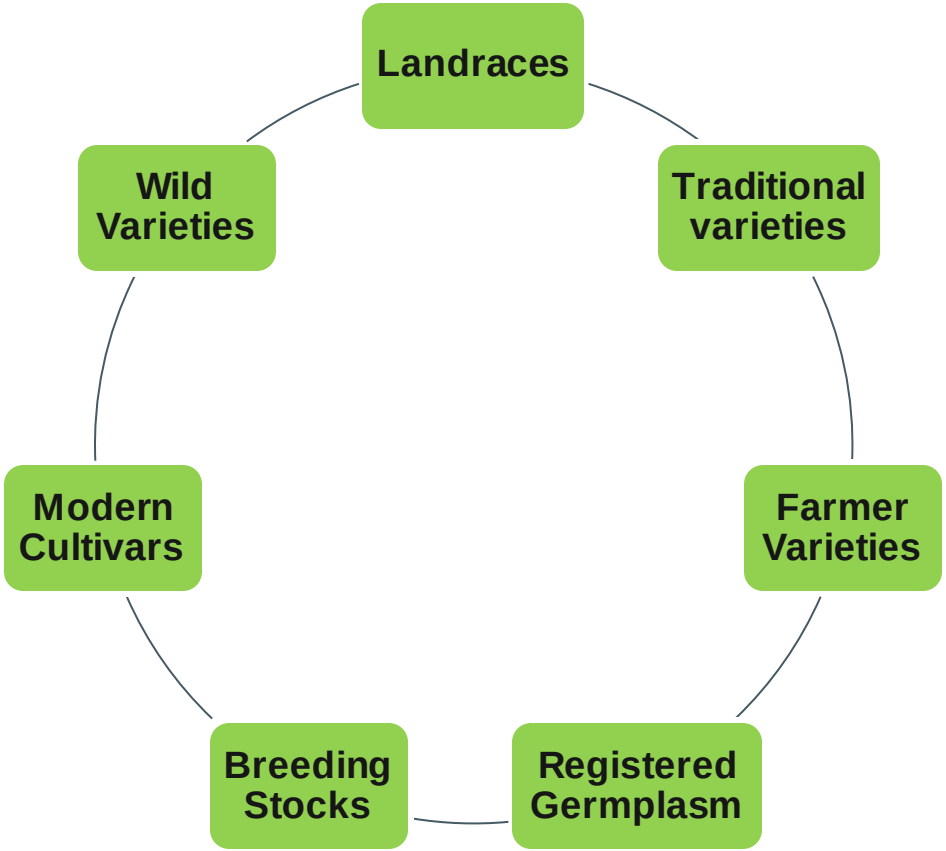
Seed & Planting Material (S & P Material)



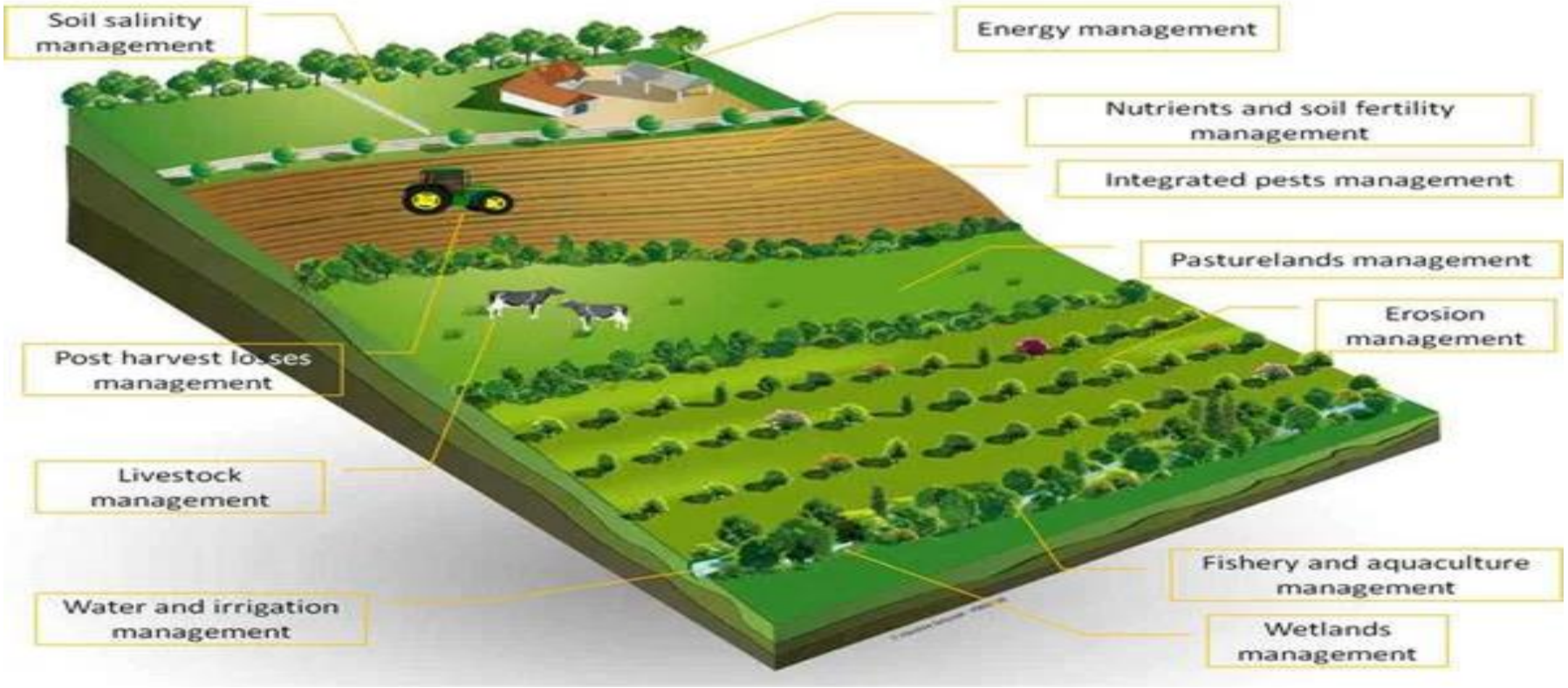
Landraces, Traditional Varieties and Farmers' Varieties

Landraces	Traditional Varieties	Farmer's Varieties
Locally adopted varieties developed through natural selection and adaptation to environmental condition (no human intervention)	Developed used by the farmers over the generations, adapted to local condition and selected for specific trait/gene, Informal process of selection is carried out by the farmer	A variety that has been traditionally cultivated and evolved by farmers in their fields. It can also be a wild relative/ landrace of a variety that farmers are familiar with

Improved Cultivars, Hybrids, and GMO/Transgenic Crops

Improved Cultivars	Hybrids	GMO/ Transgenic Crops
Plant varieties that have been genetically modified or selectively bred to have improved characteristic	Plants that are the result of crossing two genetically different varieties or species	GMO crops/plants that had their DNA altered using technology

Importance of Traditional S & P Material in NF



Indigenous Seeds

- Traditional/ Farmer/ Ethnic/ Tribal/VCK/Community/Ecotypes/ Landraces/ Wild types
- Selected and cultivated for a long time in their pristine habitats
- Evolved based on ecological suitability, farmer/ consumer needs, and preferences with farmer interventions
- Field performance is often expressed often only in their adapted or similar ecosystems
- Respond positively to location-specific traditional/nature-based Package of Practices (PoP)
- Response to chemical input-intensive PoP is minimal
- Co-evolved harmoniously with local biodiversity, wild relatives/ soil, and dynamic environment

Why Indigenous Seeds

- Climate Resilience – Extreme Events & Drought and Heat
- Pest & Disease Resilience
- Nutrient Density
- Low Input requirement
- Sustainability
- Cultural and Religious Identity
- Seed Sovereignty
- organoleptic properties

Why Indigenous Seeds

- **Climate Resilience** – Extreme Events & Drought and Heat: Indigenous varieties like Kalinga-III, a drought-resistant rice variety from Odisha, can be saved and replanted (link)

Pest & Disease Resilience: Pigeon pea: Erramachcha kandi

Nutrient Density: Traditional leafy greens like 'Amaranth' and 'Moringa' contain essential vitamins and minerals.

Low Input Requirement: Joha Rice, red rice variety from Assam is known for its low water requirement

Sustainability: The deep root systems of indigenous Foxtail millets like Nachni from Uttarakhand help prevent soil erosion in hilly terrains, promoting long-term soil health and fertility

Cultural and Religious Identity: Temple Banana (Musa sapientum Vazhai), also known as 'Poovan' or 'Arumpazham', is native to Kerala and Tamil Nadu in South India

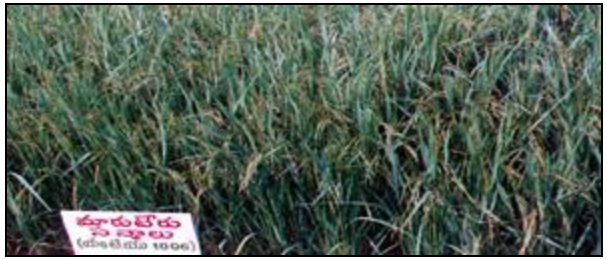
Seed Sovereignty: Reviving 'Goru' pigeon pea varieties in Maharashtra empowers farmers with seed sovereignty and preserves traditional knowledge. (link)

Organoleptic properties: Mango, each with distinct flavors, textures, and fragrances, like the Langra mango from Uttar Pradesh.

Nutritional Traits- Different Rice Landrace Groups

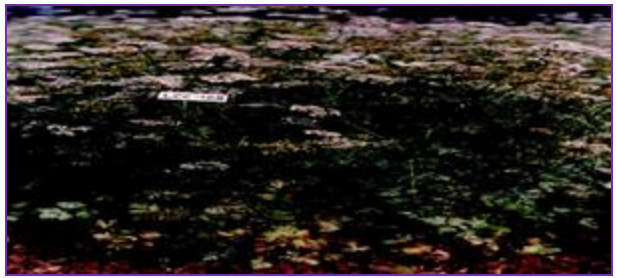
Landrace Groups	Zinc (mg/100gm)	Iron (mg/100gm)	Magnesium (mg/100gm)
Red	5.1	3.7	106
Black	5.2	2.6	97
White	5.9	4.2	113
Aromatic	5.3	3.9	113
Non- Aromatic	6.1	3.9	108
NEH	6.6	3.6	104
NWH	5.5	3.7	104
Normal	1.9	2.8	52

Registered Indigenous Varieties

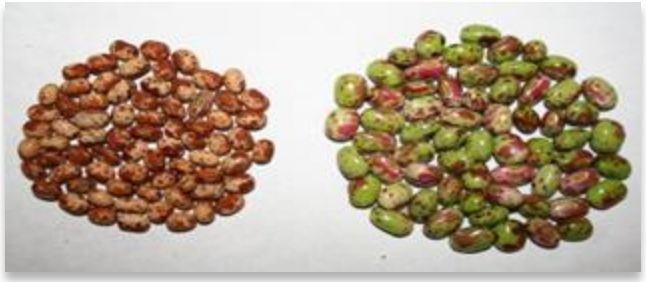


Paddy: Marutaru Sannalu

Yardlong Bean



Coriander: Sudha



Pigeon pea: Erramachcha kandi

Registered Indigenous Varieties

Sorghum: Pelala jonna

Dolichos bean: Gane chikkudu

Green gram: Balintha pesalu

Improving S & P Material for NF

1. Breeding programmes vs. traditional varieties for crop improvement
2. Adaptation to changing environments
3. Biotechnology for improving traditional varieties
4. Resilience to withstand the challenges of pests, diseases, and environmental stresses
5. Ecosystem Breeding
6. Conservation through use

Need for the Conservation

Example: Paddy

44 million ha

40,000 FVs/LRs

1100 Var/Hybs

30 Vars (>70%)

BPT 5204 (>25%)

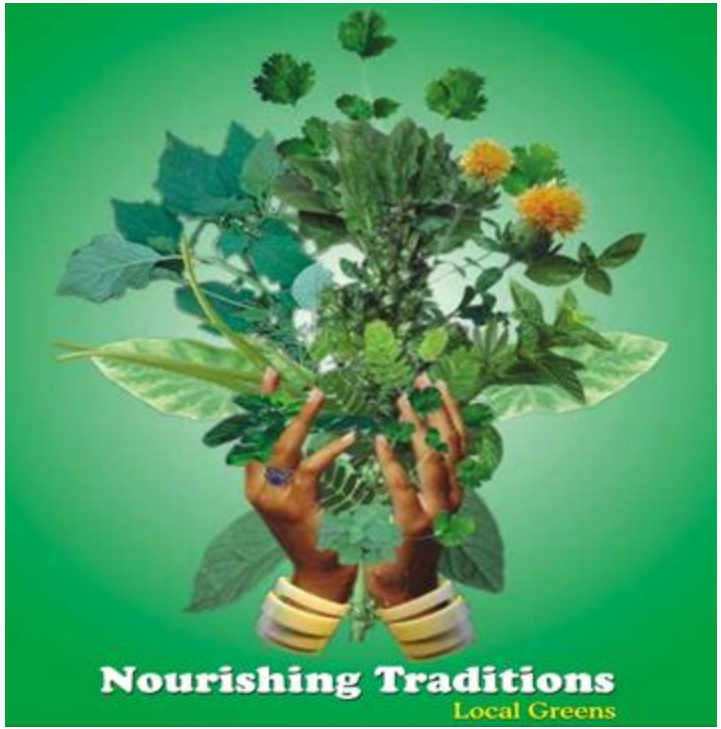
Indigenous Varieties - Very little area

Community Seed Banks & TVs

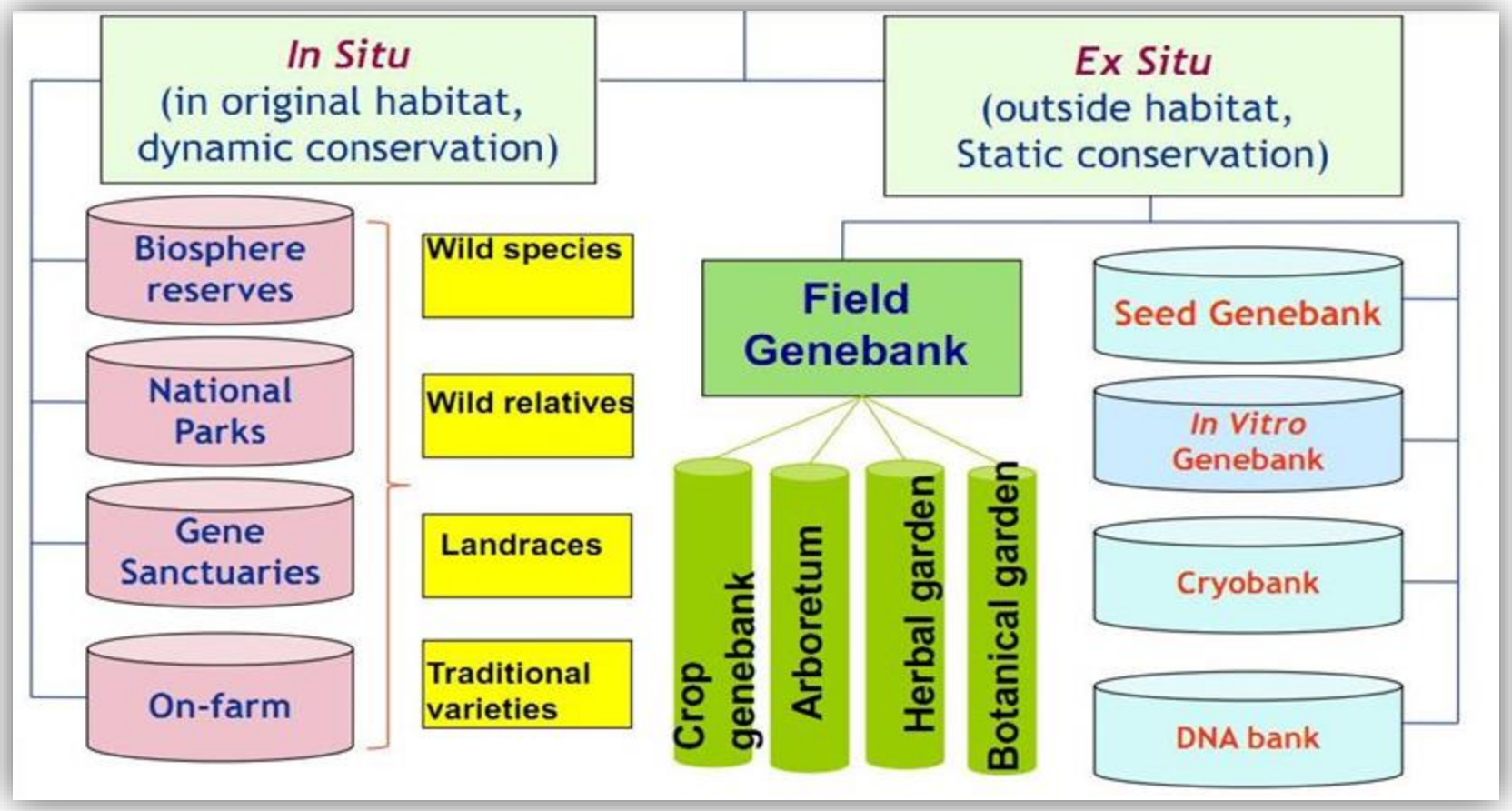
- Community seed banks contribute:
  - Conservation of local and adapted varieties
  - Emergency seed supply
  - Genetic diversity
  - Access and benefit-sharing
  - Participatory field evaluation and improvement
  - Education and knowledge sharing
  - Restoration and conservation
- Challenges: Collection gaps, incomplete documentation, altered genetic make-up of seed bank collections, and inadequate knowledge on the potential genetic value of seed bank collections

Example of a community seed bank in India: Sahaja Samrudha

Forgotten Greens



Conservation of S & P Material



In-vitro conservation

Cryo preservation

The material in the SVALBARD GLOBAL SEED VAULT

Countries: 243
Genera: 1,091
Species: 6,005
Accessions: 9,83,524

Indian Origin Taxa:524
Accessions:73,241

World Status on Gene Banks:
1750 Gene Banks
100 Countries > 7.4 Million seed samples conserved

CGIAR & International Research Centre germplasm holdings

Genebank	Total number of Accessions
International Crops Research Institute for the Semi arid Tropics, India	126,830
International Rice Research Institute, The Philippines	131,862
International Centre for Agricultural Research in Dry Areas, Syria	147,118
International Institute of Tropical Agriculture, Nigeria	32,584
International Livestock Research Institute, Ethiopea	20,229
Centro Internacional de Agricultura Tropical, Columbia	67,770
Centro Internacional de Mejoramiento de Maíz y Trigo, Mexico	178,000
West African Rice Development Association, Ivory Coast	26,098
Musa international Transit Centre, Bioversity International, Belgium	1,529
Centro Internacional de la Papa, Peru	19,093
Information and Communication Division, International Centre for Research in Agroforestry, Kenya	2,005
World Vegetable Centre (Asian Vegetable Research and Development Centre), Taiwan	61,000
Total	8,14,118

- **Rice is one of the most ancient crops been cultivated for over 10,000 years in the Asia-Pacific Region**
- **Gene banks in the Asia-Pacific region hold more than 0.15 million rice accessions**

Rice Landraces From High Altitude Areas

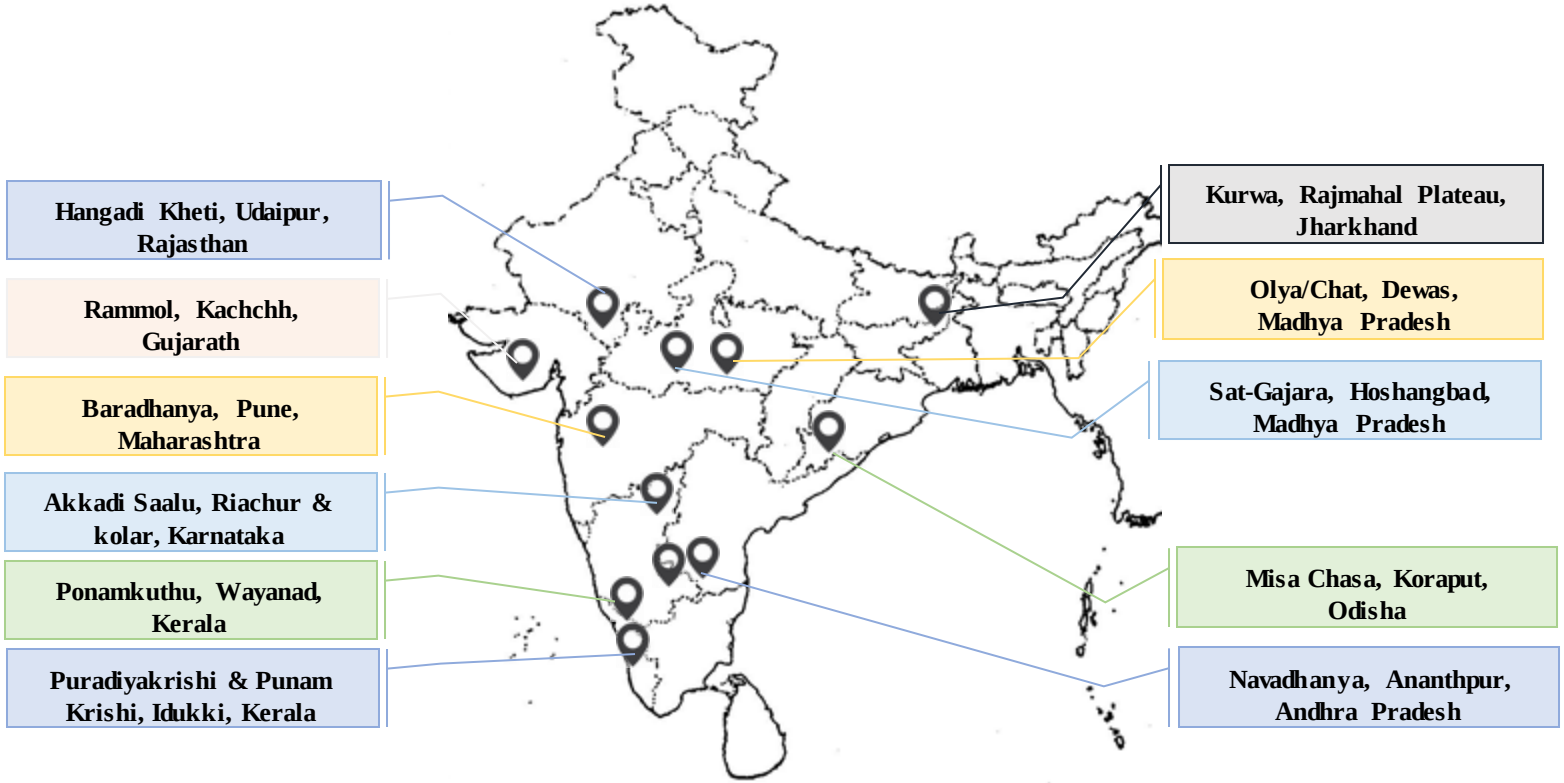
Fig. 2. Genetic diversity in paddy fields is highly endangered in these "last remnants of variability" in high altitude areas of Kashmir

Fig. 3. Genetic diversity of rice landraces collected from high altitude areas of Kashmir

Chickpea

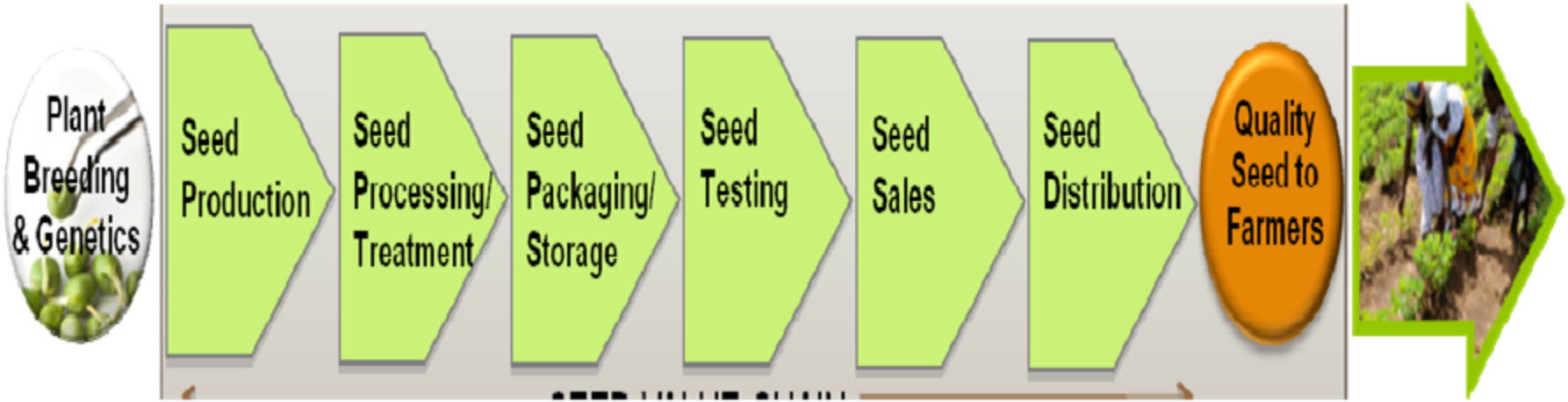
Brinjal

S & P Material in Traditional Cropping System



ITKs for Seed Treatment and Storage	Selection of healthy and good sized panicles and proper drying seeds to low moisture and storage in dry place. Seeds were soaked in cow dung urine and cow dung slurry and later seeds were dried. These seeds used for sowing
	Storage of seeds in gunny bag with neem leaves
	Seeds soaked in cow dung and cow urine slurry (1 portion of cow dung and 2 portion of cow urine) for 30 minutes and drying. Later these seeds are stored with neem leaves.
	Storage of seeds in gunny bag and bamboo silo/structure plastered with cow dung and red soil.
	Dried red chillies are used for seed storage in bags
	Common salt is mixed with paddy seeds (300g/100kg
	Selection of healthy and good sized panicles and sun drying of seeds to low moisture and stored in gunny bags with neem leaves.
	Sun drying of farm saved seeds and storage in dry place.
	Garlic cloves are placed in layers in storage bags. The garlic cloves will act as repellent
	Camphor is used for seed storage (2g/kg of seed)

Seed System



Conservation

Policy

Why Alternate Seed System?

- ‘Odisha Millet Mission (OMM)’ Experience: some of the millet landraces perform better than the released varieties.
- Several such landraces are on demand due to traits of value by the Communities (taste, nutrition, culinary process, colour, religious needs, etc.,).
- The formal seed system/ PPVFRA in place only cater to the notified & released/ registered varieties.
- Alternate Seed System facilitates for landraces :
  - Quality seed access to farmers specific to each eco-geographic region.
  - Mainstreaming landraces with heritage traits based on traditional knowledge.
  - Protocols for collection (Melas), evaluation (BDBs), release (LRC) and conservation (CSBs, state gene bank).
  - Protocols for all components of seed supply chain.

Release Criteria Revised

- Evaluation limited to few eco-geographic regions/ districts from where the landrace cultivated/ collected / originated
- Farmers' yields based on CCE considered
- Nutrition, local preference, cropping system and resilience to climate and biotic stresses value is considered
- Protocols for all steps of Seed system based on pilot study will be documented
- Validation of all protocols will be done by competent committees constituted by the Apex Committee

Suggested Seed Policies

- The decision-making on seeds must be non-centralised (both for regulation, and for actual seed varieties)
- Local conservation bodies to work on seed diversity revival and *in situ* conservation of local varieties by State biodiversity boards (SBBs) and local biodiversity management committees (BMCs)
- Investment policies on community seed banks , managed by women farmers and work community seed self resilience on the basis of their regional condition
- There could be Eco-System Services payments made to farmers adopting ecological agriculture based on a diversity index

Conclusion and Way Forward

- Indigenous varieties have great potential for mainstreaming in view of their resilience to climate, pests, nutrient density, and low input requirement harmonious with nature-based solutions.
- Public sector research; development in the seed sector must be re-oriented to the needs of small rainfed farmers including Indigenous varieties
- Crop breeding within formal systems should be done in organic growing conditions, in a participatory varietal selection approach.
- Synergized collaborations between research and extension departments along with civil society organizations, in addition to both production end and consumption end popularization of indigenous varieties

- Community seed banks should be set up with adequate investments, managed by women farmers.
- Existing Seed Village programmes may be modified to ensure community level seed self-reliance with appropriate, diverse kind of seeds included, suitable for local growing conditions
- Seed-related policies must be assessed and considered from the point of view of sustainable agriculture.
- Mapping of existing diversity of crops and varieties within crops through focused group discussions, walks through the fields, through participatory exercises
- Collecting feedback from farmers so that the selection, characterization– Diversity Blocks being set up for this purpose is helpful - Enhanced farmer participation in popularizing indigenous varieties

Thank you

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