

# The Biology of Seed Saving



**ECHO Asia Impact Center**  
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# How to use i>clickers

- Turn the power on
- The i>clicker you have been given is a classroom response device which allows groups of people the ability to anonymously vote and give feedback
- When power is on, a steady blue light will appear
- The instructor will begin the polling and you'll see the timer count down
- You can choose answers A-E by pressing the button ONCE
- Indicator light will flash light green when answer is received

# Question 1

## **Question 1: I currently save my own seeds**

- A: Yes, I save all of my own seeds
- B: I save most of my own seeds
- C: I save a little bit of my own seeds
- D: I do not save my own seeds

# Question 2

**Question 2: How familiar are you with seed banking?**

- A: Not at all familiar
- B: Slightly familiar
- C: Somewhat familiar
- D: Moderately familiar
- E: Extremely familiar

# Question 3

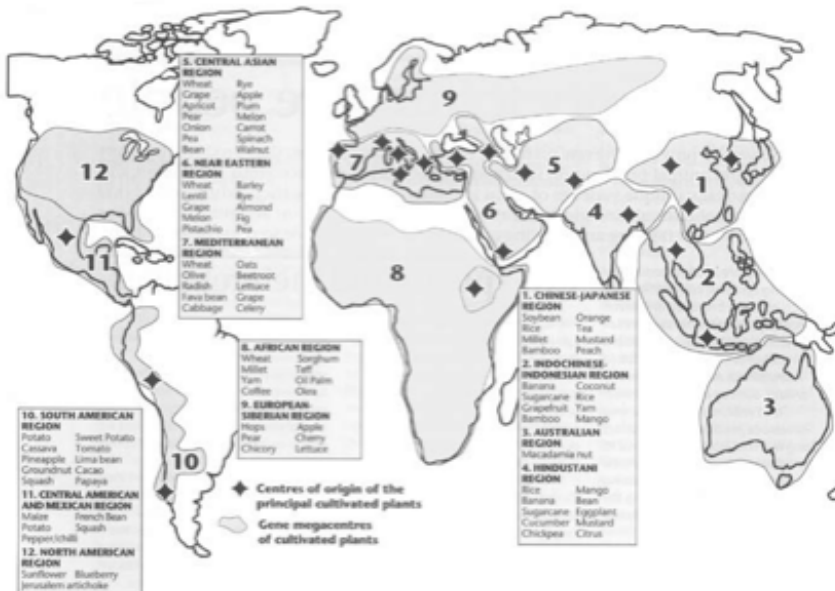
**It is estimated that what percent of all crop genetic diversity in the world has gone extinct in the last century (100 years)?**

- A: 12%
- B: 25%
- C: 54%
- D: 75%

# Why Save Seeds?

- Retains biodiversity
- 75% of crop genetic diversity has been lost in the last century - World Summit on Sus.

Develop 2002





# Why Save Seeds?

- Helps to retain Cultural Diversity
- Agri + Culture
  - Seeds and techniques develop within particular cultures
  - Often seeds and varieties developed to fit culinary niche



# Why is seed saving important?

- Uses locally available resources
- Saves money
- Preserves genetic and cultural diversity
- Develops self-sufficiency
- Local acclimatization
- Empowers others
- Decreases dependence on hybrids
- Promotes good health

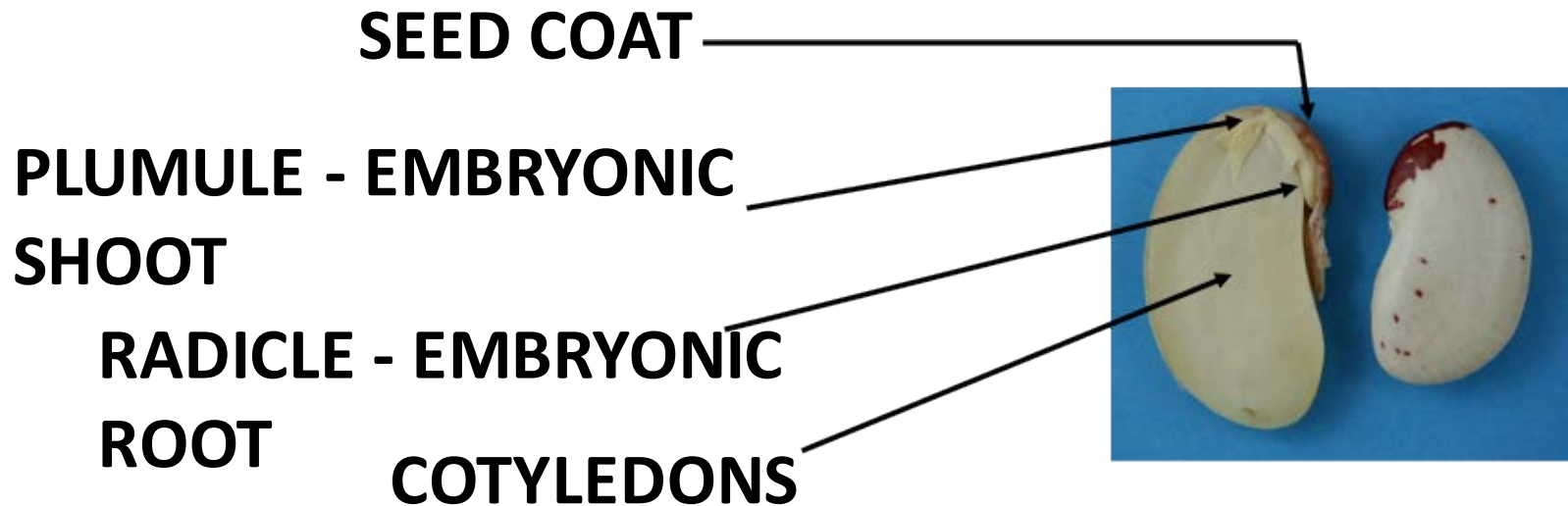


# Seed Biology

- What is a seed?
  - Embryo of a plant (Baby)
  - With stored food (Milk)
  - Surrounded by a coat (Blanket)
- What is the purpose of a seed?
  - Means of dispersal of new plants
  - Survival- transfers genes to next generation



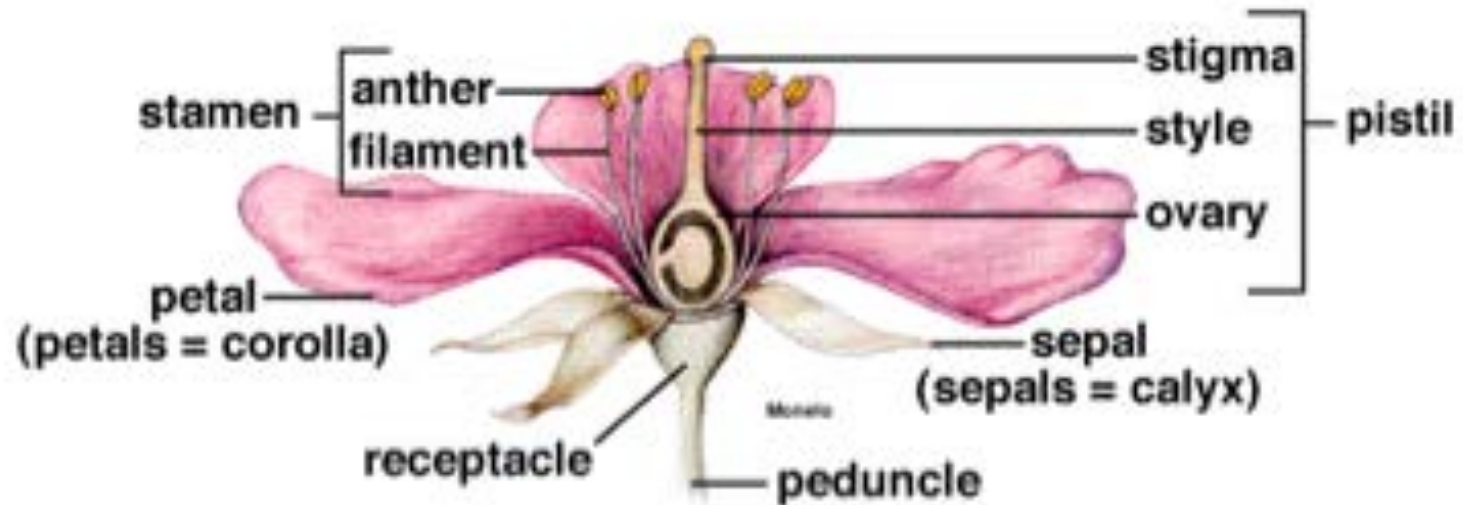
# Seed Biology



# Flowers and Pollination

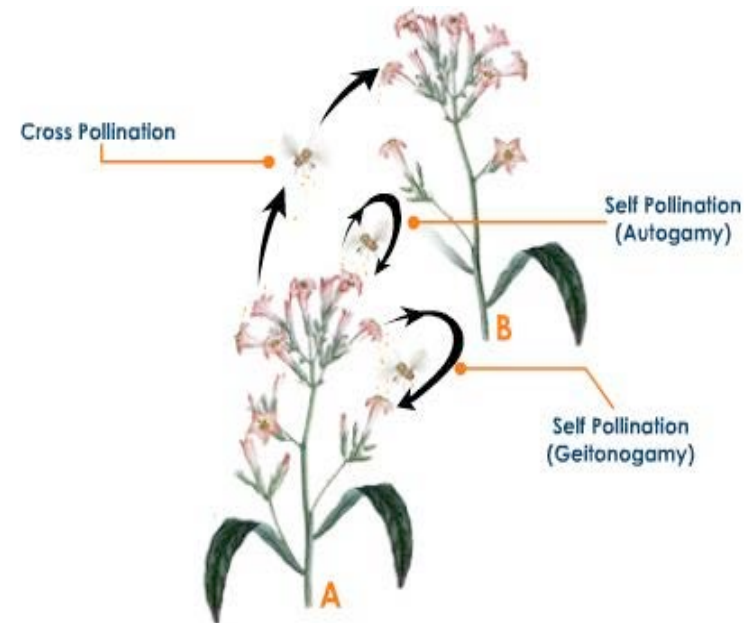
Kingsley R. Stern, Botany Visual Resource Library © 1997 The McGraw-Hill Companies, Inc. All rights reserved.

## Parts of a Typical Flower



# Flowers and Pollination

- Types of Pollination:
  - Self pollination: pollination within the same flower or flowers on the same plant
    - Lettuce, tomato, okra, peas, beans
  - Cross pollination: pollination between flowers on different plants
    - Onions, carrots, parsley, celery, broccoli, cabbage
    - If wanting to save pure varieties, be careful to prevent cross-pollination



# Types of Seeds

- **Heirloom seed- “Heirloom,” “Traditional,” “Indigenous,” “Open Pollinated (OP)”**
  - Plants that have been domesticated over time and produce ‘true to type’ seeds
  - Traits relatively stable; can be saved
  - Genetic makeup more diverse than hybrids
  - Benefits:
    - Under adverse conditions, some plants may die, but others may survive and have resistance
    - Crop harvest lengthened, as seeds/fruit do not all mature at same time

# Types of Seeds

- **Hybrids**
  - Created from the cross of 2 parent plants and backcrossed multiple times to make the cross stable (by a breeder)
  - Do not produce 'true to type' seeds
  - Loses 'hybrid vigor' in subsequent generations
  - Saving seeds is not recommended and can be illegal
  - Loss of biodiversity
  - High input expenses





# Types of Seeds- Definitions

- **Species-** The least divisible unit of a group of organisms in biology
  - Can breed and produce *viable* offspring
- **Variety-** A plant or set of plants with a particular set of traits in a species
- **Cultivar-** “Cultivated-variety” of a plant

*Solanum lycopersicum*





# Seed Biology: Germination

- Once a flower is fertilized, it starts to add resources to the embryo (seed)
- After the embryo reaches a certain size, it becomes dormant before germination
  - Dormancy dependent on many different factors including the inherent abilities of seed:
    - **Orthodox**- can be dried and stored for long periods of time
    - **Recalcitrant**- cannot be stored for long periods of time



# Seed Biology: Germination

- Besides inherent abilities, dormancy dependent on many different factors:
  - Maturity of harvested seed
  - Seed moisture content (optimum= 8-10%)
  - Oxygen?
  - Insects/pests/fungi/disease



# Seed Biology: Germination



- **Factors that then result in germination:**
  - Water- must penetrate the seed coat
  - Temperature- heat
  - Sunlight in some instances
- **To store seeds, we need to try to overcome these “triggers”**

# Quiz

- **Which type of seed can you easily save?**
  - A: Hybrid seeds
  - B: Interspecific seeds
  - C: Varietal seeds
  - D: Open-pollinated seeds

# Seed Multiplication: How to Know What to Multiply



- Observe what farmers are growing already and look for better varieties of those crops
- Identify needs and possibly introduce a completely new crop for a specified need
- Conduct small-plot trials to test new varieties/species and get farmer feedback



# Seed Multiplication: Farmer Selection

- Can be as simple as farmers taking notice of valuable traits and tagging plants to harvest later
- Can be by cross-pollinating plants with special traits
- Can be bagging fertilized flowers to prevent cross-pollination
- Thousands of varieties
- In as low as 7+ generations can get a new variety



# Seed Multiplication



- Select land: consider renting
- Ensure adequate soil moisture and fertility
- Control pests
- Labor?
- Plant sufficient quantity of seed
- Label varieties



# Seed Multiplication

- Beware of cross-pollination:
  - Some plants are very susceptible to this (grains), especially when flowering at same time
  - Ways to overcome:
    - Isolation- growing them apart
    - Planting at different times
    - Bagging flowers or using netting



# Seed Multiplication



- Selecting plants for harvest
  - Select for desired traits:
    - Pest resistance
    - Drought resistance
    - High yield
  - Mark the plants you want to harvest when growing
  - Rogue out undesirable plants so they do not contaminate good plants



# Characteristics of Good Seed

- Pure lineage
- Can trace the crop history
- Clean and new
- High viability
- Low moisture content



# Advantages of Good Seed

- Better yield
- Needs less resources
- Produces healthy plants
- Maintains pure line
- High germination
- Adapts well
- Farmers uses less = food security





# Disadvantages of bad seed

- Less and lower quality yield
- More labor–intensive less cost effective
- Low germination
- Unable to be sold at market



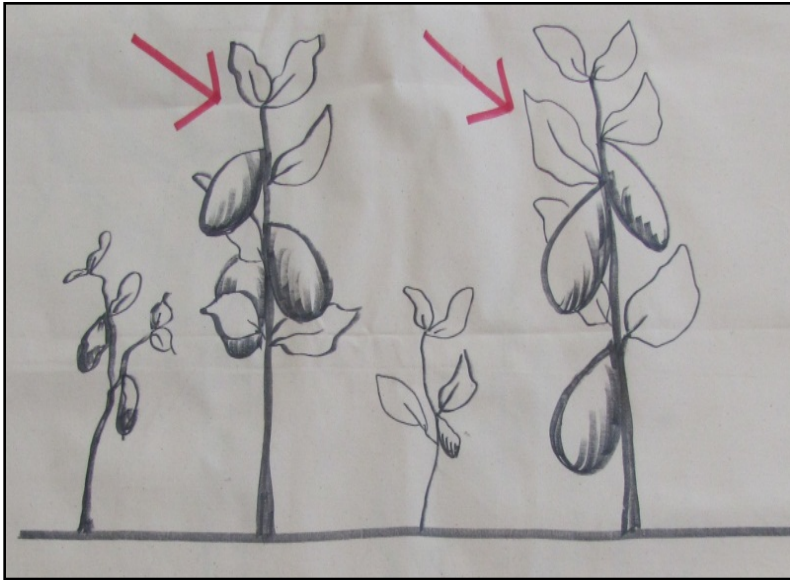
# Criteria of Selecting Seed

- From strong and healthy plants

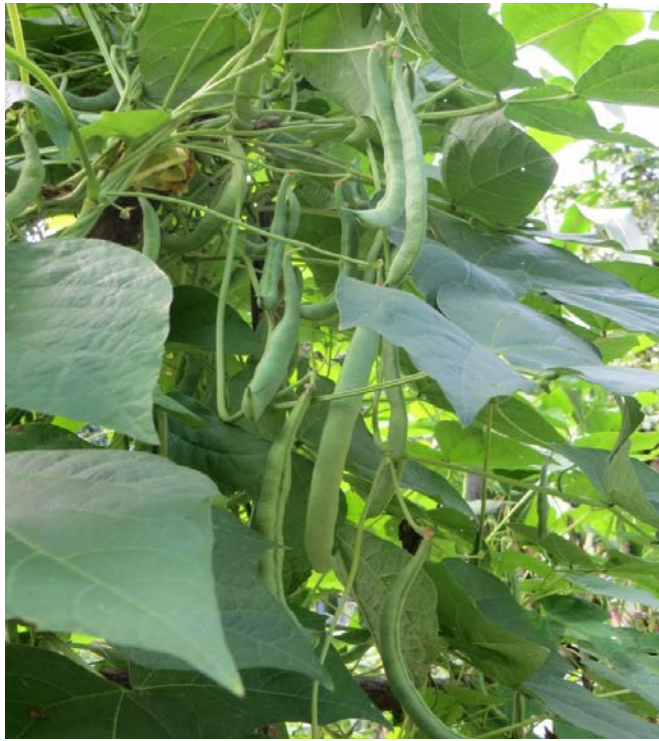




- Good flavor and color
- High productivity
- Avoid plants that are too young, too old or sick





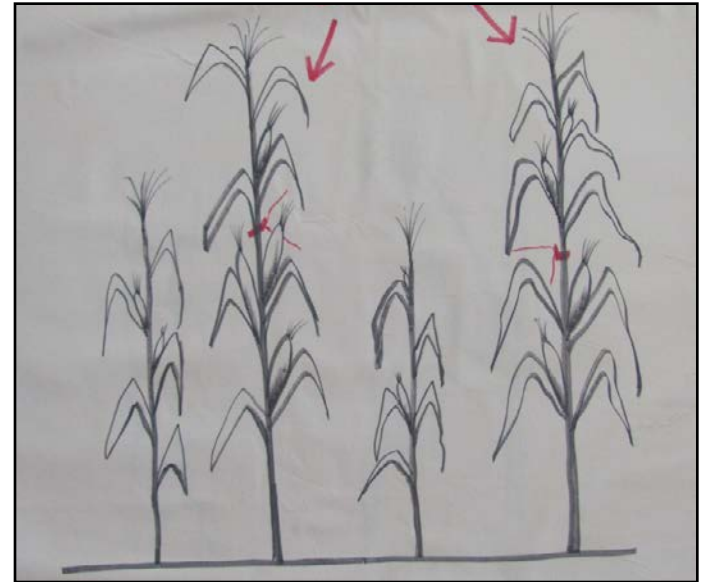


- Vigorous growth

- Adapted to your farm



- Mark the healthy plants to remember which ones to collect seeds



- Try to prevent cross-pollination

# Principles of Harvesting Seed

- Harvest from desired plants or plant parts
- The goal should be genetic diversity so plants can adapt to changing conditions
- Label bags or containers
- Harvest at the right time

# Harvesting Variations

- Chili
- Cucumber
- Eggplant
- Pumpkin
- Papaya





**Varieties that need to be collected from dried, mature fruit before harvesting seeds**

- **Bottle gourd**
- **Sword bean**
- **Wax gourd**





# Varieties that require ripening on plant before harvesting seeds



- Yard long bean
- Mustards and lettuce
- Corn



# Varieties that should be harvested before pods disintegrate

- Amaranth
- Winged bean
- Rice bean, cowpea
- Sesame
- Horse gram





Too late for  
harvesting



Right time for  
harvesting



# Varieties that can be propagated by cuttings

- Sweet potato
- Chaya
- Cassava
- Katuk
- Fern



# Propagation

With soil in container



Submersion in water



Directly in the ground





# Cleaning seeds: why do it?

- Chaff and stems make it harder to get an accurate seed count
- Debris can harbor insects
- Removes any insects and diseases that come in from the field

# Tomato Cleaning



1. Scoop out the seed



2. Soak with water and ferment



3. Wash with water and strain



4. Dry



# Seed Cleaning by Sand



# Papaya Cleaning





# Dry Pod or Husk Seed Cleaning

Yard long bean, horse gram and green bean



Remove seed from pod by hand



Remove debris and separate  
good seed from bad

# Seed Drying

- Ideal seed moisture content for storage is 3-8%
- Be sure the temperature does not exceed 41C (105F) for tree or high-oil seeds and 54C (130F) for most other orthodox seeds



# Some Appropriate Drying Methods

## Drying in the Sun





# Drying Above Fire





# Drying Shelves



# Seed Dryer

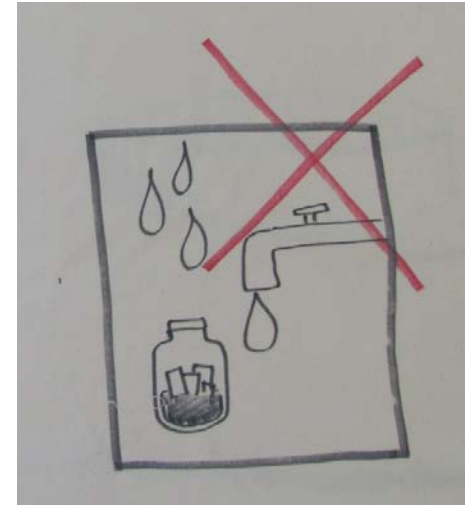


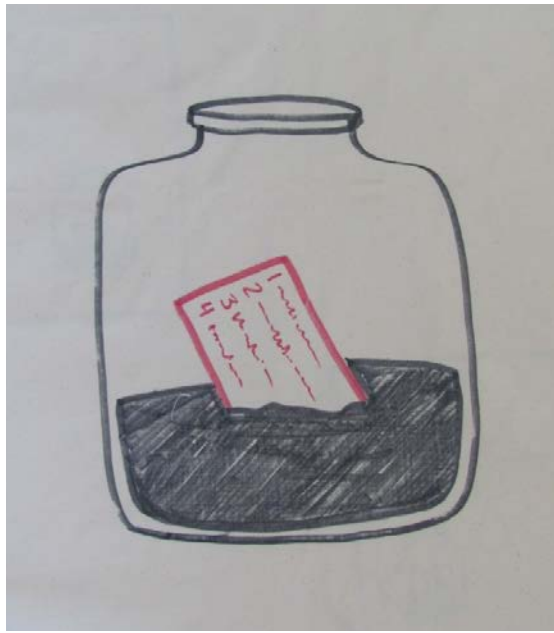




# Storing Seeds

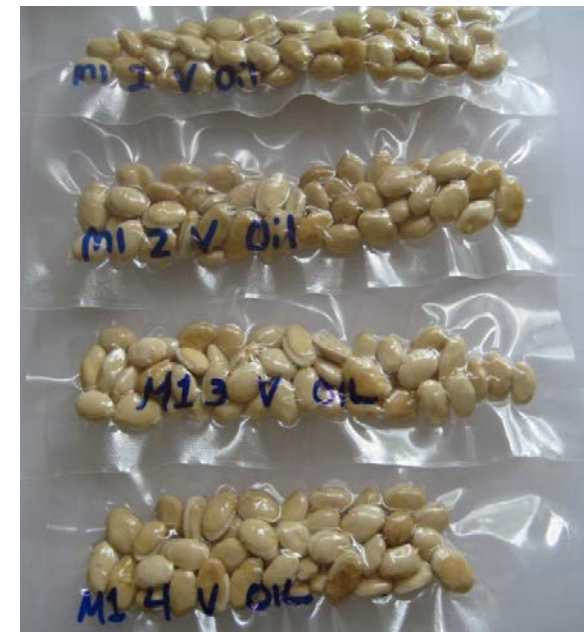
- Seed should not be exposed to ambient moisture in storage
- Don't let them be exposed to high humidity again!





# How to Store Seeds:

- Label your seeds!
- Climate controlled environment
- Use desiccant
- Airtight containers
- Vacuum seal





## ☐ **Rule of 100:**

☐ The combination of the temperature (F) plus the relative humidity (%) of the ambient environment where seeds are being stored should not be greater than 100

☐ How to overcome?

☐ Climate controlled environment

☐ Desiccant

☐ Airtight containers

☐ Vacuum sealing

# Some Appropriate Storage Methods



# Vacuum Sealing





# Some Appropriate Storage Methods

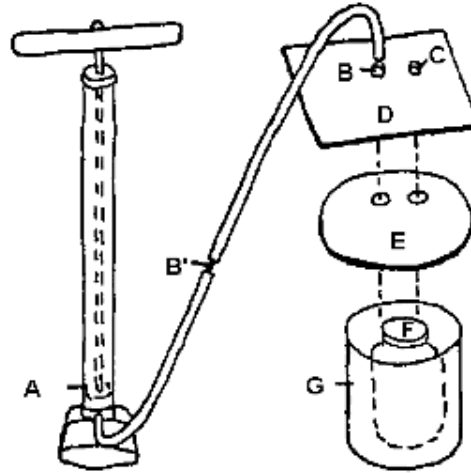


Figure 1. The vacuum packing system for seed storage.



# Climate Controlled Room



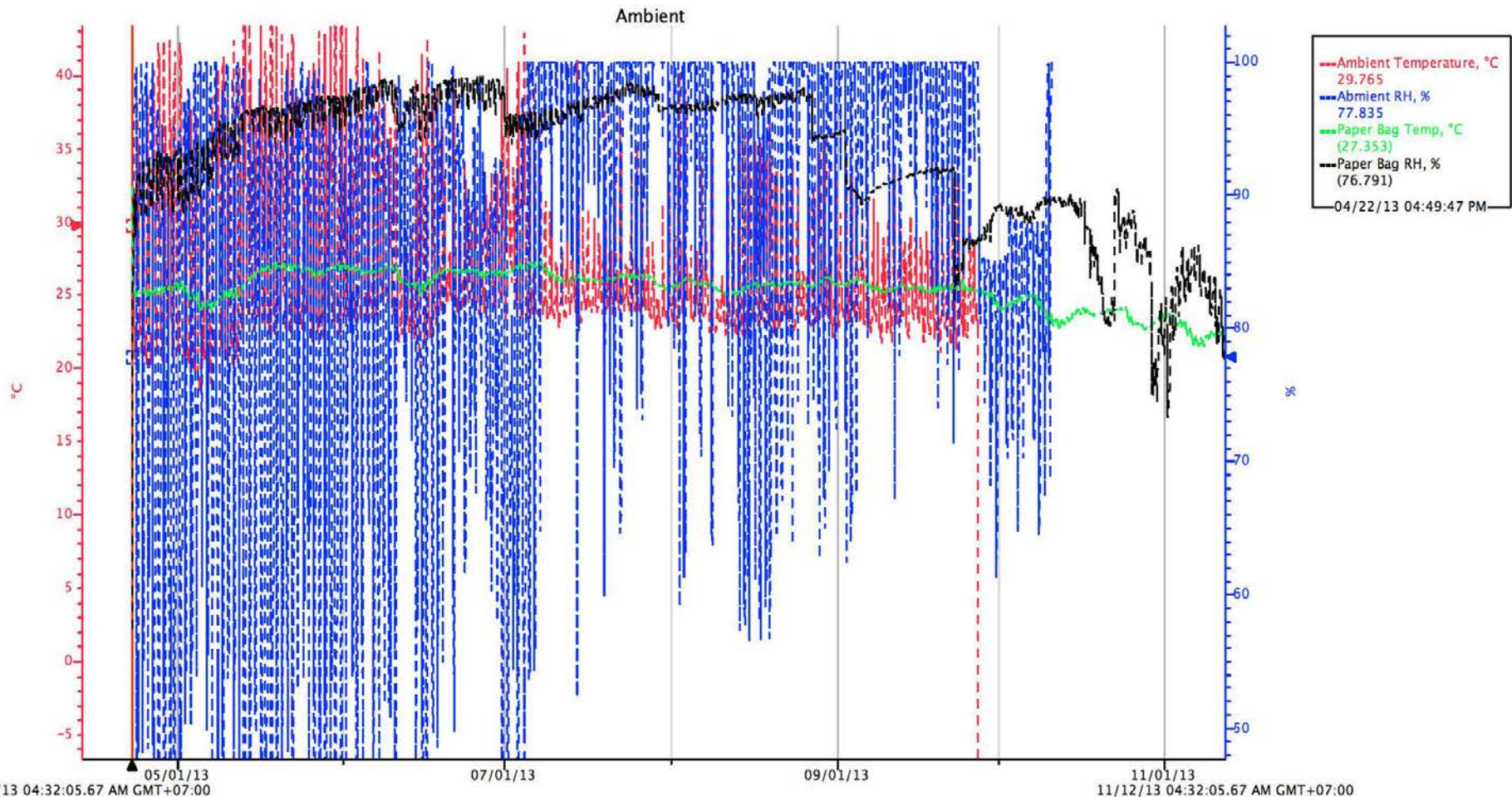






# Data logger Data

## AMBIENT TEMPERATURE VERSUS TEMPERATURE IN EB HOUSE



# Why Should We Do Germination Testing ?

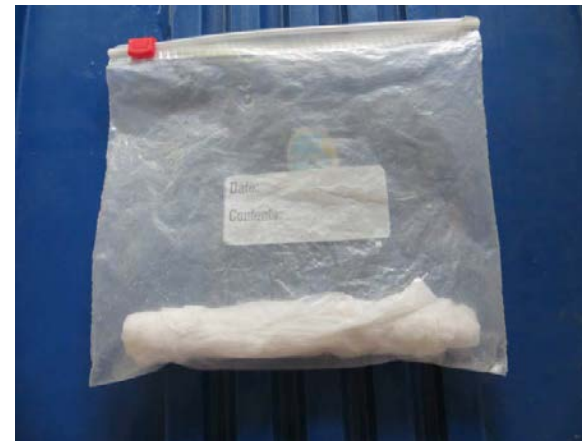
- Selective
- Reduces wastage
- Maximizes use of space
- Improves community relations

# Germination Testing Process: Petri





# Germination process: Rag Doll



# Germination Process: Soil



# Germination Data Recording

[illegible]



# Seed Saving Main Points:

- Increases food security
- Increases food sovereignty
- Preserves diversity
- Helps promote community relationships

# How will seed saving improve your community?



# Thank you!

