

**Training cum exposure visit on  
“Natural Farming for the Master Trainers”**

# **Seed and Planting Material in Natural Farming**

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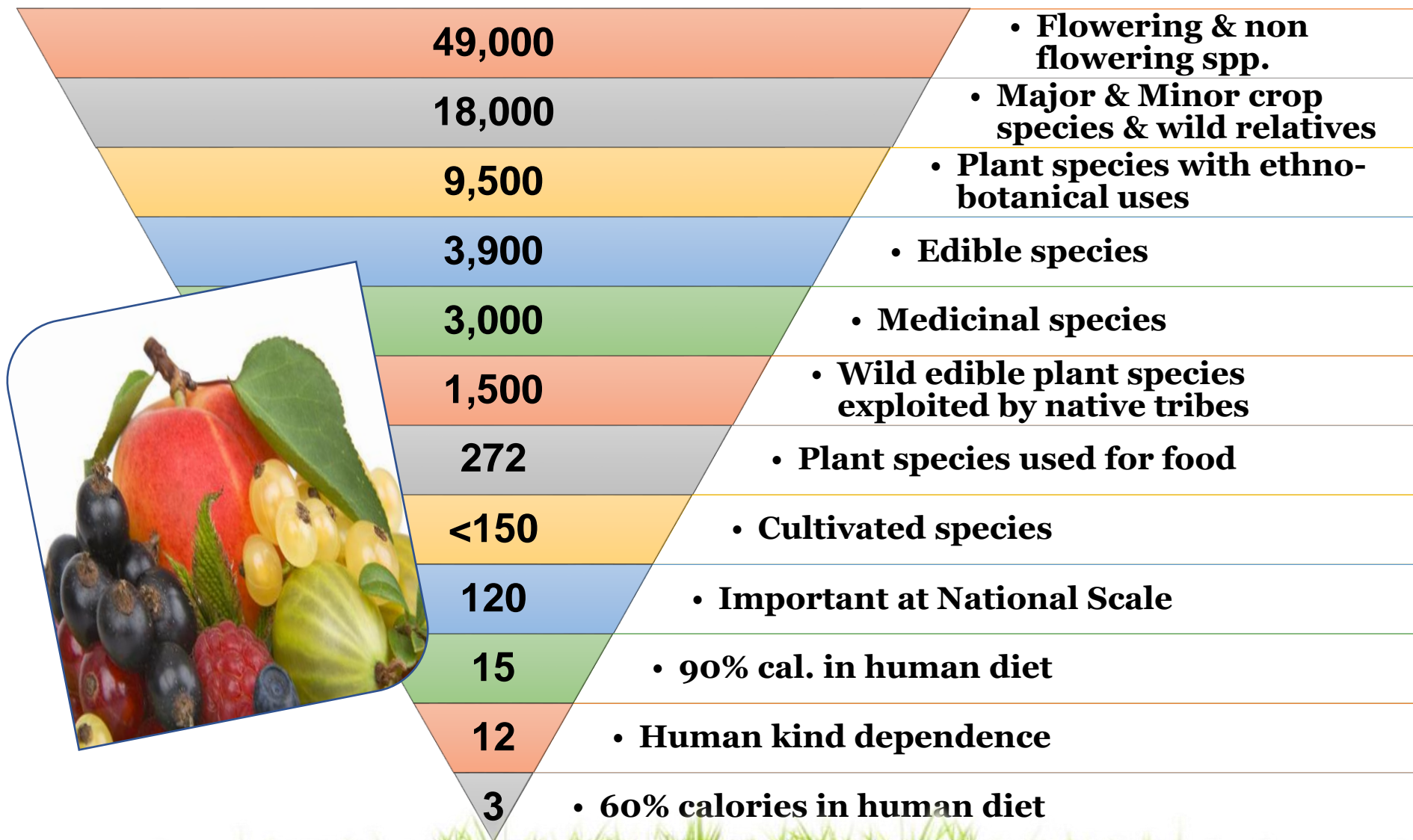
Anand – 388 110, Gujarat (India)

## INDIA: A BIODIVERSITY RICH COUNTRY

- India is one of the 17 mega biodiversity countries
- **Vavilov: Indian region is one among the eight centre of origin and diversity of cultivated plants**
- India has over 49000 species of plants and fungi representing 11% of the world's flora
- **India is rich in endemic species representing 33% of its flora**
- Three hot spots of biodiversity: Western Ghats, Himalayan Region, NEH
- Thousands of varieties, cultivars, landraces and ecotypes evolved



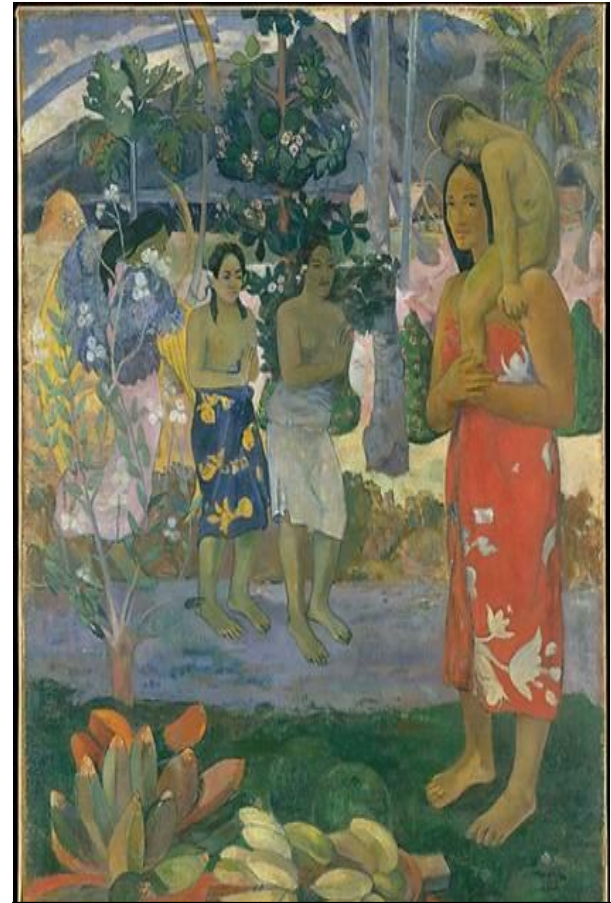
# AVAILABILITY OF INDIAN CROP BIODIVERSITY FOR PLANT IMPROVEMENT





# FARMERS' INNOVATION AND TRADITIONAL KNOWLEDGE

- **Developed varieties from PGR through selection as per their needs**
- Climate resilience, biotic/abiotic stresses, therapeutic uses, medicinal uses *etc.*
- ITK – on innovative cultivation and end uses
- **Innovations in informal seed systems, storage, control of store grain pests**
- Need to protect these knowledge systems



Farmers' Varieties

- ❖ **PGR are the heritage of human kind**
- ❖ **Foundation of attaining food nutritional and health security**
- ❖ **Before 1993-PGR-Shared freely**
- ❖ **Green revolution could happen due to exchange of PGR**

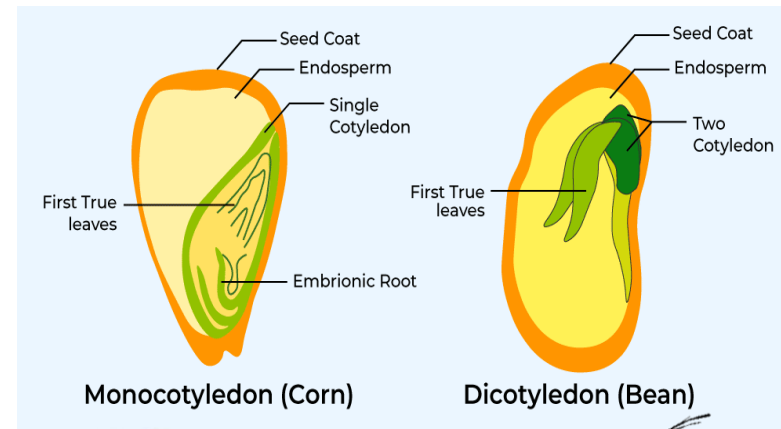
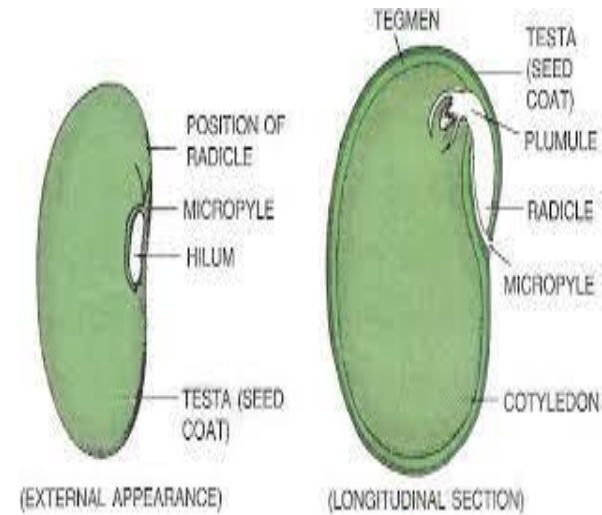


# WHAT IS SEED?

- It is a mature ovule consisting of an embryonic plant together with a food storage tissue surrounded by a protective seed coat.
- Seed is a mature integumented megasporangium.

## Seed contains:

- An embryo
- A nutrient source (typically endosperm and/or cotyledon), and
- A protective covering (typically a seed coat and/or pericarp)
- An immature seed, prior to fertilization, is known as an ovule.





# Planting material in different crops

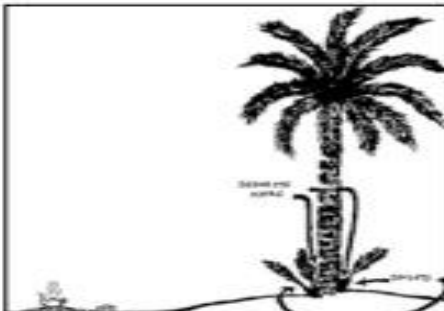


Hard Wood

Semi-hard wood

Soft wood

Herbaceous



Off-shoot in palms



# WHAT ARE SEED STANDARD?

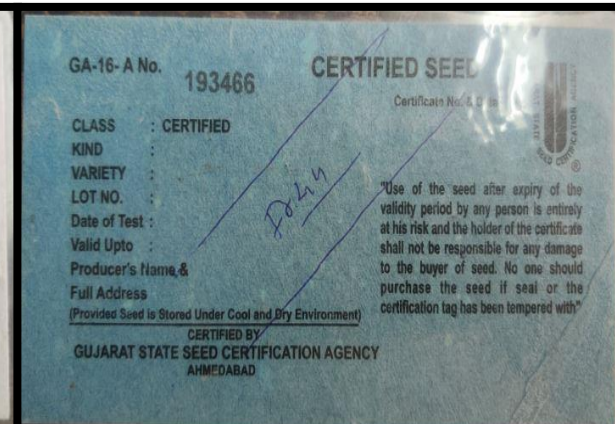
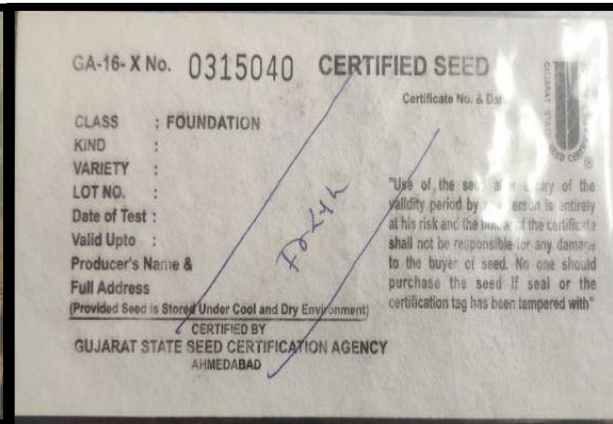
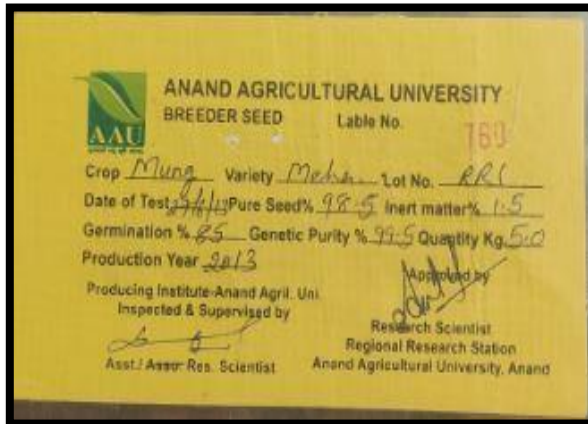
- Seed standards are seed quality parameters consist of
  - **Physical purity**
  - **Genetic purity**
  - **Germination capacity**
  - **Moisture content**
  - **Seed health status**
- Seed testing protocols are methodologies standardized for determining above seed quality parameters





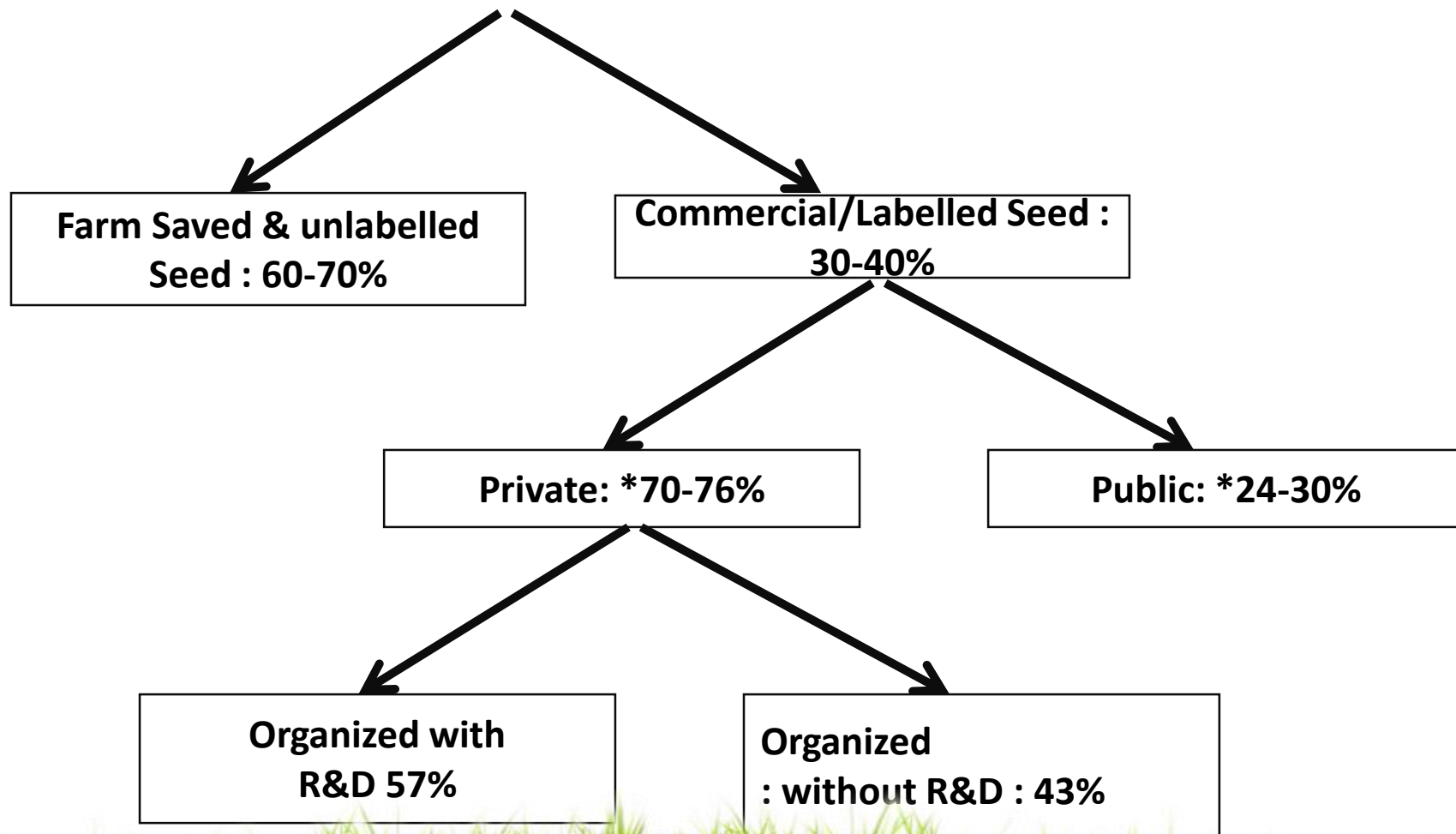
# Indian Seed Industry

- **Nucleus Seeds** : Initial handful basic seed for seed production maintained under the direct supervision of the concerned plant breeder for further multiplication. Nucleus seeds possess high percentage of genetic purity (100%).
- **Breeder seed:**
- **Foundation seed**
- **Certified Seed**





# SEED MARKET COMPOSITION



# Enhancing Food and Health Through Sustainable Agriculture

1.

## **Global Food Challenge (2050):**

FAO projects **70% increase** for global food production.

2.

## **India's Population Projection (2030):**

India to be most populous by 2030, with 1.51 billion people.

3.

## **Food Security Concerns for India:**

Critical concern due to projected population growth.

4.

## **Caution on Unproven Technologies:**

Adoption of unproven farming practices may jeopardize food security goals.

5.

## **Legacy of the Green Revolution (1960s):**

'Green Revolution' addressed food shortages with HYV seeds, fertilizers and irrigation.

6.

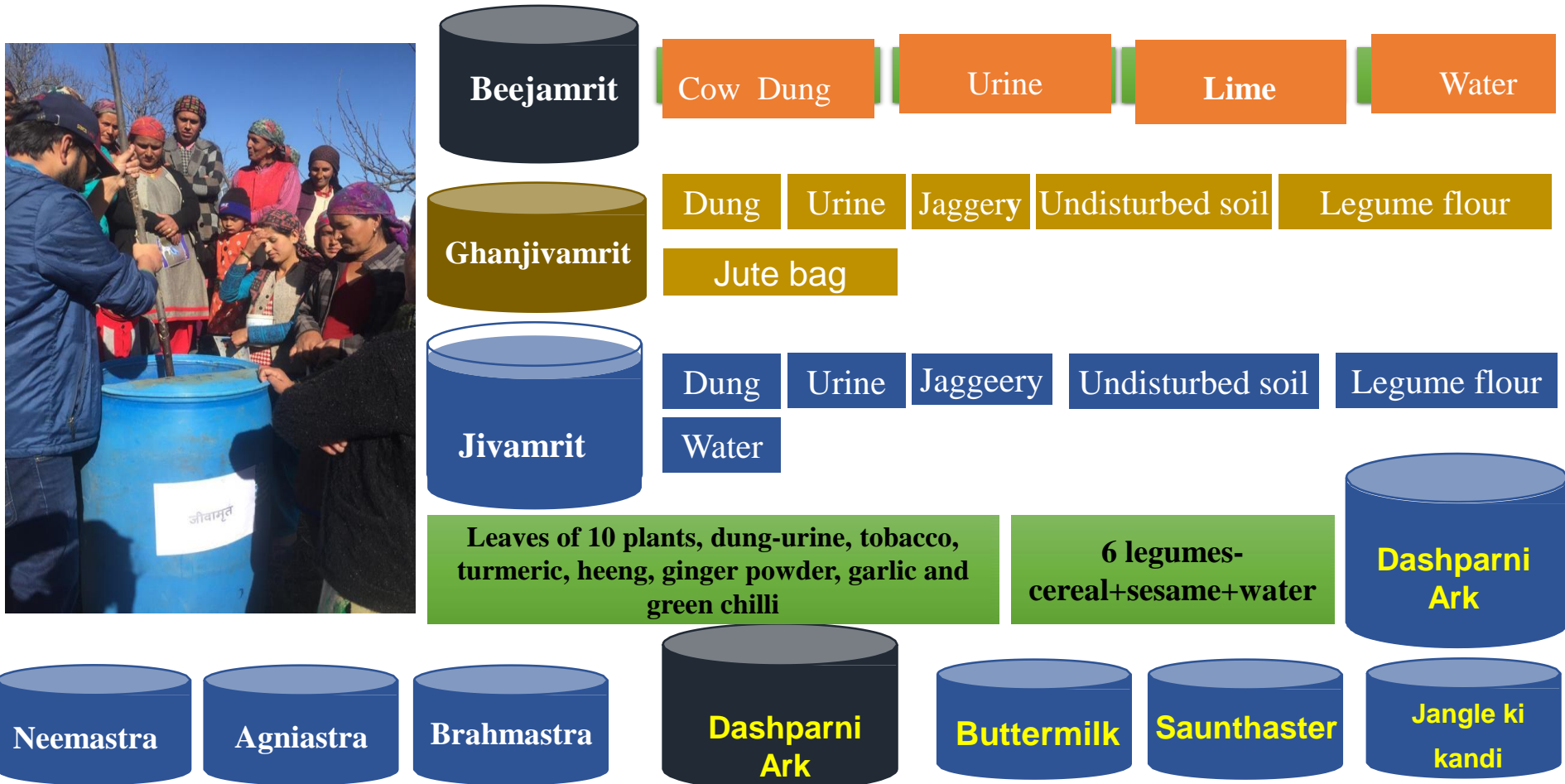
**Environmental Costs of Agricultural Intensification:**  
Adverse environmental impacts including soil degradation, eutrophication, greenhouse gas emissions, and biodiversity losses.

Driven by concerns for **food safety, quality, long-term sustainability**, and supported by accumulating evidence of productivity, **organic and natural farming has risen as a viable alternative**. It effectively addresses quality and sustainability concerns while providing a profitable livelihood.



# NATURAL FARMING AND ITS COMPONENTS

An agricultural production system which mainly emphasizes on use of **locally available on farm/traditional inputs integrated system** with good agronomic practices that encourage coexistence, soil health, ecology, natural cycles, natural micro flora and fauna, diversity, production density and good production management system.



# Seed and Planting material in Natural Farming System

- All seeds and planting materials shall be of **natural farming origin**.
- When natural farming seeds/ planting material are **not available**, organically grown seeds can be used. In case no alternate options are available, conventionally grown seeds may also be used but **without chemical treatment**.
- Seed/ plant borne diseases can cause problems in production. In conventional agriculture, the diseases are intensively controlled by common seed treatment, while natural farming system **botanicals, biofertilizer and mechanical means** of seed treatment is practiced.
- Growing natural farming/organic seed/ planting material without treatment might cause problems of unintentional propagation and spreading of seed/ plant borne diseases.
- It is therefore, important that **seed/ plant materials are tested for occurrence of pathogenic fungi/ viruses** and the seed lots rootstock/ scion materials are discarded accordingly and seed enhancement techniques to be used.



# The seed are treated normally with materials from natural sources

Botanicals	Cow's product	Biocontrol agent	Others
Neem leaf extract	Panchgavya	<i>Pseudomonas</i> spp.	Coconut milk
Mint leaf extract	Cow milk	<i>Trichoderma</i> spp.	Tender coconut
Sarani leaf extract	Curd		Vermicompost
Prosopis leaf extract	Cow urine		Vermiwash
Arappu leaf extract	Cow dung		

Types	Ingredients	Filler	Adhesives
Seed pelleting	Leaf powders e.g., Pongamia, Neem,, Moringa, rhizome, curcuma	The leaf powder itself act as a filler	Rice gruel, wheat gruel, Gum arabiac,



# Why we need seed treatment ?

Seed treatment provides better germination and prevents seed and soil borne diseases in plant. Outcome is healthy (disease free) and high yielding crop.

- **Advantages of Seed Treatment:**

- It protects **germinating seeds and seedlings** against soil and seed-borne pests and diseases.
- It improves the germination process and increases the germination percentage.
- It enhances the **seed viability and vigour** which are the two most important factors in agriculture or cultivation practices.
- It results in the early and uniform establishment and growth of the crop or plants.
- It **enhances nodulation in legume** crops.
- It results in uniform crop stand especially in adverse situations like low moist and high most conditions.



# BEEJAMRIT

- Beejamrit is an ancient, sustainable agriculture input.
- It is used for **seeds, seedlings or any planting material** and is effective in protecting young roots from fungus.
- Beejamrit is a **fermented microbial solution**, with loads of plant-beneficial microbes, and is applied as seed treatment
- It is expected that the **beneficial microbes would colonize the roots and leaves** of the germinating seeds and help in the healthy growth of the plants.
- Beejamrit can be given as seed treatment to any crop via; coat them, mixing by hand; dry them well and use them for sowing. For leguminous seeds, which may have thin seed coats, , just dip them quickly and let them dry.



# Preparation of Beejamrit

- Take **5 kg fresh cow dung** in a cloth and tie it by rope and hang this in a drum having **20 liter water, for 12 hrs**
- Take one liter water in another pot, add **50g lime in it, keep over night**
- On next day, **squeeze the bundle of cow dung for 2-3 times** in the same water to extract most of its content
- Add one handful of **virgin soil, 5 litre cow urine and lime water** and stir it well with wooden stick
- Beejamrit is ready to treat the seeds
- In transplanted crops, saplings are dipped in the beejamrit before transplanting Smearing of the seeds with beejamrit before sowing controls many diseases that attack the plant right from its seedling stage.



1st Day

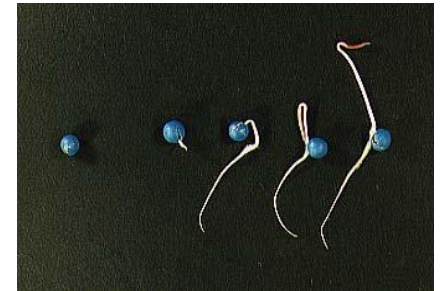
2nd Day

- Beejamrit can be used for treating the seeds.
- **Twenty litre of beejaamrit is sufficient for treating 100 kg of seeds.**
- After treatment, **shade dry the seeds before sowing.** Vegetative planting materials like rhizomes, stem, root cuttings, leaf cuttings, tuber etc. and roots of crop seedlings are **dipped for 5 minutes in beejamrit before sowing.**



# Seed enhancement techniques in Natural Farming

- Indigenous technologies-seed enhancement
- Mechanical seed enhancement
- Physiological seed enhancement
  - Pre germinated seed
  - Seed Priming
- Physical seed enhancement
  - Seed colouring
  - Seed film coating
  - Pelleting



## Seed film coating

Application of precise amount of active ingredients along with a liquid material directly on to the seed surface without obscuring its shape.

## Seed pelleting:

Process of enclosing the seed with small quantity of ingredients along with filler materials to change shape and size of the seed for precision planting



# Indigenous seed enhancement techniques

## • CEREALS

- **Paddy:** Paddy seeds are immersed in hot water for a day. Soaked seeds are kept on the ground and covered with **Neem leaves** and small **wheat straw** for 4 days. After 4 days the germinated seeds are sown in the nursery.
- A gunny bag filled with paddy seeds is kept immersed in a water trough for 12 hours. Then the seed bags are immersed in diluted biogas slurry for another 12 hours. This increases the resistance of seedlings to pest and diseases.
- **Wheat:** To control wheat rust the seeds are immersed in **milk** before sowing
- **Sorghum Seeds:** - Sorghum seeds are treated with the **juice of neem leaves**.
- Soaking in cow's urine to induce drought tolerance.
- Treating with salt solution to ensure better germination.
- **Maize:** Seeds are soaked in **cow urine** for 12 hours before sowing.

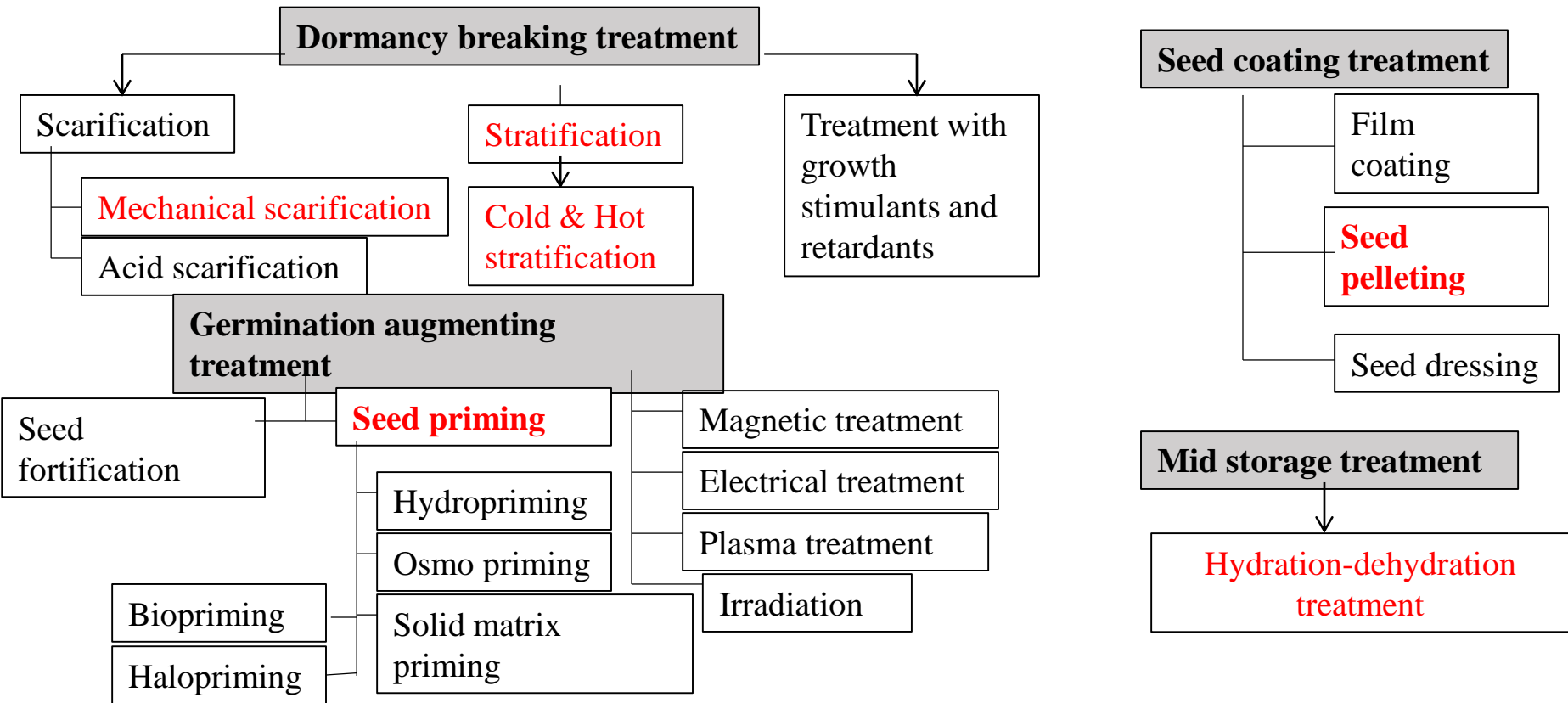
# Indigenous seed enhancement techniques

- **Bottle Gourd:** Soaking in water for 24 hours before sowing for good germination.
- **Watermelon seeds:** Watermelon seeds are soaked in **Kumkum** (vermilion) water for a day before sowing. They will germinate faster and grow into healthy plants.
- **Bitter gourd seeds:** If soaked in **milk** for a day prior to sowing bitter gourd seeds will germinate faster and develop well.
- **Radish, Beetroot seeds:** These seeds are tied in a piece of cloth and soaked overnight in water and are sown after sprinkling water on them repeatedly. Plants from these seeds are well developed and fast growing.
- **Chilli:** Seeds are immersed in **biogas slurry** for half an hour will germinate faster and develop well.
- **Bhendi (Okra):** Wrapping in a piece of cloth and put in water in the sun for a full day. The seeds are then kept inside, a straw keep overnight and sown next day.





# SEED QUALITY ENHANCEMENT TECHNIQUES



# Methods of breaking dormancy

## **Treatments to break Dormancy:**

The various treatments for overcoming dormancy may be divided into the following three groups

### **Seed coat treatments:**

These treatments aim at making hard seed coat permeable to water or gases either cracking or softening them. The process is usually referred as scarification. These treatments are either physical or chemical in nature.

#### **1. Stratification:**

The incubation of seeds at a suitable temperature (Usually 0-5°C) over a moist substratum before transferring them to a temperature optimum for germination. Ex. Cherry (*Prunus cerasus*), Mustard and rape seeds.

#### **2. High temperature treatment:**

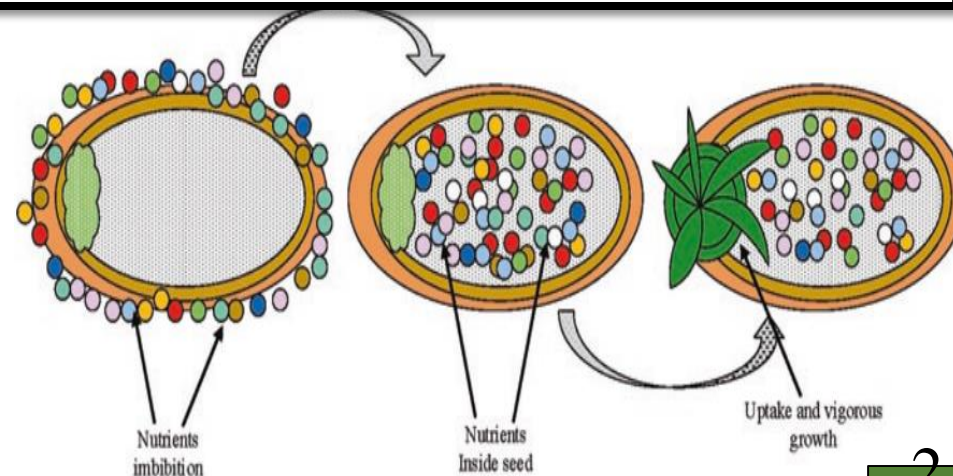
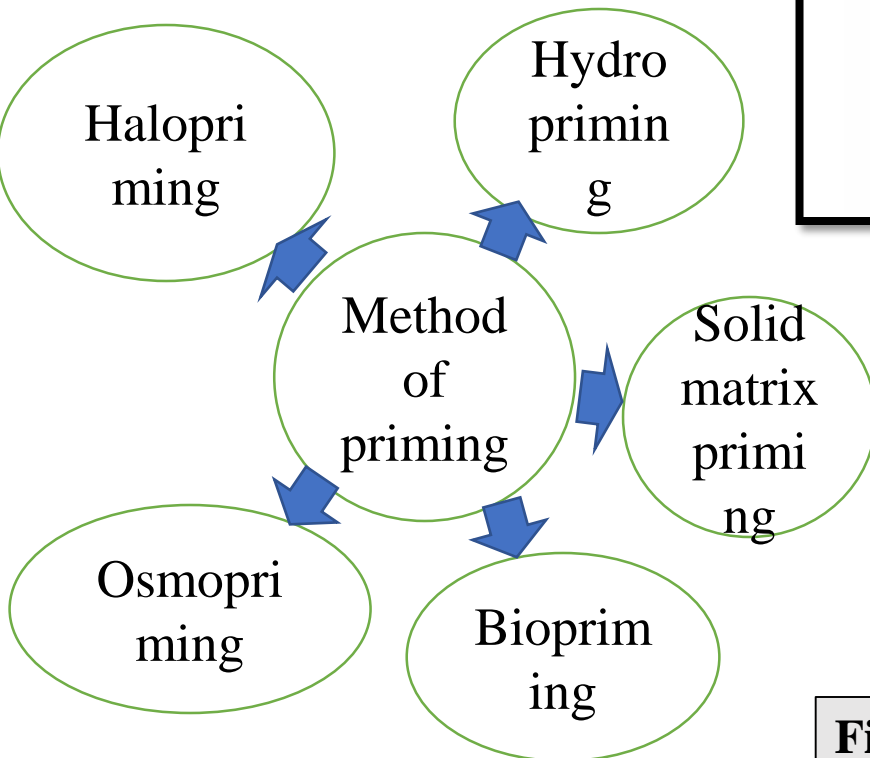
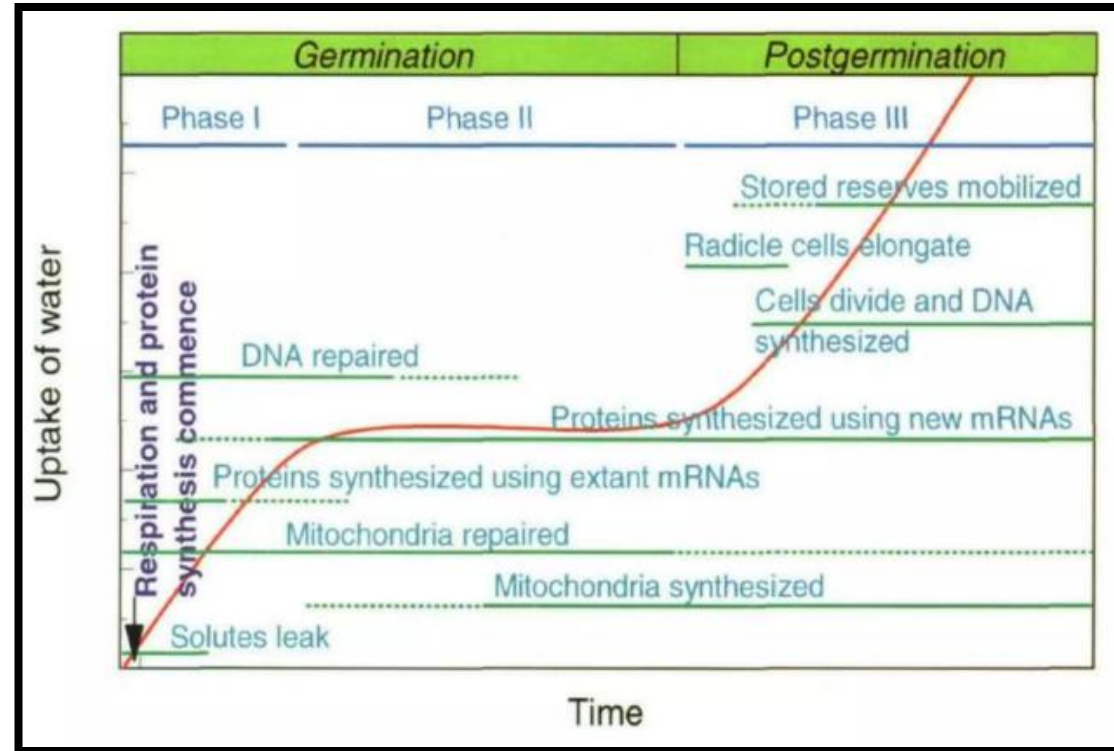
In some species, incubation at 40-50°C for few hours to 1-5 days may be effective in overcoming dormancy. Ex. Rice seeds more than 15% seed moisture treated in hot water of 40°C for 4-5 hours.



# Seed Priming

## What is seed priming?

- Controlled hydration of seeds to a level that permits pre-germinative metabolic activity to proceed & prevents actual emergence of the radicle



**Fig. 6 General phenomena of seed priming**



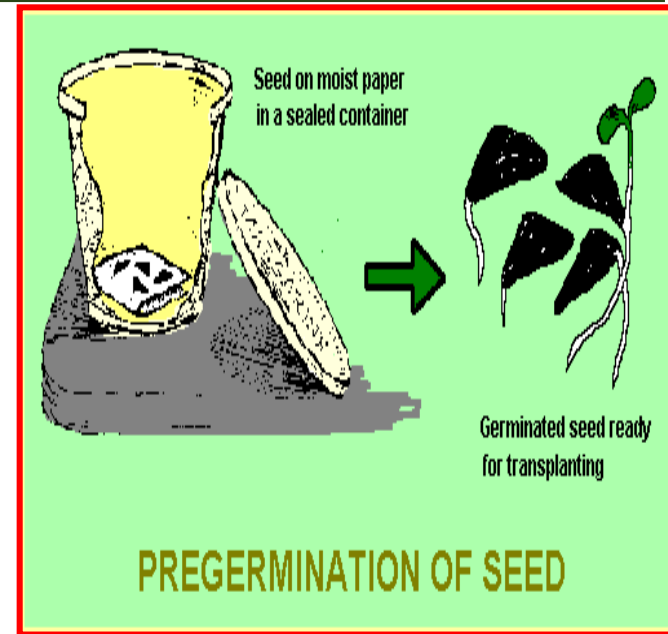
# Physiological seed enhancement

## A) Pre-germinated seeds:

seeds are allowed to perform radicle protrusion. This is followed by sorting for specific stages, a treatment that reinduces desiccation tolerance and drying.

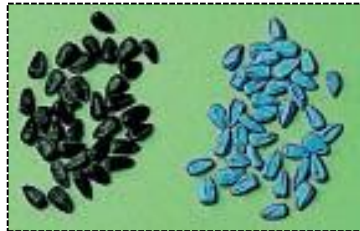
e.g., PreNova and PreMagic pre germinated seed products *e.g.*, flower crops

- During the pregermination process, the seed coat cracks and the radicle emerge, dead seeds and abnormal seeds are removed- PreMagic.
- Dry the seed to the moisture content of normal seed. Pre-Nova pre-germinated seeds.
- Fully imbibed seeds germinated to point of visible radicles, then sorted and gradually dried to induce desiccation tolerance.
- Can produce damp pre-germ seeds with storage life of a few weeks at ambient temps, or dry pre-germ seed (viable for a few months).



# Process of various seed coating technologies

Seed film coating	Seed colouring	Seed pelleting
Seed coating polymer + Active ingredients (Botanicals+ Biofertiliser	Colouring materials (Natural dyes)	Adhesive + Filler material Adhesive + Nutrients Adhesive + Bioinoculants Biofertilizers + pelleted seed



Film coating and pelleting = integrating of two processes.

Film coating - performed as the final step after pelleting to provide a dust free as well as better stability of the pellet.





**Seed pelleting:** Pelleting is achieved by applying specially formulated layers of powders and binders to the seed to make it easier to handle.

## Advantages of seed pelleting

- Increase in size
- Singling of seeds
- Precision planting
- Attraction of moisture
- Stimulation of germination
- Influence of micro-environment
- Reduces seed rate
- Uniform field establishment
- Protection from birds, animals & insects





# General Guideline for seed and planting material in natural farming

- **Growing condition**

The seeds/planting materials meant for natural agriculture must be propagated under a system of natural farming by using on farm input.

- **Selection of crops/ crop varieties**

Choice of crops is based on soil type, soil condition, climate, crop rotation and market demand. Yield is not the overriding factor; Product quality is equally important.

- **Adaptability to soil and level of fertilization**

Natural farming relies heavily on the natural resources available on farm. This necessitates use of cultivar that are best adapted to their particular environment and to the available nutrient levels. Crop with longer taproot is desirable , when the soil fertility is low.

- **Weed control**

Crop vigour and ability to compete with the weeds, particularly in early growth stages are vital for good plant establishment. Performance under unfavourable abiotic condition are the trait which help to overcome such problems.

- **Resistance to pests and diseases**

Prevention is a desirable to head off pests and disease. Seeds of varieties possess broad –based resistance.

# Seed Production technology in natural farming

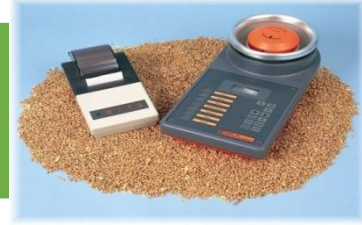
- **Seed Source:** Biodynamic seed and propagation material must be used. Plant material/Untreated seed/ treated seeds of conventional origin may have to be used.
- **Care of seed crop:** Propagation of seed crops should be **under natural conditions only**. The standard for purity (genetic & physical), seed-borne disease in respect of natural farming and isolation as per requirements.

The **control of genetic contamination** from nearby fields of same crop would also be desirable. No contamination/ and or admixture should take place during the harvesting/ threshing/ drying operations/ storage and handling of the seed produce with chemically treated seeds as well as other crop/ varieties.

- **Seed processing:** The processing of natural seed stocks would need to be done at organic seed processing plants. Until such separate seed processing units are available, processing can be done at conventional seed processing plant.



# WHAT IS SEED TESTING ?



- It refers to **evaluation of seed quality parameters** and compared with '**minimum seed standard**'
- It helps to evaluate the **planting value** of seeds
- To assess **seed lot attributes** and determine **overall quality and value** for seedling development and storage
- Seed testing standards are based on **scientific evidence**
- It provide set of procedures for facilities to conduct tests in a **uniform manner** and ensure **comparable results**



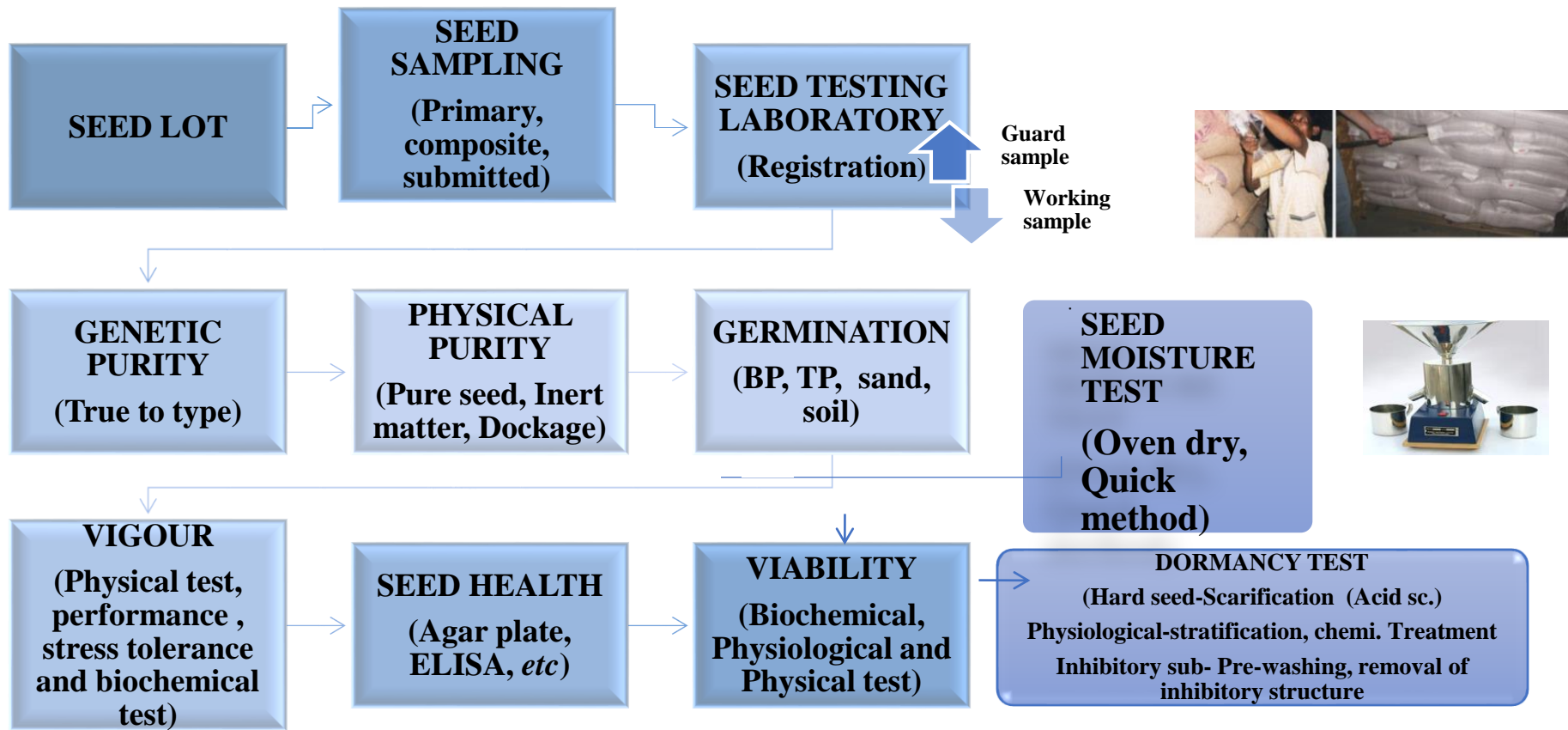


# OBJECTIVES OF SEED TESTING

- **Uniformity** and **reliability** of test results
- To identify the **quality problem** and their probable cause
- To determine their **suitability for planting**
- To determine the **need for drying and processing** and specific procedures that should be used
- To determine if seed meets established **labeling specifications**
- To help and to ensure **better quality**, governments usually utilize seed testing, certification and legislation



# GENERAL PROCEDURE FOR SEED TESTING



# SEED CLEANING AND UPGRADING

The seed is separated from undesirable material (*i.e.* inert matter, weed seeds, other crop seeds, light and chaffy seeds, deteriorated and broken seeds) on the basis of physical differences like density, surface texture, affinity to liquids and electric conductivity is known as seed cleaning.

Cleaning of seeds involves three steps.

- **Pre-cleaning and pre-conditioning**
- **Basic cleaning**
- **Seed upgrading**

## **Pre -cleaning & Pre –conditioning:.**

- Scalper or Rough Cleaner
- Huller Scarifier
- Debearder
- Maize Sheller





# Air Screen Machine

**Principle:** The separation of undesirable material from seed is done on the basis of differences in seed size and weight. The air screen machine uses three cleaning elements:

1. **Aspiration:** the light seed and chaffy material is removed from the seed mass through aspiration.
2. **Scalping:** Good seed are dropped through screen openings but large material (trash, clods etc.) are scalped off over the screen into a separate spout.
3. **Grading:** The good seed ride over the screen openings, while smaller particles (undersized, weed seeds, shriveled) drop through the screen perforations.

## ***Upgrading equipment***

- |                                 |                              |
|---------------------------------|------------------------------|
| a. <i>Indent Disc Separator</i> | b. <i>Gravity Separator</i>  |
| c. <i>Spiral separator</i>      | d. <i>Magnetic separator</i> |
| e. <i>Velvet separator</i>      | f. <i>Colour separator</i>   |



# Methods of Seed Production in Temperate Vegetables

- » The **six** methods of temperate vegetable seed production have been proposed, (Singh *et al.* 1959) based on the **suitability, type of seed crop and stage**.
- » **Seed to Seed (*in-situ*) method**
  - » Head intact method
  - » Stump method
  - » Stump method with central core
- » **Head to seed (transplanting) method**
- » **Knob to seed (replanting) method**
- » **Root to seed method**
- » **Modified method**
- » **Late planting**



# Important Terminology Seed Production in Temperate Vegetables

- **Bolting**

It refers to the **premature production of flowering stems**, especially on horticultural crops. It is natural attempt to boost seed production.

- **Stump**

Shoots **sprout from the cabbage head** to produce flowering.

- **Head**

**Ball formation** stage of cabbage

- **Curd**

It is a **pre-flower primordia** which often bolts slowly and incompletely in cauliflower.

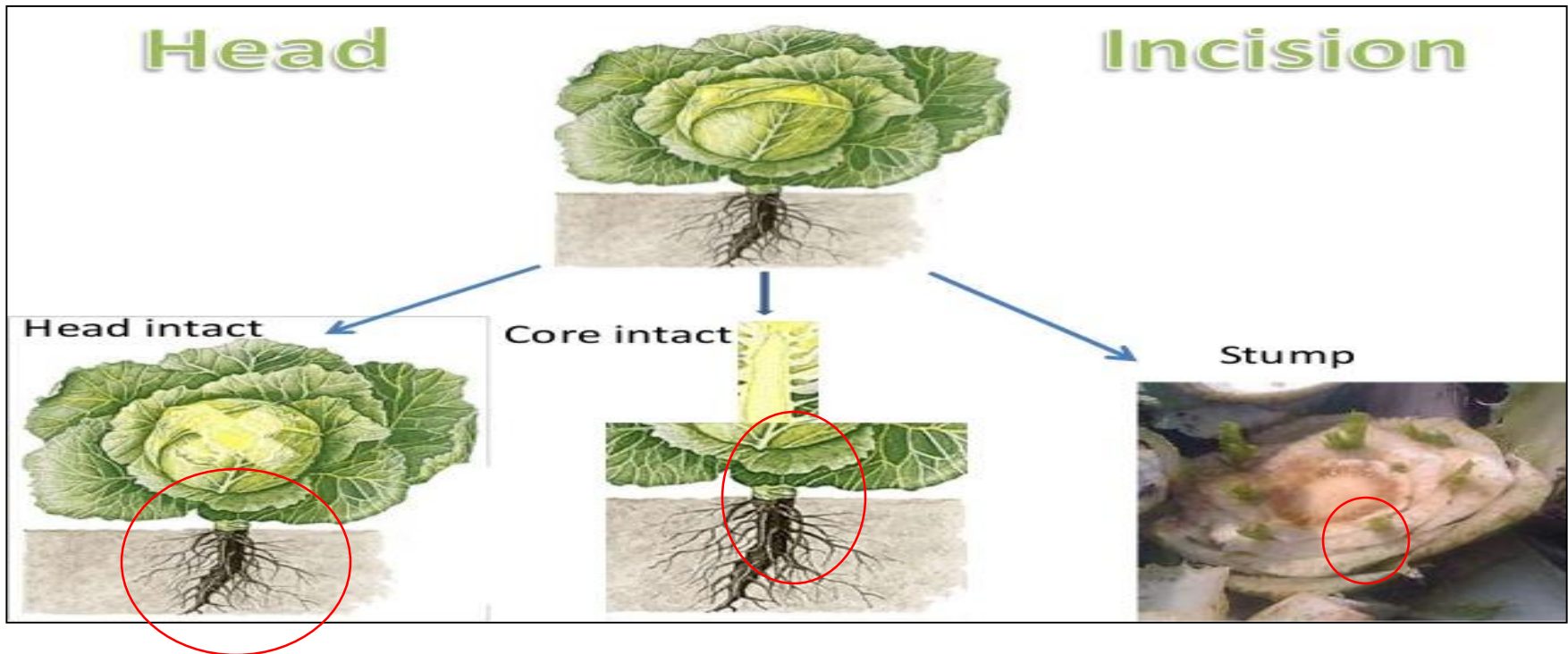
- **Scooping**

It is a process to **remove curd (white inflorescence meristem)** portion in **cauliflower**



## Seed to Seed (in-situ) method

- For **foundation** and **certified seed** production, this method commonly used for high **quality breeder seed**.
- In this, plants are allowed to **grow, overwinter** and produce seed in their **original position** where they were first planted as seedling.





## (A) Head intact method



- ▶ The **rise** in temperature in the **first fortnight of march**, developing flower stalk exerts an internal pressure and head starts bursting.
- ▶ Head bursting from **lateral sides** which allow the flower stalk to come out.
- ▶ To facilitate the flower stalk to emerge easily and uniformly, **two vertical cross cuts** with a sharp knife are given to the heads.

### Merits:

- ✓ The heads are allowed to **overwinter** in the field and no wastage of labour for shifting
- ✓ No direct injury of snow/ frost on internal growing parts is found.

### Demerits:

- ✓ No **extra income** from the sale of heads.
- ✓ The **earthing up** needed to support the weight of heads cross cuts carelessly done may injure the terminal buds.



Fig. 3

## (B) Stump method

- The fully mature heads are **decapitated** just **below the base** with sharp knife keeping the stem with outer whorls of leaves intact.
- Removal of heads should only be done after ascertaining **true to type** of mature heads and remaining heads are marketed from the field for extra income.

### Merits:

- It gave **extra income** to farmers
- Crop matures **earlier** than other
- Seed yield slightly higher

### Demerits:

- Flowering shoots are **decumbent**
- Requires heavy **stacking**



Fig. 4



## (C) Stump method with central core

- Instead of removing the whole heads they are chopped off on all sides with **downwards perpendicular** cuts in such a way that the **central core** is not damaged.
- The outside leaves are removed and only the **central portion** is left from where the flower stalks come out.

### Merits:

- It include **higher yield** then the stump method.
- The flowering branches are not decumbent, early seed maturity and cut portion usable as vegetable at home.

### Demerits:

- It include the cut portion of heads which are **unmarketable** and require additional labour.



Fig. 5

## (D) Head to Seed (transplanting) method

- ▶ Matured plants after head formation are uprooted, based on foliage and head characters
- ▶ The outer whorls of leaves are removed and, Immediately planted in well prepared main field.

### Merit:

- ▶ Higher quality seeds
- ▶ Low technique required and mostly followed.

## (E) Knob to Seed (replanting) method

- ▶ The mature plant after the formation of knobs are selected for true to type, and uprooted in autumn.
- ▶ All the leaves around the knob are removed, keeping crown leaves intact.
- ▶ The selected plants are immediately replanted in well prepared field in such a way that the whole stalk below the knob is buried in the soil and knob just touches the ground.

### Demerits:

- ▶ Low yield
- ▶ High labour cost
- ▶ Loss of transplanted plant





## (D) Head to Seed (transplanting) method

### A. *Ex-Situ* method



Developed head In field



Store with root for 6-8  
wk at 4-7°C



Retransplanting  
Immediate/in spring



Bolting

### B. *In-Situ* method



Developed head In field



Keep as such in situ



Bolting

## (F) Root to seed method

- When the roots are fully matured the crop is harvested the **true to type roots** are selected for next planting.
- To cut **1/4<sup>th</sup> of root** and **1/3<sup>rd</sup> of top** for obtaining higher yield and quality seeds
- The harvested roots are carefully rogued out for **colour** and **over sized roots** were discarded.
- Selected roots are replanted with a necessary spacing of in well prepared field
- Irrigation is given immediately after planting for emergence.

### Merit:

- ▶ **Higher** quality seeds

### Demerits:

- ▶ **Low** yield
- ▶ **High labour** cost



Fig. 7

# Isolation distance of important crops

Sr. No.	Name of Crops	Isolation in Variety (m)		Isolation in Hybrid (m)	
		Foundation	Certified	Foundation	Certified
1	Wheat	3	3	200	100
2	Paddy	3	3	200	100
3	Barley	3	3	200	100
4	Maize	400	200		
5	Sorghum	200	100	300	200
6	Pearl millet	400	200	1000	200
7	Finger millet	3	3		
8	Kodo millet	3	3		
9	Black gram	10	5		
10	Cowpea	10	5		
11	Green gram	10	5		
12	Indian bean	10	5		
13	Lentil	10	5		
14	Peas	10	5		
15	Pigeon pea	250	100		

Sr. No.	Name of Crops	Isolation in Variety (m)		Isolation in Hybrid (m)	
		Foundation	Certified	Foundation	Certified
16	Castor	600	300	1000	300
17	Ground nut	3	3		
18	Mustard	200	50		
19	Linseed	50	25		
20	Safflower	400	200		
21	Sesame	100	50		
22	Soybean	3	3		
23	Sunflower	400	200	600	400
24	Cotton	50	30	50	30
25	Tobacco	3	3	50	30
26	Brinjal	300	150	200	200
27	Okra	500	250		
28	Tomato	50	25	200	100
29	Cabbage	1600	1000		
30	Cauliflower	1600	1000		
31	Fenugreek	50	25		
32	Onion	1000	500	1200	600
33	Potato	5	5		

# Minimum seed germination percentage

Crop	Germination (%)	
	Foundation seed	Certified seed
Cereals		
Paddy	80	80
Wheat	85	85
Sorghum	75	75
Pearl millet	75	75
Finger millet	75	75
Pulses		
Chickpea	85	85
Cowpea	75	75
Mung bean	75	75
Pigeonpea	75	75
Urid bean	75	75
Oilseed		
Castor	70	70
Groundnut	70	70
Safflower	80	80
Sesame	80	80
Soybean	70	70
Sunflower	70	70
Cotton	65	65
Vegetable		
Brinjal	70	70
Capsicum	60	60
Okra	65	65
Tomato	70	70
Onion	70	70
Peas	75	75
Cabbage	70	70
Cauliflower	65	65



## Seed standards for planting materials

Factor	Foundation	Certified	Foundation	Certified
Crop	Turmeric		Ginger	
1. Appearance	Healthy & Plumpy	Healthy & Plumpy	Healthy & Plumpy	Healthy & Plumpy
2 .Uniformity (Minimum)	95.0-100.0%	85.0%	95.0	85.0%-95.0
3. Dry rot (Maximum)	1.0%	5.0%	1.0%	
4. Scales (Maximum)	1.0%	5.0%	1.0%	5.0%
5. Mealy bugs (Maximum)	1.0%	5.0%	1.0%	5.0%
6. Phyllosticta (Maximum)	-	-	5.0%	10.0%

## Clone (seed) standards for planting materials

Factor	Pure living clones (minimum)		Other living plants including Rootstocks (maximum)	
	Foundation	Certified	Foundation	Certified
Acid Lime Lemon	99.5% (by number)	98.0% (by number)	None	None
Mango Banana Apple Date Palm Guava Anola	99.5% (by number)	98.0% (by number)	0.5 (by number)	2.0% (by number)

## Seed standards for planting materials in Garlic

- **Seed (Planting stakes) Standards**

1. The average diameter of each bulb shall not be less than 2.5 cm or 25 gm in weight.
2. The seed material shall be reasonably clean, healthy and firm and shall conform to the varietal characteristics of the variety. The bulbs not conforming to varietal characteristics shall not exceed 0.10% and 0.20% (by number) for Foundation and Certified seed classes respectively.
3. Cut, bruised, cracked, immature or those damaged by insects, slugs or worms shall not exceed more than 2.0% (by weight).



# IMPORTANT SEED LEGISLATION IN INDIA

1) Essential Commodity Act -1955

**2) Seed Act -1966**

3) Seed Rules -1968

4) Seed Amendment Act -1972

5) Seed Amendment Rules -1973

6) Seed Amendment Rules-1974

7) Seed Amendment Rules-1981

8) Seed (Control) Order -1983

9) New Policy On Seed  
Development -1988

10) The Plants, Fruits And Seeds  
(Regulation Of Import Into India)  
Order -1989

**11) Protection Of Plants  
Varieties And Farmer's  
Rights Act -2001**

**12) Biodiversity Act-2002**

13) Protection Of Plants  
Varieties And Farmer's  
Rights Rules -2003

14) Seed Bill -2004

15) The Seeds (Amendment)  
Rules -2014

16) Cotton Seeds Price (Control)  
Order -2015





# WHY TO PROTECT PLANT VARIETIES?

UNIQUENESS	
Crop	Special Traits
Navara-Rice	Medicinal: curing circulatory, respiratory digestive, nervous system ailments and pest resistance
Borah Rice	Absence of the need for cooking, instant cooking
Pokkali Rice	Salt resistance
Chennellu Rice	Curing stomach ulcer
Jugal, Sateen-Rice	Resistance to BLB & BPH, multiple grains
Karchia Local Wheat	Salt tolerance
Jhakrana Bajra	Drought tolerant
Kali tur-Pigeon pea	Resistant to drought, SMV, Good quality
Naga Chilli (Bhut jholakia)	Pesticidal value



# Protection of Plant Varieties and Farmers' Rights Act (2001)

- **Breeders' Rights**

Breeders will have exclusive rights to produce, sell, market, distribute, import or export the protected variety. Breeder can appoint agent/ licensee and may exercise for civil remedy in case of infringement of rights.

- **Researchers' Rights**

Researcher can use any of the registered variety under the act for conducting experiment or research. This includes the use of a variety as an initial source of variety for the purpose of developing another variety but repeated use needs prior permission of the registered breeder.

- **Farmers' Rights**

A farmer who has evolved or developed a new variety is entitled for registration and protection in like manner as a breeder of a variety. Farmers variety can also be registered as an extant variety.



# Farmers' Rights

- **As conserver and cultivator**

- Right to **save, use, sow, re-sow, exchange, share or sell farm** produced seed, including the seed of registered variety
- Right to **share benefit when farmers'** variety is used for breeding new commercial variety.
- Right to farmers and communities to **receive reward and recognition** for conserving PGR
- Right to get **adequate supply of seed of registered** varieties at reasonable prices
- Right to **claim compensation for under performance of registered variety**
- **Right to register farmer's variety** ("Farmers' variety" means a variety which has been traditionally cultivated and evolved by farmers in their fields; or a land race or wild relative, about which the farmers possess common knowledge)



# Farmers' Rights

- **As Breeder**

- Right to register farmer's variety

("Farmers' variety" means a variety which has been **traditionally cultivated and evolved by farmers in their fields; or a land race or wild relative, about which the farmers possess common knowledge**)

- In the event of an essentially derived variety (EDV) is developed from farmer's variety, the commercialization of such EDV cannot be done without prior consent from the Farmer concerned

- **On socio-economic consideration**

- Exemption to farmers from **paying all fees** related to administrative and judicial proceedings under this Act

- **On socio-political consideration**

- **Judicial Protection** against first innocent infringement of this Act





# AWARDS, REWARDS AND RECOGNITIONS

To support and reward farmers, particularly the tribal and rural communities engaged in conservation, improvement and preservation of genetic resources of economic plants and their wild relatives, particularly in areas identified as agro-biodiversity hotspots



Awards / Reward / Recognition	Awarded	Since
<b>Plant Genome Saviour Community Awards (max. 5, consisting of a citation, memento and cash of Rupees Ten lakh each)</b>	<b>10</b>	<b>2009-10</b>
<b>Plant Genome Saviour Farmer Reward (max. 10, consisting of citation, memento and cash of Rupees one lakh each)</b>	<b>10</b>	<b>2012</b>
<b>Plant Genome Saviour Farmer Recognition (max. 20, consisting of a citation and memento)</b>	<b>15</b>	<b>2012</b>

# MODALITIES FOR ESTABLISHING COMMUNITY SEED BANKS

Identification of potential plant genome saviour community award winner / community conserving farmers' varieties



Community strength in terms of farmers' varieties with unique traits

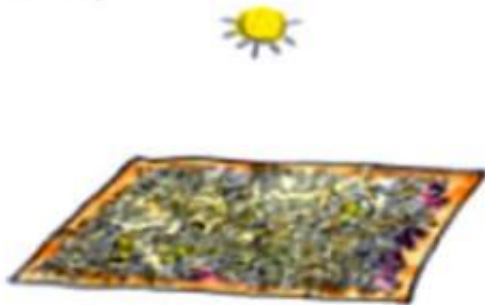


Classification of crops and farmers varieties possessing:

- Climate resilient traits: tolerant to biotic and abiotic stresses
- Therapeutic / nutraceutical uses
- Traditional knowledge

# Preventive Measures Against Storage Pests And Diseases

**1. Timely harvesting and drying**



**Harvest during dry weather**

**2. Proper threshing**



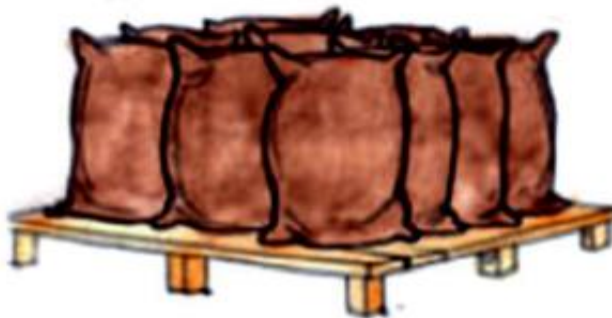
**3. Cleaning to remove the trash**



**4. Sorting to remove damaged beans**

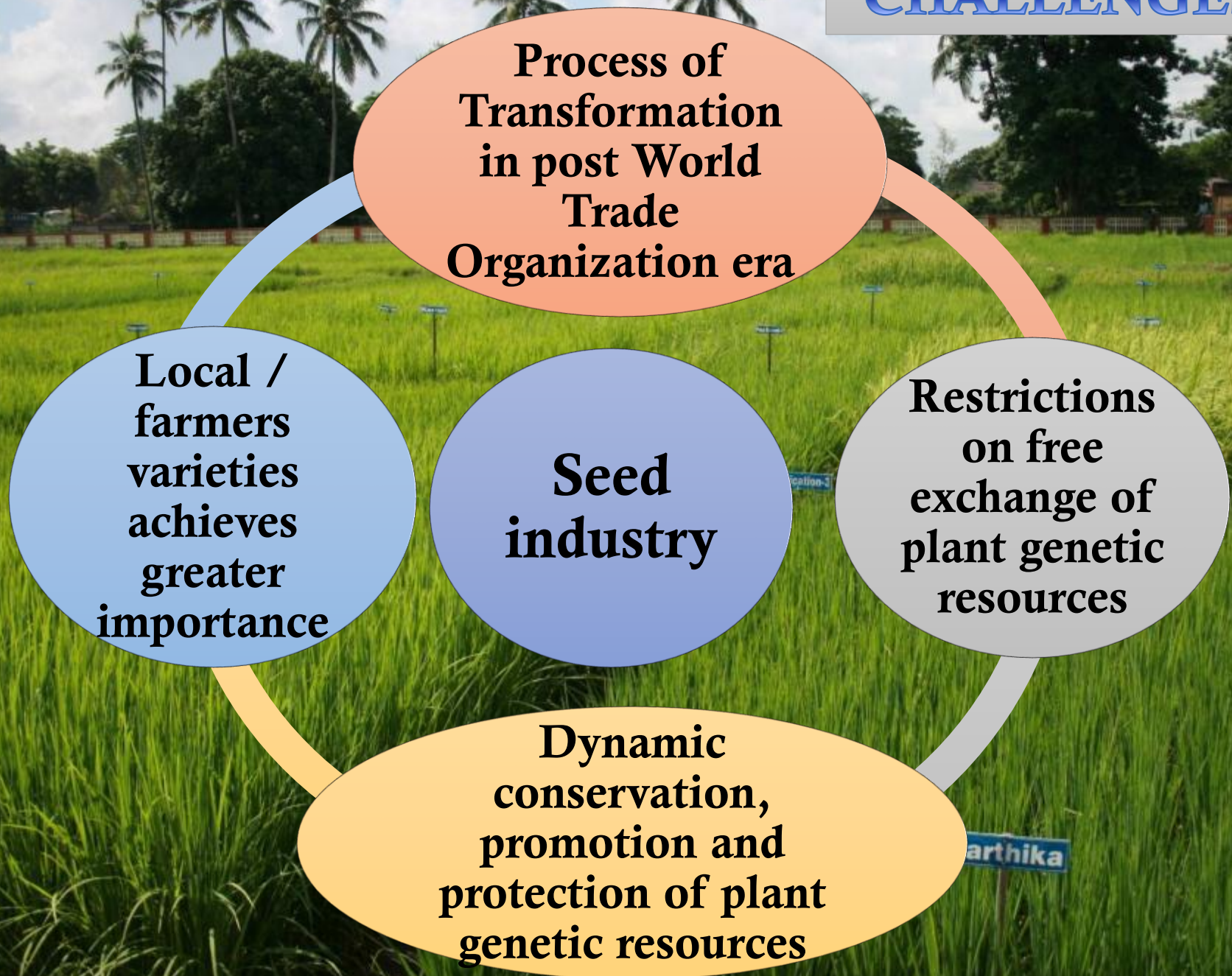


**5. Proper packing and storage off the ground**





# CHALLENGES





# What's needs to be done

- Adequate, **alternative seed treatment techniques** for natural farming need to be developed, and legislated
- For successful production of natural farming seed and planting material intensive communication between and mutual commitment of farmers, traders, breeders and governmental organizations are necessary.
- Farmers together with traders should be involved in variety testing and in designing crop ideotypes by **identifying the desired cultivar(s) and variety traits.**
- In addition, a great effort is needed to develop empirical knowledge and **research-based information on adapting and improving cultural practices** for natural farming seed production, developing resistant cultivars for healthy seed production, developing protocols for seed health testing, assessing disease threshold values, and designing new seed treatments technique.



# Indian Brand Ambassador of Millets

- **India's millet queen** — **Smt. Lahari Bai**, from Baiga tribal of Madhya Pradesh.
- She has conserved **150 local varieties of millets** in her two-room at her own cost.
- She distributes the seeds grown by her, free of cost, to the farmers in the village in order to conserve the varieties of millets.





स्वर्ण

ल का मार्च पास्ट

| राफेल लड़ाकू विमानों ने सलामी मंच से आगे बढ़ते समय टुकड़ि

11:31



# Rahibai Soma Popere

## Seed Mother

- **Tribal farmer** from Ahmednagar district, honoured with the title of 'Seed Mother' by **CSIR** for her inspirational work in the tribal-dominated region
- Conserved 50 acres of **collective indigenous land**, growing many varieties of rice & vegetables
- Established **seed bank** - successfully preserving hundreds of varieties of various crops in a traditional tribal way
- Created methods to **harvest water** on farms thereby turning wasteland into fertile land
- Increased **crop yield by 30%** with improved cultivation practices
- Excellent outreach work, **training** other farmers and spread awareness

"self-taught tribal woman famous globally for her work in agro bio-diversity conservation particularly of indigenous varieties"



Padma Shri | Others (Agriculture - Organic) | Maharashtra | 56 Yrs



## Awards

- **Nari Shakti Puraskar-2018**
- **Padma Shri- 2020**
- **Seed Saver Award**





**THANK YOU...**

# Vegetable Biodiversity

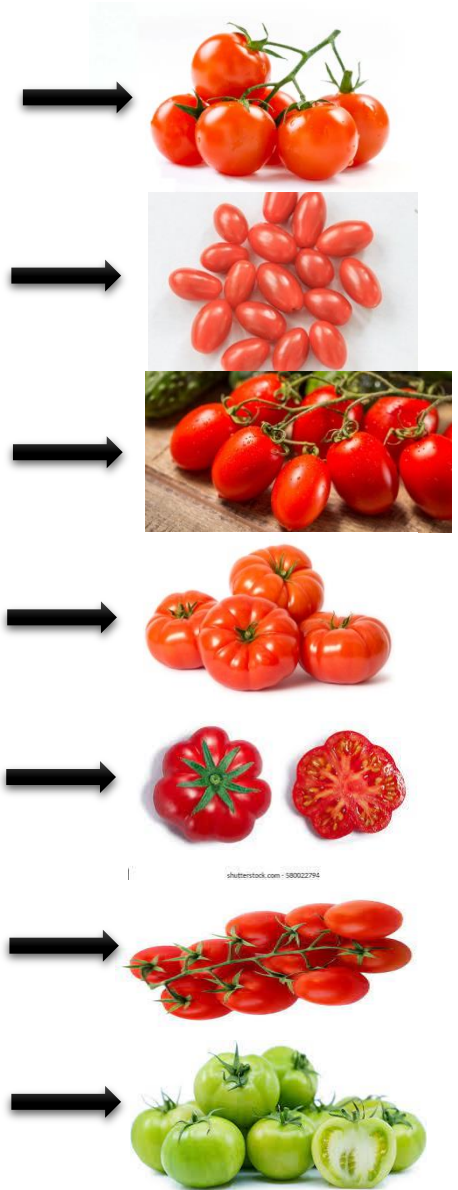
- Biodiversity is the natural heritage of the planet and is one of the key factors of sustainable development, due to its importance not only for the environmental aspects of sustainability but also for the social and economic ones.
- Biodiversity International in collaboration with the FAO
- **Total vegetable species – 1097**
  - Leafy vegetable species – 495
  - Multiple vegetative parts (bulb, root tuber, stem, *etc*) – 227
  - Root species – 204
  - Fruit or seed – 90
  - Plant parts (flower, inflorescence) – 80
- However, from the point of view of major share in the market and variety/hybrid development hardly 25 vegetable crops

## Status of indigenous vegetables in National gene bank

Crop	No. of accessions. available	Crop	No. of accessions. available
Brinjal	3739	<i>Basella</i>	88
Wild brinjal	412	<i>Portulaca oleracea</i>	23
Cucumber	624	<i>Ipomoeea aquatica</i>	15
Redge gourd	326	<i>Diplazium esculentus</i>	01
Sponge gourd	408	<i>Lasia spinosa</i>	04
<i>Luffa</i> spp	95	<i>Colocasia esculentus</i>	2410
Pointed gourd	274	<i>Oxalis corniculata</i>	16
Snap melon	206	<i>Moringa oleifera</i>	197
Ivy gourd	34	<i>Murraya koenigii</i>	24
<i>Solena amplexicaulis</i>	08	<i>Lasia spinosa</i>	04






# Types of Tomato

<b>Cherry tomatoes</b>	Perfect size for salads or to eat alone as a snack. They're also well suited for skewers and kebabs.
<b>Grape tomatoes</b>	Half the size of cherry tomatoes. excellent in salads or eaten alone as a snack.
<b>Roma tomatoes</b>	Used for slicing and known as plum tomatoes. canning or making sauces
<b>Beefsteak tomatoes</b>	Slice up for sandwiches and hamburgers
<b>Heirloom tomatoes</b>	Canning and making sauces
<b>Tomatoes on the vine</b>	Sliced for sandwiches
<b>Green tomatoes</b>	Relish, a condiment for sandwiches and meats

















# Tomato varieties released from AAU

<b>Anand Roma</b>	<b>2021</b>	<b>Ovoid in shape with flat to pointed blossom end</b>	→ 
<b>Gujarat Anand Cherry Tomato 1</b>	<b>2018</b>	<b>Fruits are red in colour with ovoid in shape</b>	→ 
<b>Gujarat Anand Tomato 5</b>	<b>2017</b>	<b>Flat fruit shape at blossom end</b>	→ 
<b>Anand Tomato -3</b>	<b>2008</b>	<b>Fruits are round shape long shelf life</b>	→ 
<b>Gujarat Tomato 2</b>	<b>2004</b>	<b>Immature fruits have dark green soldier</b>	→ 

# Types of Tomato

<b>Chinese brinjal</b>	Chinese eggplant perfect for slicing into rounds and sauteing	→	
<b>Sicilian brinjal</b>	Eating whole or pureeing	→	
<b>Indian brinjal</b>	Commonly used in Indian dishes like curry	→	
<b>Italian brinjal</b>	Slightly smaller and sweeter	→	
<b>Little Green brinjal</b>	Extra creamy texture when cooked	→	
<b>Thai brinjal</b>	Can be stuffed, or diced and tossed in curries	→	
<b>White brinjal</b>	Less bitter, creamier and denser	→	

# Brinjal varieties released from AAU

<b>Gujarat Round Brinjal 8 (Anand Raj</b>	<b>2021</b>	<b>ovoid shaped fruit with purple fruit skin colour</b>	→ 
<b>Gujarat Anand Brinjal 6 (Anand Doli)</b>	<b>2019</b>	<b>Club shaped fruit with medium size and cluster fruiting pattern</b>	→ 
<b>Gujarat Anand Brinjal Hybrid 3</b>	<b>2014</b>	<b>dark purple to black fruit skin colour</b>	→ 
<b>Gujarat Anand Oblong Brinjal 2</b>	<b>2013</b>	<b>pinkish purple fruit skin colour, obovate fruit shape</b>	→ 
<b>Gujarat Oblong Brinjal 1</b>	<b>2004</b>	<b>black colour and shining. Short size of calyx and pedicle</b>	→ 

# Types of chilli

<b>Bhut Jolokia</b>	Hottest chilli in the world in the Guinness Book in 2007; an interspecific hybrid ( <i>Capsicum Chinese</i> and <i>Capsicum frutescens</i> ), cultivated in North Eastern States
<b>Kashmiri Chillies</b>	Most favorite red chilli in India for its colour; less pungent as compared to the other variants in India
<b>Jwala Chilli</b>	Finger hot-pepper, pungent in taste & flavour, cultivated in Gujarat and other north-western parts.
<b>Kanthari Chilli</b>	This chilli is grown in Kerala and some parts of Tamil Nadu. It is also known as bird eye chilli of Kerala and becomes white when matures
<b>Byadagi Chilli</b>	It is a famous variety of chilli-Paprika, mainly grown in Karnataka. It is named after the town of Byadagi, of Karnataka
<b>Dhani Chilli</b>	Grown in Manipur and is available up to Kolkata. It has strong pungent smell and heat, it is deep red in colour.





## Chilli varieties released from AAU

<b>Gujarat Anand Vegetable Chilli 141 (Anand Tej)</b>	<b>2021</b>	<b>higher ascorbic acid</b>
<b>Gujarat Anand Vegetable Chilli hybrid 1</b>	<b>2011</b>	<b>fruits of this hybrid are elongated straight with pointed blossom end</b>
<b>Gujarat Anand Vegetable Chilli 112</b>	<b>2011</b>	<b>variety are pungent, elongated straight, light green colour</b>
<b>Vegetable Non Pungent Chilli 131</b>	<b>2007</b>	<b>non pungent variety are elongated, straight, compac</b>
<b>Gujarat Vegetable Chilli 111</b>	<b>2003</b>	<b>green colour with elongated straight shape</b>



**THANK YOU...**

