ISEA
Institute for Social Entrepreneurship in Asia

PRRM
Philippine Rural Reconstruction Movement
building sustainable communities

OXFAM

FOOD HIVES TO NOURISHING CITIES

COMMUNITY SEED BANKING TRAINING MODULE

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- C. What is Community Seed Banking?
- D. Objectives of Community Seed Banking
- E. Importance of Community Seed Banking

II. Seed Selection Processes

- A. Selection of Mother Plants
- B. Methods of Seed Selection
- C. Timing of Seed Selection
- D. Record Keeping/Labeling

III. Processing of Vegetable Seeds

- A. Seed Drying
- B. Methods of Seed Drying
- C. Seed Quality Testing
  - a. Moisture Content
  - b. Purity Test
  - c. Visual Inspection
  - d. Flotation
  - e. Rapid viability Test
  - f. Seed Germination Test
- D. Seed Storage

IV. Establishment of Community Seed Banks

- A. Seed Conservation Methods
- B. Community Seed Banking as a Form of Ex Situ conservation
- C. Seed Banking Facility Management

TRAINING DESIGN

Training Objectives

General Objective

To provide the participants with basic skills, knowledge and attitude about the establishment of community seed banks and its management

Specific Objectives

At the end of the training, the participants are expected to:

1. Discuss seeds and its importance and relation to attaining food security and food sovereignty
2. Identify important traditional or heirloom crop seed varieties and existing culture or tradition of seed sharing in their communities.
3. Illustrate the different seed conservation and preservation techniques
4. Discuss the objectives and importance of community seed banking
5. Explain how to establish and operationalize community seed banks

One-Day Training Design

TIME	OBJECTIVES	TOPIC/ACTIVITY	METHODOLOGY	MATERIALS NEEDED	PERSON RESPONSIBLE
8:00 – 8:30		**ARRIVAL AND REGISTRATION**			
8:31 – 8:40		**INTRODUCTION** Opening Prayer National Anthem Welcome Remarks			Training Management Team
8:41 – 9:15	To level-off on the objectives and the expected outcomes of the activity	**TONE SETTING** • Activity Introduction • Expectations Check • Training Objectives • Discussion Flow • Host Team formation	Presentation of the rationale and objectives of the training. Discussion on the training objectives and how these relates to the participants' expectations. Participants' apprehensions and fear on the training will be addressed arriving to suggestions and recommendations.	PowerPoint presentation LCD projector Audio equipment Meta cards Pentel Pen Masking Tape Manila Paper	Training Management Team
9:16 – 9:30		**BREAK**			

TIME	OBJECTIVES	TOPIC/ACTIVITY	METHODOLOGY	MATERIALS NEEDED	PERSON RESPONSIBLE
9:31 – 11:00	*At the end of the training, the participants are expected to:* • Heighten awareness of participants on the definition and principles of food security and food sovereignty • Discuss the relation of seed and seed banking to attaining food security and food sovereignty • Gain insights on how farmers will address issues related to corporate control over seeds • Heighten farmers' appreciation of the role and importance of a community seed bank in addressing issues related to food security, sovereignty, corporate control, and climate change	**I. Community Seed Banking Overview** A. Food Security and Food Sovereignty B. The Seeds and Its Parts C. What is Community Seed Banking? D. Objectives of Community Seed Banking E. Importance of Community Seed Banking	Open Discussions/ Interactive Lecture The Resource Person will open the discussions by asking the participant this question: "If you are a seed what are you and why?" Each participant will be given the opportunity to choose the kind of seed they are and explain the reasons. The Resource Person will start the discussions from the responses of the participants and relate the inputs to the "why's or the reasons" of the participants in choosing their kind of seed.	PowerPoint presentation LCD projector Audio equipment Meta cards Pentel Pen Masking Tape Manila Paper	Resource Person

TIME	OBJECTIVES	TOPIC/ACTIVITY	METHODOLOGY	MATERIALS NEEDED	PERSON RESPONSIBLE
11:01 – 12:00 and 1:00 – 1:30 (30 minute lecture and 1 hour practicum)	• Explain the processes involved in selection of mother plants for seeds purposes • Discuss how seeds are selected from mother plants • Explain when is the best time for collecting seeds	**II. Seed Selection Processes** A. Selection of Mother Plants B. Methods of Seed Selection C. Timing of Seed Selection D. Record Keeping/Labeling	Open Discussion/ Interactive Lecture Practicum: Selection of Mother Plants and Seed Selection/Workshop : Seed Mapping The participants will be divided into small groups. Each group will be given the materials needed in doing the practicum on the above stated topics. Likewise, the small groups will be asked to identify heirloom seeds that can still be found in their areas/farms/field. The practicum will be done in a vegetable garden to undertake the practicum	PowerPoint presentation LCD projector Audio equipment Meta cards Pentel Pen Masking Tape Manila Paper	Resource Person
12:00 – 1:00		**LUNCH**			
1:31 – 3:00	• Show/Illustrate the basic techniques in seed banking from seed selection, collection, processing, storage, and germination testing for common agroforestry trees and vegetables.	**III. Processing of Vegetable Seeds** A. Seed Drying B. Methods of Seed Drying C. Seed Quality Testing	Open Discussion/ Interactive Lecture Practicum: Processing of vegetable seeds from seed selection, collection, processing, storage, and germination testing.	Power Point presentation LCD projector Audio equipment Materials needed for the practicum (seeds, vegetable fruits, knives,	Resource Person

TIME	OBJECTIVES	TOPIC/ACTIVITY	METHODOLOGY	MATERIALS NEEDED	PERSON RESPONSIBLE
	• Discuss the importance of applying these basic techniques in their own farming system and community seed banking • Share their experiences in processing vegetable seeds and common agro-forest trees	D. Seed Storage	The participants will be divided into small groups. Each group will be given the materials needed in doing the practicum on the above-stated topics. The practicum will be done in a vegetable garden to undertake the practicum	sieves, bottles, rag doll, etc.)	
3:00 – 3:15		**BREAK**			
3:16 – 4:30 30 min. lecture and 1 hour workshop	• Discuss the origins/ history of community seed banking • Determine how community seed banks are established • Explain the requirements in putting up community seed bank • Show how community seed banks are managed/ operated	**IV. Establishment of Community Seed Banks** A. Seed Conservation Methods B. Community Seed Banking as a Form of Ex Situ conservation C. Seed Banking Facility Management	Open Discussions/ Interactive Lecture Workshop Starting a Community Seed Bank Guide questions: • Do you need a Community Seed Banking work? Why? • What is the purpose of your seed bank? • Individual or group undertaking? • How do you intend to manage? • What is the support needed? • Policies • Operations	Power Point presentation LCD projector Audio equipment	Resource Person

TIME	OBJECTIVES	TOPIC/ACTIVITY	METHODOLOGY	MATERIALS NEEDED	PERSON RESPONSIBLE
4:31 – 5:00	Discuss the strengths and weaknesses in the conduct of the training Give recommendations on how to improve the conduct of the training	**IV. Training Assessment and Evaluation**	The assessment may be done through initiating an activity, e.g. game with focus on training assessment, e.g. evaluation clap, Bingo, etc. After the game, the written Evaluation Form will be distributed for the participants to accomplish.	Rules or Instructions for the game or activity Evaluation Form	Training Management Team
		Closing **Awarding of Training Certificates**			Training Management Team
- ***Nothing follows –***					

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TOPIC I.
COMMUNITY SEED BANKING OVERVIEW

A. Food Security and Food Sovereignty

What is Food Security? Based on the 1996 World Food Summit, food security is defined when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

What is Food Sovereignty? Food sovereignty is a food system in which the people who produce, distribute, and consume food also control the mechanisms and policies of food production and distribution. This stands in contrast to the present corporate food regime, in which corporations and market institutions control the global food system. Food sovereignty emphasizes local food economies, sustainable food availability, and center culturally appropriate foods and practices.[1]

Corporate Control over Seeds

Dr. Vandana Shiva, a physicist, ecologist and founder of Bija Satyagraha (Navdanya Organization) remarks that "When you control food, you control society." It is then difficult to imagine a society to survive, with its privately-owned food regime. Saving seeds, sharing and exchanging them can help us throttle or regulate the seed dictatorship that has been imposed on us and our farmers. In my view, if each seed can give rise to a hundred more, then freeing the seed should be the first step by the government, to substantively help the farmers and thereby achieve the goal of doubling farmer's income by 2022.

Picture 1. The Seeds of Vandana Shiva. June 7, 2022. https://northerngardener.org/the-seeds-of-vandana-shiva/

[1] *Food sovereignty. Wikipedia. https://en.wikipedia.org/wiki/Food_sovereignty*

It is the pro-corporate laws and policies which have led to an increase in corporate control over a free resource, such as seeds. The arsenal of the private cartel and of legal institutions prevents the farmers from the multiplying, exchanging or sharing seeds. It is the pro-corporate laws and policies which have led to an increase in corporate control over a free resource, such as seeds. The arsenal of the private cartel and of legal institutions prevents the farmers from the multiplying, exchanging or sharing seeds.[2]

Seed vaults are not a new concept and had its roots 40 years ago over growing concerns for maintaining biodiversity. A decade ago, it became mainstream when the global seed vault in Svalbard, Norway took center stage. It is just one of some 1,400 seeds banks around the world. As of 2010, in that location alone, more than 500,000 unique seeds rest waiting to bail out humanity. But what is the chance that the ordinary people would ever have access to it? The answer is none.[3]

The 6 big companies control our seeds: Monsanto, Syngenta, DuPont, Bayer, BASF and Dow. They control 98% of the world's seeds with precious little left for people who wish to grow plants without genetic modification.

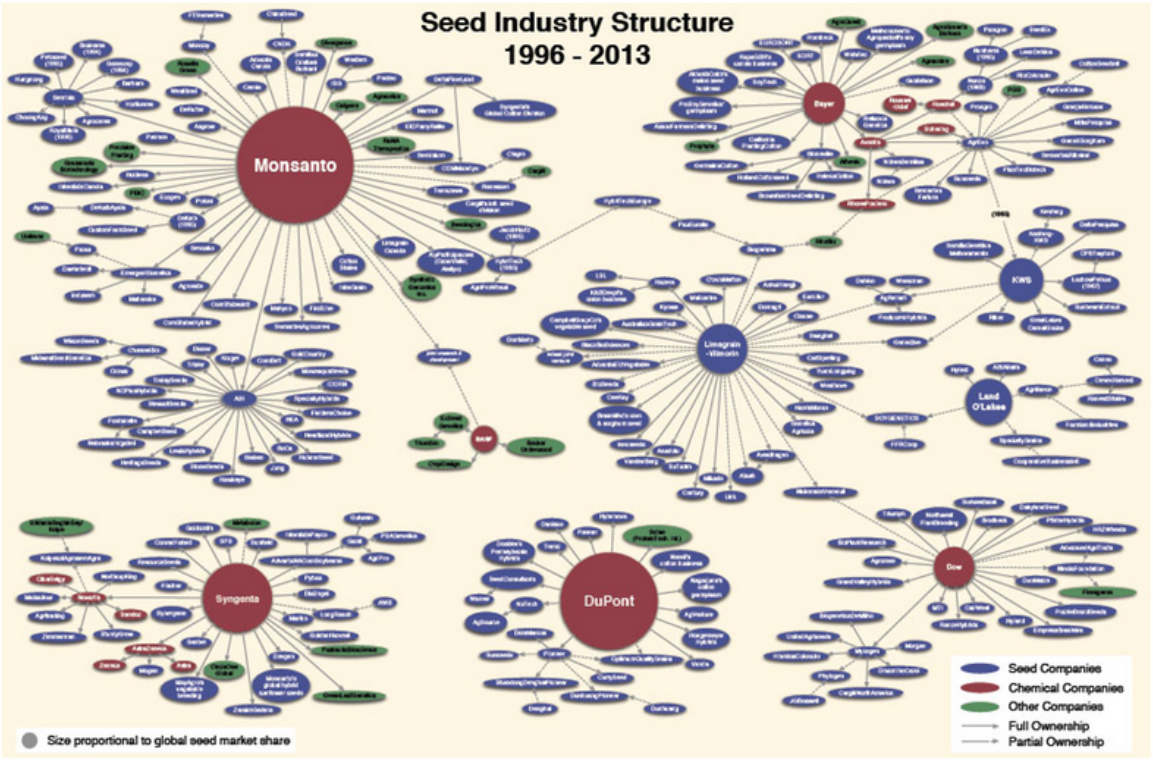

Figure 1. Seed Industry Structure (1996-2013)

[2] *The politics and control of seeds by corporations. Shivika Manchanda. The CSR Journal. May 6, 2019. https://thecsrjournal.in/politics-control-seeds-corporations/*

[3] *Start Your Own Seed Bank: How to Beat the Food Killers at Their Own Game. Holly Deyo. April 11, 2022. https://www.theorganicprepper.com/start-your-own-seed-bank/*

'Bought' scientists have gone one step further to render seeds sterile after one season. It used to be that seeds grown from hybrid plants reverted to one or the other parent plant, bypassing the combined strength and benefits of the parents. Hybrids produced a more disease-resistant variety, bigger, more vigorous and more flavorful fruit, or grew veggies at a faster rate. The end product was better, but the downside is that seeds from these plants, known as F1's, don't pass on these 'enhancements'. It's a one-shot deal and then their seeds go back to the less-than-spectacular parent.

A gardener can still grow these F1 seeds, but it's risky what the fruit or vegetable might look and taste like. Farmers would never venture here as they may also be more susceptible to disease.

B. The Seed and its Parts

A seed is an embryonic plant enclosed in a protective outer covering, along with a food reserve. The formation of the seed is a part of the process of reproduction in seed plants, the spermatophytes, including the gymnosperm and angiosperm plants.

Seeds are the product of the ripened ovule, after the embryo sac is fertilized by sperm from pollen, forming a zygote. The embryo within a seed develops from the zygote and grows within the mother plant to a certain size before growth is halted. The seed coat arises from the integuments of the ovule.

Parts of a Seed

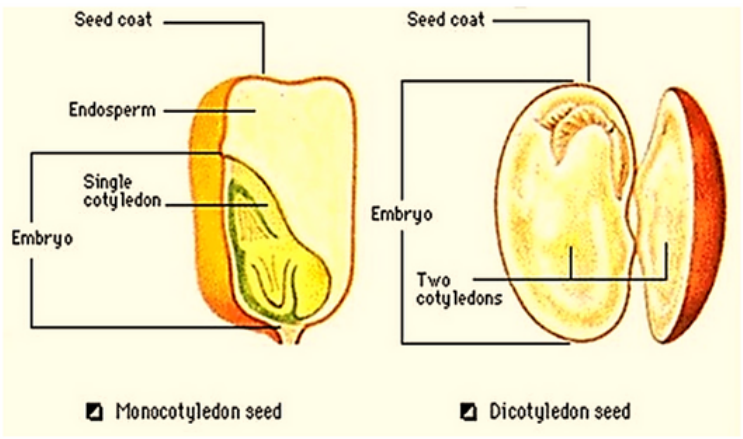

Figure 2.
Plant and Seeds. Slide Serve. https://www.slideserve.com/ashleigh/plants-and-seeds

A seed is an important part of a flowering plant. They give rise to a new plant. They may be of different shapes, colors and sizes. They may be round, wrinkled, winged or hairy. They are in a dormant condition until they receive adequate sunlight, water, and soil. The growth of the plant from a seed is known as germination. A seed has three parts:

- Seed Coat
- Endosperm
- Embryo

Seed Coat

A seed coat protects the internal parts of a seed. The seed coat has two layers. The outer layer is thick and known as the testa. The inner layer is thin and known as tegmen.

A thick seed coat protects the seed from sunlight and water. It prevents the loss of water and entry of parasites within the seeds. The hard seed coats prevent germination during unfavorable environmental conditions.

An opening in the integument of the ovule is known as the micropyle and is visible on some seed coats. The hilum is also visible which is equivalent to the naval in humans where the umbilical cord is attached.

Endosperm

The endosperm contains the nutrients stored in it. It provides nutrients to the seed in the form of starch, carbohydrates and proteins to support the embryo during germination. It is located below the seed coat. The seeds remain viable with the intake of nutrients until germination.

The endosperm may be mealy, continuous or ruminated. An endosperm has a triploid chromosome complement.

In corns and other cereals, endosperm constitutes a major portion of the seed. In seeds like beans, the endosperm is utilized in the embryo development and is absent in the seed. Coconut is the liquid endosperm.

Embryo

The embryo is the most important part of a seed. It is diploid, developed from the fertilized egg. All the cells that need to develop into a mature embryo are present within the embryo. An embryo comprises the following parts:

- Epicotyl
- Hypocotyl
- Radicle
- Cotyledons

Epicotyl is a small shoot which gives rise to the entire plant shoot system.

The primary root emerges first during germination. It is also known as hypocotyl. It anchors the plant firmly in the soil.

Radicle is a small embryonic root.

The cotyledons provide nourishment to different parts of the embryo. It emerges as a tiny or fleshy leaf from the soil with the seedling during growth. It stores food in the form of starch and protein.

The embryonic leaves are the first to appear above the ground. An embryo develops from a fertilized egg.

Types of Seeds

Open Pollinated Seeds/Heirloom Seeds	Hybrid Seeds/Terminator Seeds
produced through natural crossing	seeds or plants produced through highly controlled pollination
composed of more variable plants in a population	highly uniform and generally expensive
can be recycled for several generations	they cannot be authentically recycled
could be made more genetically diverse in the field	Reduce genetic diversity
Open pollination	The result of artificially crossing two plants together
Adapted to particular places	Seeds do not produce “true to type” plants like the parents
Saved for their adaptive benefits	Bred for industrial traits.

Terminator seeds go hideously beyond hybrids and are dead in a season. They don’t reproduce anything good, it’s bad or indefinite. They are dead seed. Is there anything more inherently evil?

This is how the big 6 mega-conglomerates are taking control of our food supplies. This is unspeakable. Unthinkable. It’s all about the New World Order and if we will submit to being a food slave. This is not what God and nature intended, yet they are knowingly and with forethought take people’s food futures and crush them with their **patents and bio-tech**. It is all about **greed and control.**

HYV vs. Heirloom, TRVs and OPVs

High-yielding varieties (**HYVs**) of agricultural crops are usually characterized by a combination of the following traits in contrast to the conventional varieties:[4]

- Higher crop yield per area (hectare)
- Dwarfness
- Improved response to fertilizers
- High reliance on irrigation and fertilizers - see intensive farming
- Early maturation
- Resistive to many diseases
- Higher quality and quantity of crops can be produced.

Most important HYVs can be found among wheat, corn, soybean, rice, potato, and cotton. They are heavily used in commercial and plantation farms.

HYVs become popular in the 1960s and play an important role in the Green Revolution, although their ancestral roots can be older. These seeds are developed in the branch of Biology ,that is Biotechnology.

Monoculture crops are often planted with hybrid varieties, that are created by scientists and seed companies. Hybrid seeds are the result of **artificially crossing two plants**. If you save the seeds of these plant, they do not necessarily produce **'true to type'**, which means **they will not necessarily come out like their parent plants.** This is similar with people—just because your mother and father have blue eyes, they may have recessive genes from brown eyes, so you are not guaranteed to have blue eyes too. These hybrids are breed for reasons that appeal to industrial farms—mechanical handling, high yield, uniformity, and pest control. This genetic mixing **reduces genetic diversity**—recall in the game that diversity is important in order to respond to changes. The **seeds must be purchased**, because saving seed is not guaranteed, so farms across the U.S., and the world, begin using all the same varieties. There are fewer varieties available then, and these varieties will not necessarily thrive in all the different environments of this world.

Heirloom varieties such as rice or Traditional Rice Varieties (**TRVs**) are traditional varieties cultivated by **indigenous farmers** in rice terraces and passed on as **heirlooms** to the next generations. Open pollinated plants are produced by seeds that have resulted from the natural pollination of the parent plant. These pollination methods include **self-pollination** as well as **pollination achieved by birds, insects, and other natural means.**

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[4] *High-yielding variety. Wikipedia. 7 September 2022. https://en.wikipedia.org/wiki/High-yielding_variety#*

Heirloom seeds are **open pollinated or Open Pollinated Varieties** (**OPVs**)—which means they will grow **"true to type"** and produce plants like their parents from seed. They are **adapted to a particular place and its climate, soil, growing conditions**, and are often **more resistant to the local pests and diseases** and therefore **climate smart**. People save these seeds for this **adaptability** and for **culinary and flavor preferences.** Because heirlooms are adapted to a particular place, this **reduces the need for using pesticides and herbicides**, and other inputs, because the seeds will naturally do well here. Moreover, heirlooms increase the genetic diversity, because each seed changes and adapts to a particular place.

TIP: Do not plant hybrids and heirloom seeds for the same vegetable during the same growing season in a simple backyard garden. **Hybrids will 'pollute' your heirlooms** and you'll end up with **'junk' seeds.**

Values of Heirloom Crops

- Diversity
- Taste
- Adaptation
- Culture

Picture 2. Heirloom Tomato Seeds for sale online.

C. What is Community Seed Banking?

Definition

Community seed banks are mainly informal institutions, locally governed and managed, whose core function is to stored and preserve genetic diversity seeds for local use and future generation.

Community Seed banks offer a way to preserve that historical and cultural value – in that sense, seed banks are like seed libraries that contain valuable information about evolution strategies of plants.

A community seed bank is seen as the place to obtain seeds of local crops and varieties, as commercial seed companies, extension input depots, and private dealers are marketing only modern varieties and hybrids of a limited number of crops.

Community seed banks are trying to regain, maintain, and increase control over seeds by farmers and local communities and to strengthen or establish dynamic forms of cooperation among and between farmers and others involved in the conservation and sustainable use of agricultural biodiversity.

A seed bank is **a place where seeds are stored**. The purpose of a seed bank is **to preserve the genetic diversity of plants so that they can be used in the future to help improve crops or create new varieties of plants.** Seed banks are often located in countries with diverse climates and ecosystems so that they can store a wide range of plant species. Seed banks play an **important role in preserving the genetic diversity of plants, which is essential for the future of agriculture.** Seed banks also help to **ensure that new and improved varieties of plants can be created, by storing the seeds of rare or endangered plant species.** Seed banks help to **preserve the genetic diversity of plants**, which is essential for the future of agriculture. Seed banks also help to **ensure that new and improved varieties of plants can be created**, by storing the seeds of rare or endangered plant species. In addition, seed banks can provide **a source of income for farmers and other people who collect and sell seeds.**[5]

[5] *What Is The Purpose Of Seed Bank?. GrowLightsBuddy. https://growlightsbuddy.com/what-is-the-purpose-of-seed-bank/*

E. Importance of Community Seed Banking

1. Preservation of crop diversity for future generation. This is the most important reason for the storage of seeds. Just as human beings and animals are adapted to different conditions for survival, so are crops. Different types of the same species exist due to this adaptive nature. Therefore, it is of critical necessity that such diversity is preserved.

2. Protection from climate change. One thing is certain about the future: higher temperatures, too much or too little rain will increase the risks and bring in unpredictability which will make our food systems vulnerable.

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[6] *Community seed banking works. Aldrin Castro. PhilRice. August 3, 2021. https://www.philrice.gov.ph/community-seed-banking-works/*

For a couple of decades now, the world has witnessed radical climatic change that has been accelerated by increased industrial pollution. Crop extinction is inevitable with such extreme changes. If seeds are stored in seed banks, the danger of total elimination of certain species of crop is eliminated.

3. Protection from natural disasters. Natural disasters are unforeseen events that could lead to complete annihilation of crops from the face of the earth. The foresight of keeping seeds in a seed bank could save such a situation. Malaysian rice paddies for example, were wiped out during tsunami and international seed banks provided farmers with seeds that helped them start over.

4. Disease resistance. Crop diseases are highly contagious and very deadly to plants. a serious break out could completely eliminate crops. Where diseases have ravaged crops and left no traces that farmers could start on, seed bank can intervene and provide them with seeds that will enable them to start on a clean slate.

5. Provide seed material for research. Seeds that are stored in seed banks can be made easily available to scientist and researchers who wish to study the seeds specially in such research could lead to improvement of crop production.

Preservation from man-made disasters. Man-Made disasters such as war and oils spills could lead to the annihilation of crops. Countries that engaged in war make it difficult for farmers to continue farming and its easy for crops to disappear. One peace is stored seeds can be retrieved from seed banks and replanted.

Seed Saving [7]

- One of the oldest traditions of civilization
- Keeps alive traditional agricultural and culinary practices, essential for the stability of cultures
- Must be open pollinated
- Enhances biodiversity

The Potential Risks of GMOs to People and Environment

PROS	CONS
• Reduced pesticide uses initially • Convenient • Short term resistance initially • Initial higher yield	• Unknown risks to human health and environment • Long term resistance • Cross pollination with non-GMOs • Loss of biodiversity • Ethical considerations • Loss of ability to save seed

[7] *Seeds: The Future of Our Food. Pennie Aurelia. SlideServe. https://www.slideserve.com/pennie/seeds-the-future-of-our-food*

The risk of cross pollination with non-GMOs will cause **genetic pollution** – an ecological disaster.

Pros:

Reduce pesticide use: Not necessarily true, as an overwhelming number of GMO crops require the use of heavy chemicals such as the widely used Round-Up Ready line of crops produced by Monsanto. The company not only benefits from the seed profit, but from the world's most widely used herbicide Round-Up manufactured by Monsanto.

Convenience: Farmers do not have to save seeds or decide among a wide variety of herbicides. With Bt crops farmers do not have to monitor pest levels and decide if and when to apply pesticides, and they don't have to spray as often. The pesticide is automatically produced by the plant.

Resistance: Several weeds have begun to develop resistance to the types of herbicides commonly used. However, little is known about this GMO technology, so resistance could still develop.

Cons:

Unknown Risks: GMOs are such a new technology, that it is impossible to know the longer term affects to human health and the environment. It took us a long time to know the harm of tobacco, pesticides, and heavy metals. GMO foods do not have to be labeled in the US, so it is hard to track and study the long-term health effects of these products. What happens if a plant is crossed with a peanut and someone with a nut allergy eats this plant?

Long term resistance: While in the short term, pests may not be able to compete with this crop, in the long term, nature develops resistance to these measures, and thus we are left with "super pests" and "super weeds" that can withstand these assaults of GMOs and pesticides.

Cross pollination: Genes can 'escape' and find their way into species. What would happen if the herbicide-resistant genes found their way into weeds? This cross pollination is a serious threat to biodiversity, as we are introducing genes into the environment without knowing the full effects.

Loss of Biodiversity: GM crops could compete or breed with wild species threatening biodiversity. What happens to the birds, insects, and other wildlife that come in contact with and eat these GMOs?

Ethical Consideration: Intrinsic values of nature are not considered when we, humans, take control and modify species.

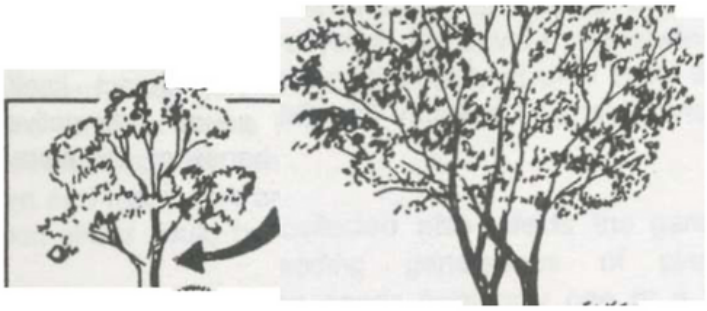
Seed Saving: An age-old tradition that maintains farmers self-sufficiency and independence is threatened when they become dependent on seed companies.

TOPIC II.
SEED SELECTION PROCESSES

The value of a seed lot depends on its authenticity or "trueness-to-type", germination capacity, general health and ability to withstand stresses in the field and during storage. To a large extent, selection of mother trees, of fruits in the tree and the technique and timing of seed collection determines the quality of harvested seeds. To assure a good quality seed lot, seed collection tips should be observed.

TREES

Survey the area for potential mother trees. A good mother tree should be vigorous, healthy, with abundant and healthy fruits and of good growth and form representing the purpose for which it is grown (i.e., for timber, fodder or fruit). Collect only from mature and healthy trees. Avoid very young trees or plants.



Also, avoid choosing an area where only few trees of the same species grow, especially if they are naturally cross- pollinating. A large population gives a better chance of selecting good mother trees. Avoid collecting in stands with numerous poorly-formed, off-colored, abnormal or disease-infected trees. Collect fruits/seeds from trees standing in the center of the field. Make sure that seeds come from many trees of the same kind and quality to ensure that the seedlot contains all the representative characteristics of the variety.

VEGETABLES

Generally, it is best to have a plot of land for growing vegetable seeds. In these (relatively small) plots, you should plant 1-3 plants whose fruits will turn into seeds at their biologically mature stage. But it is also possible to select the most biologically typical plants in a field and mark them for future seed varieties (e.g., bow ties or ribbon).

To obtain seeds of varieties, the plot should be in optimal conditions as follows:

1. In a bright place, away from wind rises and draughts
2. With enough space, especially important for cross-pollinated crops.
3. Plant only 1 variety of crops. Be aware of the cross-pollinated crops.
4. Plots must be kept absolutely clean, as weeds can choke cultivated plants, over-pollinate (single-seeded crops such as crucifers), become a source of disease and a temporary shelter for pests.
5. Seedlings must be completely healthy.
6. Special care should be taken in the care and handling of the seed patch: timely watering, feeding, prevention of pests and diseases, the timing of harvesting the fruits, and further processing.

A. Selection of Seeds from Mother Plants

The value of a seedlot depends on its authenticity or "trueness-to-type", germination capacity, general health and ability to withstand stresses in the field during storage. To a large extent, selection of mother plants or trees and timing of seed collection determines the quality of the harvested seeds. To assure a good quality seedlot, seed collection tips or techniques should be observed.

Seeds selected from mother plants should be:

- free from weed seeds and free from viral borne diseases
- In selecting seeds, choose those that grow in the region or in climatic conditions where it should be planted
- consider the germination percentage; select those with germination percentage of more than 90%

Box 1. Mga Paraan sa Wastong Pagpili ng Pananim na Pangbinhi

1. Pumili ng masiglang halaman sa iyong mga pananim at lagyan ito ng tanda o marka upang di aksidenteng maani, at mabigyan ng kaukulang pangangalaga.
2. Piliin o kilalanin ang unang bunga na lumaki na pagkukunan ng binhi.
3. Protektahan ang halaman at bunga nito laban sa mga peste at sakit.

Selection of mother plants

Survey the area for potential mother plants or trees. A good mother plant/tree should be vigorous, healthy, with abundant and healthy fruits and of good growth and form representing the purpose of which it is grown. collect only from mature and healthy plants or trees. Avoid very young trees or plants.

A large population of plants gives a better chance of selecting mother plants. Avoid collecting in stands with numerous poorly-formed, off-colored, abnormal or standing disease-infected plants. Collect fruit/seeds from plants standing in the center of the field. Make sure that the seeds come from plants of the same kind and quality to ensure that the seedlot contains all the representative characteristics of the variety.

Box 2. Tamang pagpili sa Halaman na pagkukunan ng binhi

1. Pumili ng matibay at malusog na halaman sa iyong mga tanim.
2. Matatag sa anumang uri ng mga peste at sakit
3. Matatag sa anumang uri o iba't-ibang kondisyon ng kapaligiran (halimbawa: tagtuyot, init, baha)
4. Panahon ng pagbunga ng halaman
5. Dami ng bunga
6. Katangian ng bunga at buto (gaya ng: kulay,laki,hugis or pagkakayari atbp.)
7. Kalidad ng pagluluto at pagkain
8. Itinatagal ng buhay ng buto sa lalagyan o imbakan
9. Iba pang katangian ayon sa gamit (gamot o mga likhang sining)
10. Kailangang sapat na ang gulang ng halaman at ng bunga para binhian.

B. Methods of Seed Collection

For Fruit Trees

1. From the ground

For fruit trees, fruits/seeds from the ground is common, especially for large-fruited species or species with seeds that are naturally dispersed. Although convenient, this practice increases the risk of collecting immature, empty. decayed/deteriorated and sprouted/germinated seeds. Identifying the source of seeds (mother trees) would also be difficult especially when crowns of trees are interlocking.

Some points to consider in collecting fruits/seeds from the ground:

- Gather sound fruits and seeds right after they have fallen. Avoid collecting first fruits that fall during the season as they are often of poor quality.
- Shedding of mature fruits/seeds may be induced by shaking the trunks of small trees. Long poles, aided by hooks and ropes could be used for taller trees. Lay a mat on the ground to facilitate collection.

2. From standing trees

- *Direct access from the ground.* Pick fruits/seeds from the lower branches by hand. Bend, cut, break or saw branches.
- *Climbing trees.* Pick fruits/seeds from higher branches by climbing up trees. This technique assures seed collection from well-identified mother trees. It is also applicable for small-seeded species, winged seeds, fruits/pods that split open when mature, or fruits/seeds that are prone to insect, rodent and mold attack on the ground.

3. From crowns of felled trees

Collection of seeds from felled trees is easier and usually a lot quicker. However, this should be avoided as much as possible since this could lead to significant reduction in tree population and expose to soil erosion.

For Vegetables

It is very important to be very careful in collecting vegetable seeds to ensure high quality of planting materials. Ensure that seeds are collected from mature plants for seeds purposes.

Dry seeds from dried fruit/pods	Wet seeds from fleshy fruits	Dry seeds from fleshy fruits
		

1. **Dry seeds from dry fruits or pods** (e.g., patani, kadios, sitaw)

These are obtained or extracted from a dried fruit or pod. These are extracted by hand or pounded collectively while inside a sack or net bag. Pounding the seeds inside the bag is necessary to prevent them from scattering.
Other examples: cabbage, cauliflower, mustard, pechay, lettuce, pea, lima bean, yard long bean

2. **Wet seeds from fleshy fruits** (e.g., eggplant, cucumber, tomatoes, bitter gourd, winged gourd, bottle gourd)

Seeds can be extracted from its fruit using your bare hands or by using a knife. Seeds are fermented to about 2-3 days after extraction to facilitate removal or seeds from the fruit. Then after, seeds are soaked to water in about 1-2 days before drying.

3. **Dry seeds from fleshy fruits** (e.g., pepper, ladys finger)

For vegetables like ladys finger and chili, fruits can be dried first before extracting the seeds.

C. Timing of Seed Collection

1. Collect fruits/seeds at about mid-morning or mid-afternoon when it is sunny and not windy. This avoids pod shattering or obtaining pods or seeds that are moist with dew.

2. Harvest fruits/seeds only from plants where most of the fruits are mature (i.e. avoid over mature and immature ones). Do not collect seeds from fruits that flowered early or late.

3. To know when a fruit or seed is mature requires familiarity with the species. Some common indices of maturity are changes in size, texture and color.

Box 3. Indicators of seed maturity

1. Ang bunga ay may guwang na tunog (e.g., kalabasa, pakwan, upo, melon)
2. Kulay, laki at hugis ng bunga (e.g., kamatis at sili – pula; paayap at iba pang legumbre – dilaw hanggang brown; talong – dilaw)
3. Nasisira ang bunga (e.g., mga legumbre o butong-gulay)
4. Humihiwalay ang bunga sa kanyang sanga (e.g., kalabasa, pakwan, upo, melon)
5. Bilang ng araw depende kung pamilyar ang magsasaka sa uri ng halaman

Huwag hayaang mahinog ang bunga sa puno, maaring tumubo ang buto sa loob ng bunga (halimbawa: kalabasa, upo, patola)

PAALALA:

- Huwag mag-ani ng buto kapag umuulan o kaya sa umaga kung saan mayroon pang hamog.
- Huwag mag-aani kapag nasa kalagitnaan ng araw kung saan madaling mag-crack ang bunga at tumapon ang buto sa lupa.
- Huwag hayaan na madikit sa lupa o organismo ang mga buto sapagkat bababa ang kalidad nito.

Characteristics of matured seeds

			
• Turns brownish in purple varieties and brownish yellow in green varieties • 60-80 DAT	• 40% orange to red • 60-80 DAT	• Yellow-orange • Presence of powdery ash • Peduncle is dry and brown • 120-125 DAS	• Yellow- orange • Fruits have yellow streaks • 20-24 days from flowering

D. Record Keeping/Labelling

Mark mother plants for future collection. Record the site, location of the mother plants and date of collection. this will serve as reference in evaluating the performance of seed lots in relation to origin and seed source (provenance) as well as predicting seed longevity.

TOPIC III.
PROCESSING OF VEGETABLE SEEDS

A. Seed Drying

Drying is a normal part of the seed maturation process. The amount of moisture in the seed is probably the most important factor influencing the longevity and germination capacity of the seed. Seeds of fleshy fruits such as tomato, cucumber and melons, have much higher moisture content at harvest and may absorb more water during their wet extraction process. On the contrary, the seeds, which become desiccated during the ripening process, are relatively dry at the time of harvest, e.g., onion, amaranthus, brassicas, etc.

Some seeds must dry down to minimum moisture content before they can germinate. Low seed moisture content is a pre-requisite for long-term storage and is the most important factor affecting longevity. Seeds lose viability and vigor during processing and storage mainly because of high seed moisture content (seed moisture greater than 18%).

Lowering down the vegetable seeds moisture content to safe moisture limits is very important in order to maintain seed viability and vigor and save from mold growth, heating and increased micro-organisms activity.

By the time the vegetable seeds are separated from the mother plant, the seed moisture content is below fifty per cent and there after the moisture content is in equilibrium with the storage atmosphere. It is frequently necessary to dry vegetable seeds immediately after threshing and cleaning or when they first arrive at the seed bank from the field, after extraction from fruit or possibly after processing but before storage and packaging.

B. Methods of Seed Drying

Mainly three methods of seed drying are followed viz. natural drying, sun drying and artificial drying.

1. *Natural Drying.* The natural drying helps the seeds to lose water naturally in standing seed crop at and after maturity and needs no help of farmers. The extent of natural drying is controlled principally by weather and maturity at harvest.

2. *Sun Drying.* In sun drying, seeds are dried by spreading the seed material on floor under diffused sun light or under shade. Stirring of lots should be done frequently to facilitate rapid drying. On large scale seed production, natural and sun drying becomes inadequate and need to depend on artificial drying.

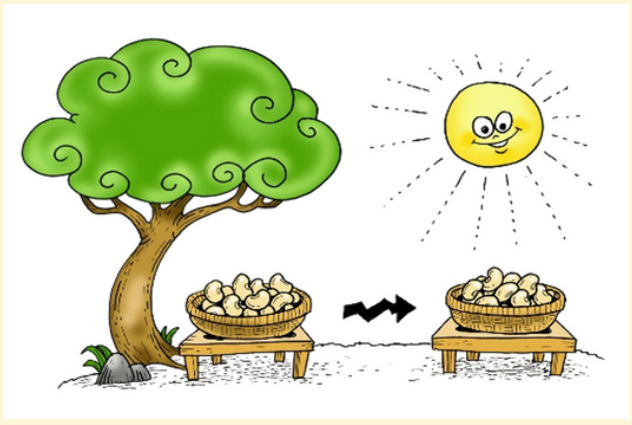
3. *Artificial Drying.* Artificial drying is used especially in seeds of large quantities. Seeds dryers are used in artificial drying. Drying rate at which a seed lot can be dried artificially depends on the packing character of the species and the initial moisture content of the sample.

When seeds do not get dried before storage, the high moisture content remains in them, leading to fungal growth and reduction in viability. However, sources say that seed moisture content below 4% may also lead to extreme desiccation or hard seediness in some crops.

Depending on the storage conditions and species, seeds can enhance their lifetime from few years to centuries. Generally, seed storage takes place in cool and dry conditions. However, they tend to survive longer when stored in a wet and warm environment. The life of a seed mostly revolves around its moisture content. Therefore, it is necessary to dry seeds to safe moisture content.

Box 4. Pagpapatuyo ng Buto

- Patuyuin ang mga mamasa-masang buto bago iimbak.
- Ang mga buto na may mataas na moisture content ay mas madaling masisira bago pa ito maiimbak.



Mga Dapat Tandaan:

1. Huwag hayaang mahulog ang mga buto sa lupa.
2. Patuyuin ang mga buto gamit ang isang bagay na may butas sa ilalim gaya ng sako, bilao, banig para tumagos ang hangin at mas mabilis na matuyo.
3. Huwag madaliin ang pagpapatuyo ng mga buto dahil maaaring lalong bumaba ang pagsibol nito.
4. Bago umulan o dumilim, siguraduhing takpan ang mga buto o ipasok sa loob upang maiwasan ang pagtaas ng moisture content.

C. Seed Quality Testing

1. *Seed Moisture (%)*

Seed moisture content is one of the most important factors influencing the seed quality in storability. Therefore, it's estimation during seed quality determination is important. Seed moisture content can be determined either by hot air oven or moisture meter.

The amount of moisture in the seed determines how fast the seed deteriorates and how long it can be stored. Moisture determination is necessary, especially in seedlots whose drying and/or storage history is unknown, to know if further drying is needed before packaging, storage or shipping. The general rule is that seeds will have approximately 12 percent moisture if dried for 2-3 days in the sun. Oven-drying with controlled temperature is the most common technique to determine moisture but is not practical at the farm level. Practical approximations of seed moisture include biting (not recommended especially if seeds are treated), pinching or cracking of seeds, depending on the species.

2. *Purity Test*

Purity denotes the percentage of seeds (by weight) belonging to the variety under certification. The working sample is closely examined, usually with the help of a magnifying glass, and the following components are separated from it: seeds of other varieties, seeds of other crops, seeds of weeds/objectionable weeds, inert matter, defective seeds.

Seed purity is a measure of the cleanness and authenticity ("trueness-to-type") of the seed lot. It may be known by inspecting the composition of a particular sample.

3. *Visual Inspection*

Scoop out a handful of seeds from a well-mixed seed lot. Separate the seeds of interest (pure seed fraction) from other components like seeds of other varieties and/or species (including weeds), immature, broken, undersized, shriveled, diseased (with molds/fungus or fungal stains) and infested seeds (with holes, insects' eggs and larvae, or are partly eaten by insect), chaff, stone, soil, etc. If a large portion of the sample consists of impurities, clean the seed lot first before storing, shipping or planting.

4. *Flotation*

Most seed species sink in water and flotation could serve to separate seeds of poor quality. Soak seeds in tap water until all seeds are thoroughly wet. This may take a few minutes to a day.

Take out floating seeds and retain sinkers. Poor quality (low viability) seeds often float while those of better quality often sink. However, some species are natural floaters (e.g., coconut, nipa and teak); hence, quality must be assessed through other means.

5. *Rapid Viability Test*

The rapid viability test is done using chemicals. The Tetrazolium Chloride (TTZ) test is a quick method of testing seed viability (1-2 days). This is usually resorted to when seed germination takes more than a month or when quick assessment about the seed lot needs to be made.

6. *Germination Percentage*

Germination is determined as per cent of seeds that produce seedlings under a suitable environment. Thus, germination is of great importance because the sole function of seed is to produce healthy seedlings for raising a good crop.

Germination test determines the percentage of seeds that produce healthy root and shoot. In most of the cases, seeds are germinated on wet filter papers placed in petri dishes. The petri dishes are kept under controlled conditions in an incubator. For most species a temperature between 18-25 °C is adequate; however, for some species a specific temperature may be required.

The duration of germination test varies from 7-28 days depending upon the crops. Germinated seeds are counted at regular intervals and are removed from the petri dishes. The total number of germinated seeds would be the sum of the number of seeds that germinated at different observations.

The per cent germination is calculated as follows:

$$\text{Germination (\%)} = \frac{\text{Total number of seeds germinated}}{\text{Total number of seeds planted}} \times 100$$

For convenience, 100 seeds are plated in each sample. From each seed lot, 4 or more samples are plated for a reliable germination estimate. If there is a difference of 10 percent or more in the germination of different samples from the same seed lot, it is desirable to repeat the germination test.

Basic Procedure: The Rag doll Method

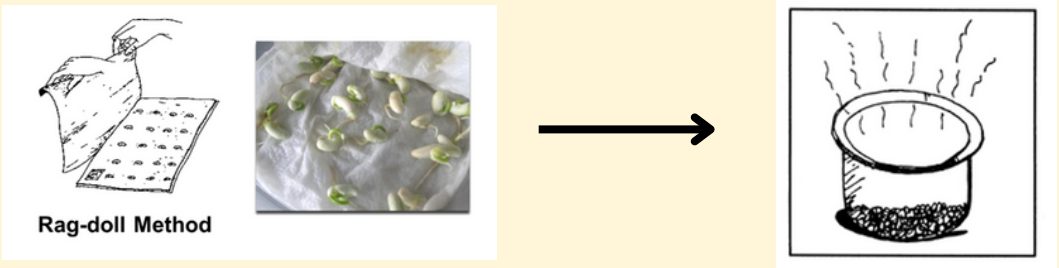
To perform a simple germination test, count out 100 seeds and place them somewhat equidistant from each other, usually not closer than half inch, spreading them out on the upper half of the moist blotter or paper towel. The bottom half of the blotter is folded over the top, and then the towel is folded over with a fold about every two to three inches and held in place loosely by a rubber band.

The towels or blotters are then placed vertically in plastic trays refrigerator containers, which are placed in the germination chamber or suitable location. The trays or containers should be covered loosely with zip-lock or plastic bags to keep the moisture in the towels, but they should not be completely closed because seeds need air. Towels are inspected twice a day and misted as necessary. Most vegetable seeds germinate in about 7 to 14 days.

During the first count remove the seeds that have germinated and when the final count is done, the remaining seeds are scored and the paper towel discarded. Seeds that require light are placed on blotter paper within plastic honey boxes. The light from the germination chamber will be sufficient to satisfy the light requirement.

Box 5. Percentage Germination

Ang bahagdan ng pagsibol ay nagbibigay ng ideya kung ang mga binhi ay hindi na dapat pang itago o itanim. Hindi na dapat itago ang mga binhi kung ang bahagdan nito ay mababa na sa 50%.



Paraan ng pagpapatubo:

- Para sa malalaking binhi: Gumamit ng buhangin sa ilog or malinis na lupa (kadalasan tubig na kumukulo ay ibinubuhos sa lupa bago gamitin para patayin ang mikrobyo) bilang isang paraan ng pagpapatubo.
- Para sa maliliit na binhi: papel (example: filter paper, tissue paper) o tela (halimbawa: cheese cloth) ang maaaring gamitin bilang paraan ng pagpapatubo.
- Hot Water Treatment. Ibuhos ang mainit na tubig (pinakuluan at pinalamig ng 10-15 minuto) sa isang lalagyan na may binhi (10 bahagi ng tubig sa 1 bahagi ng binhi). Hayaan sa loob 3-10 minuto o hanggang lumamig ang tubig.

D. Seed Storage

Seeds, even if adequately protected during storage, still undergo deterioration with time. Major factors affecting longevity (life-span) of mature, viable and healthy seeds are moisture, storage temperature and pests.

Most seeds are drying-tolerant (orthodox). Under ordinary room conditions (open storage), viability of these seeds is generally reduced by half within six months. Seeds with harder seed coats tend to live longer than those with thin coats. For improved storability, seed moisture and storage temperature must be kept low and controlled.

1. Store only new, mature, healthy and well-dried seeds, except for a few species which do not favor drying. Keep these in dry and cool environments for longer viability.
2. Seeds easily reabsorb moisture. To maintain dryness, place dried seeds in air-tight containers like tin cans or glass jars with tight-fitting lids and use some water-absorbing materials like sifted dry wood ash (white), dry charcoal, toasted rice (cooled), silica gel or pieces of newspaper (to occupy about a fourth of the container). Place a sheet of paper on top of these water absorbing materials if seeds are to be put directly into the container. Replace or re-dry these materials if containers are frequently opened.
3. Fill the rest of the container with seeds. Plastic bags may be used to keep seeds dry if sealed by heat. Label containers with the harvest and storage dates and place of harvest (or acquisition). If possible, also indicate the initial percentage viability or germination of seeds tolerant or orthodox species. Recalcitrant characteristics fare commonly found in many fruit, plantation and forest species (such as lanzones, rambutan, durian, mangosteen, mango, jackfruit, avocado, rubber, cacao and Dipterocarpus spp.).
4. Dry seeds may be protected from insects by using naphthalene balls (1 or 2 pieces per kg seed) or by mixing seeds in the containers with some materials like fine sand, dry wood ash, powdered seeds of black pepper or neem, plant oils from coconut, neem, peanut, castor, cotton, etc., (one teaspoon of oil per kg seed).

A few species have seeds which are sensitive to drying and, often, also to cold temperature (recalcitrant). They have storabilities of only several days to a few months under ordinary room conditions in contrast to the drying.

For slightly longer storabilities, keep these seeds well- cleaned and moist (1 to 2 days of air-drying is generally sufficient to keep the seed coat slightly dry but still moist inside). Store them in small batches in a cool room in inflated plastic bags (half-filled with seeds and opened once a day to prevent fermentation) or in perforated plastic bags. Moist charcoal, peat moss, sawdust, sand or coir dust may also be placed inside the bags. Moist storage for more than a week requires that seeds be protected from molds and bacteria. This may mean soaking seeds in a sterilant like the commercial bleach, chlorox (1 part chemical to 5 parts water) or applying tolerant or orthodox species.

Box 6. Pag-iimbak ng Buto

Dodoble ang haba ng buhay ng buto kapag mapababa:

- ang moisture content (MC) ng 1%, hal. seed A na may MC na 14% ay tatagal ng 2 taon. Kapag napababa pa ng 13% ang MC nito, ito ay posibleng tumagal ang buhay ng buto o binhi ng hanggang 4 na taon (doble sa inisyal na haba ng buhay nito nang 2 taon).
- ang temperatura ng lugar na pag-iimbakan ng 5 oC, hal. Seed B na nakaimbak sa lugar na may temperatura na 15 oC ay tatagal ng 3 taon

Note: Kapag naiimbak ito sa lugar na may temperatura na 10 oC, maaaring higit na humaba pa ang buhay nito hanggang anim (6) na taon.

Mga salik na nakakaapekto sa haba ng buhay ng buto habang nakaimbak

1. **Moisture content ng buto**
   - Itago ang mga buto sa mga air-tight containers
   - Siguraduhing laging tuyo ang mga buto sa pamamagitan ng paglalagay ng desiccants o iba pang bagay na na nakakasipsip ng moisture (halimbawa: uling, abo, silica gel) sa loob ng sisidlan.
   - Palitan ang desiccants sa tuwing bubuksan ang sisidlan.

   - Patuyuin sa araw ang mga buto paminsan-minsan

2. **Temperatura**
   - Ang buhay ng mga buto ay napapahaba kapag ito ay nakaimbak sa malamig na lugar (pero hindi nagyeyelo)
   - Kung walang refrigerator o air-conditioned room, maaaring pumili ng malamig na lugar (hal: malapit sa ilog, sa ilalim ng puno, sa loob ng banga
   - Siguraduhin na hindi mababasa ang mga buto

3. **Mga peste** – mga gamit upang masugpo ang peste
   - Naphthalene balls
   - Uling at abo (1/2kg abo: 1 kg buto)
   - Buhangin
   - Mantika (1 tsp: 1 kg buto)
   - Mga pinatuyong dahon o buto ng mga aromatikong halaman e.g. neem, sili, paminta, luyang dilaw, mint, lagundi

Paglalagay ng Label

Sa pag-iimbak ng buto, mahalagang malagyan ito ng label o ng mga kinakailangang impormasyon. Pangunahing inilalagay sa label ang mga sumusunod:

- Pangalan ng Buto
- Petsa ng pag-ani
- Petsa ng pag-iimbak
- Petsa ng germination test
- Percentage germination

As a general principle, the following conditions hold true:

1. When storage room temperature decreases by 5%, the time duration that seeds can be kept viable doubles.
2. When seed moisture content of the stored seed decreases by 1%, the time duration that seeds can be kept without losing viability doubles.

TOPIC IV.
ESTABLISHMENT OF COMMUNITY SEED BANKS

A. Seeds Conservation Methods

The In Situ and Ex Situ Conservation[8]

What is In situ conservation?

In situ conservation means conservation which takes place onsite. The major aim of this type of conservation is to preserve natural areas of the organisms and maintain their number. This type of conservation includes designation, managing and supervise the target taxa in the place they are present.

This method is beneficial for conservation of wild organisms and for animal breed material on farm. This method is more dynamic because it is carried out in the natural habitat itself.

This type of conservation is divided onto three types:

1. Protected area conservation
2. Home garden conservation
3. On-farm conservation

In situ conservation is a wonderful method to protect an endangered plant or animal species in its natural area, either by safeguarding the habitat itself, or by protecting the species from the predators. It helps in agricultural biodiversity conservation (farmers who use uncustomary agricultural practices).

Benefits of in situ conservation

- It helps to recover populations in the habitat where their distinct attributes have developed.
- This method ensures not only multiplication of the species, but process of evolution and adaptation as well.
- It is a cheap and convenient method of conserving biological diversity.

[8] *Difference between In Situ and Ex Situ Conservation. Dr. Amita Fotedar -Dr. DifferenceBetween.net. http://www.differencebetween.net/science/nature/difference-between-in-situ-and-ex-situ-conservation/*

What is Ex situ conservation?

Ex situ conservation means conservation which takes place off-site. In this method of biological diversity conservation, sampling, shifting, storage and preservation of target taxa is carried out outside the natural habitat of the organisms.
This method is more static and is quite suitable for conservation of several crops and their wild varieties. Various methods involved include in vitro storage, DNA storage, seed banks, pollen storage etc.
Some examples of ex situ conservation include one horned rhinoceros, golden michelia. Botanical parks and Zoos are considered the most convention methods of ex situ conservation (Hamilton, 1994.)

Benefits of ex situ conservation

- Advanced reproduction techniques will maximize the probability of reproductive success for endangered species

- Due to human intervention, health of organisms can be monitored and medical assistance is accessible whenever required.

- There are more than 150 Botanical parks globally protecting and conserving more than 80,000 species, around 850 Zoos with 3,000 species of plants, animals, mammals, amphibians and many Gene banks.

- Organisms are well attended to, provided food, security, medical aid and hence have a greater life -span and reproductive capacity.

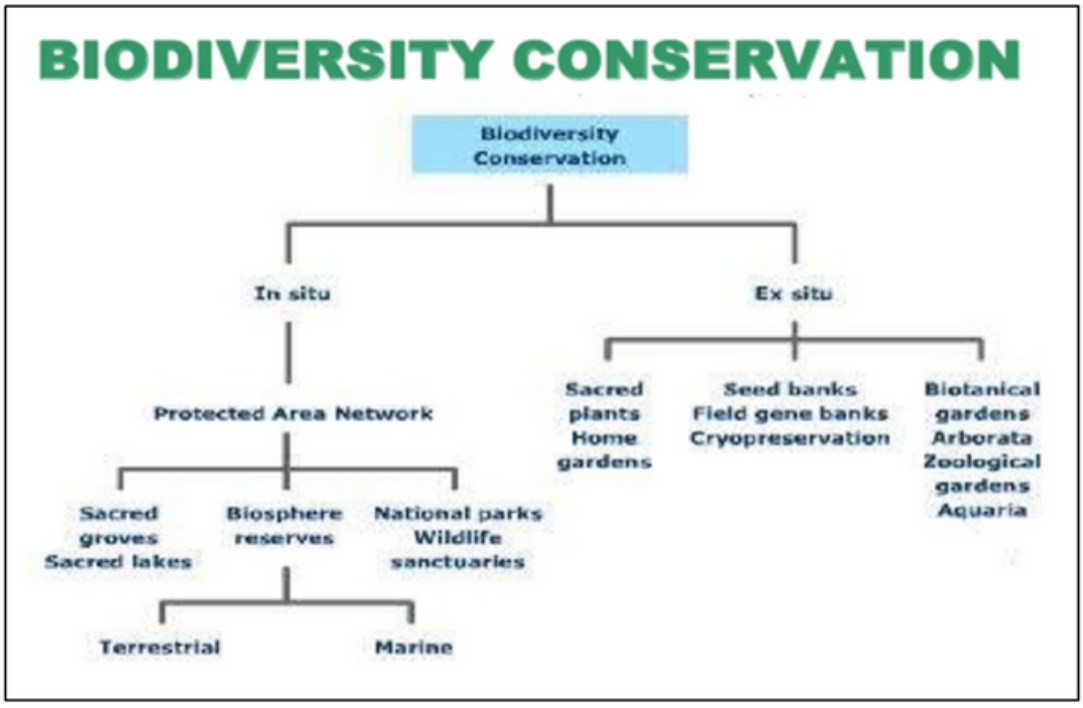


Figure 3. In situ and ex situ biodiversity conservation (Dullo, 2010)

B. Community Seed Banking as a Form of Ex Situ Conservation

Community seed banks provide seed supply service to food producer small scale farmers by making available diversity of locally adapted seeds within easy access to the community. In case when season variations occur due to **climate change** related challenges, community seed banks fill gaps of seed shortage by offering access to diversity of short maturing sequential crops as alternative. Having diversity offers farmers to replant their farm plots in case when the first planting fails and strengthens the resilience capacity of farmers to **climate changed** induced shocks.

Community seed banks play particular importance especially to farmer households who are resource-poor and face seed shortage frequently. By offering access to diversity, CSBs supply seeds that are keys to achieving seed and food security.

The Conception of Community Seed Banking

The 1960's and 1970's were characterized as a time period when technological advancement and input use has brought a leap in the agricultural production sector. The focus by then was on commercial agriculture and no attempt was made to link the agricultural technology developed with the small-scale food producing farming sector. This led to undue displacement of diversity of crop genetic resources from the hands of farmers. Then the issue got global attention and the United Nations Food and Agriculture Organization developed a strategy of collecting seed samples from farmers' field in collaboration with farmers and then conserving these in ex situ gene banks. By then, general agreement was reached to give recognition to the role that farmers play in the management and conservation of crop genetic resources, the right of farmers as owners of the genetic resources as well as use rights. Therefore, it became clear that support is needed to enable farmers continue playing the same role.

The ex-situ gene banks were established in developed countries, and these happened to serve the needs and interests of formal researchers in the respective countries. Hence, accessibility to the small-scale farmers became an issue of concern. This led to emergence of the concept of community seed banking and its establishment in developing countries so that small scale farmers also get easy access to diversity.

The purpose of having community seed banks was to conserve the available crop genetic resources and thereby promote skills and knowledge sharing along with the seeds, and enhancement of these resources. Hence, the community seed banks were designed to serve as suppliers of genetic diversity and also a strategy to ensure seed security of respective communities.

Four Key Elements of Community Seed Banking

1. Seed reserve – this refers to diversity of crop types and varieties including farmer varieties as well as those developed by the national agricultural research centers so that farmers get access through loan system. The seed stock kept is dependent upon the needs of farmers.

2. Germplasm reserve – these are samples representing crop genetic resources diversity of the locality and neighboring areas. The reserve stock is kept for medium term conservation (up to 5 years), for research and enhancement activities. In case something goes wrong and what is planted in the field fails for one reason or another, the reserve stock will be used to restore on-farm diversity. The stock kept in a CSB could vary from one locality to another based on specific agro-ecological condition and the capacity of the CSB facility. From experience, such reserve stock keeps well for up to 5 years without serious decline in germination potential (seed viability).

3. Grain reserve – community seed banks could also play a role of food grain reserve to stabilize in cases of unexpected shocks resulting in food insecurity. For instance, when crop failure is experienced in a given season, farmer households with low income become vulnerable and face food shortage. In such cases, a community seed bank nearby can use its grain reserve stock and play a rescue role to enable needy households survive the shock.

4. Market access creation – farmers organized under a CSB structure could access a better market outlet and negotiate on price margins, provided that they act collectively. As individual, a farmer has no capacity to negotiate with industries that require supply of large volumes of grain. Hence, if the CSB members pool their harvest and deal collectively, they can have a better bargaining power. Alternately, the association can keep (store) the harvest for some months within the CSB facility and wait till price increases later during the next planting season. The usual practice is that farmers sell their produce largely right away during harvest season so as to settle financial obligations.

C. Seed Bank Facility Management

Organizational Structure of a Community Seed Bank

A community seed bank (CSB) is a community-based institution that provides seed supply service to its members. A CSB Association can be formed by 20 or more volunteer farmers who like to engage in the conservation, management and use of crop genetic resources. The Association has a legal status and is officially registered.

A community seed bank (CSB) facility is built in a central location for its members in area that is accessible during both dry and wet seasons. A CSB provides access to diversity of locally adapted materials (i.e., different kinds of crop types and varieties) and contributes towards seed security of members of the association.

Structure

Once you have formed your core group of organizers, take time for the group to reflect on the different aspects of scope and operational structure. The following are suggested questions to serve as guide:

1. How will the group make decisions? Do you need centralized leadership?
2. Will the seed bank be open to the public, or will participants need to become members and/or make any commitments to support the project?
3. At what times (year, month, week, and times of day) will the inventory be accessible, and will volunteers be available to help when it requires care?
4. Will all types of seed be accepted for the inventory? Will it be limited to seed grown by the participants, or will it also include seed from commercial or nonlocal sources?
5. Does the group want to organize a seed grow-out program and set priorities for increasing the amount and quality of certain seeds?
6. How much of a focus will you have on education about seed saving and what space or resources will this require?

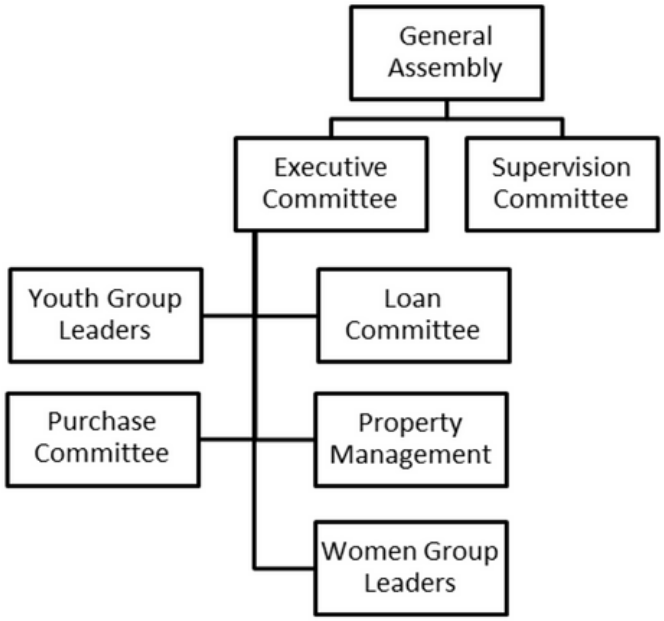


Figure 4. Organogram of a model community seed bank association.

Site

The ideal site for a community seed bank must provide adequate storage for the seed inventory and be accessible to the public. Selecting a site can sometimes be compromise. Seeds last longer in ideal conditions, but long-term storage will not be a major issue because community seed banks distribute seed regularly and get new seed on a seasonal basis. The following may serve as guide when selecting a site:

1. **Accessibility.** Choose a site that is convenient for your community, where people will want to visit. Make sure there is enough space around the seed inventory for several people to be there at the same time. Try finding a space where groups can also gather for educational programs, social events, or instructional classes.

2. **Climate.** Select a site where your inventory will stay dry and protected from weather—usually indoors with cool or at least stable temperatures.

3. **Protection from pests.** Evaluate whether there is a risk of rodents, insects, or other animals causing damage to your seeds.

4. **Cost.** It would be great if you can get the space for free via partnerships. If you are renting, you need to consider utility, insurance, and other monthly operating costs in your budget.

5. **Additional storage.** Consider whether you need extra room for supplies like inventory records, seed saving books, and other materials. It also might help to have space to store seed donations until they are sorted, labeled, and ready to be offered to your patrons. Nonprofit organization offices

A model or an ideal CSB has the following units:

- Office for the CSB leaders,
- Meeting hall,
- Seed store,
- Germplasm unit,
- Office for technical support staff, and
- Community knowledge library.

If resources permit, it is advisable to have office spaces for youth group leaders, women group leaders, and a seed testing laboratory as well. Also, there should be a store for keeping tools.

The size of a CSB facility is dependent upon the following key elements:

a. the number of people expected to use the facility,
b. financial resource available at hand,
c. the cost of construction materials, and
d. the types of services the CSB is intended to provide.

Organization of a Community Seed Bank Association, Goal, and Business Model

The goal of a CSB Association is to fill gaps of seed shortage and support resource-poor households by supplying diverse types of seeds adapted to the particular locality where the CSB is located. By doing so, a CSB increases diversity of seed stock in the hands of farmers. Therefore, the prime function of a CSB is service provision to its members and not on money making like profit-oriented business organizations.

Figure 5. (L) Arrangement of racks inside a seed store and (R) proper piling of sacks for storage.

ANNEX A

Presentation:
Orientation on Basic Concepts of Community Seed Banking

Orientation on basic Concept of Community seed banking

PRRM

Definition:

Community seed banks are mainly informal institutions, locally governed and managed, whose core function is to stored and preserve genetic diversity seeds for local use and future generation.

Community Seed banks offer a way to preserve that historical and cultural value – in that sense, seed banks are like seed libraries that contain valuable information about evolution strategies of plants.

A community seed bank is seen as the place to obtain seeds of local crops and varieties, as commercial seed companies, extension input depots, and private dealers are marketing only modern varieties and hybrids of a limited number of crops.

Community seed banks are trying to regain, maintain, and increase control over seeds by farmers and local communities and to strengthen or establish dynamic forms of cooperation among and between farmers and others involved in the conservation and sustainable use of agricultural biodiversity

Adaptation is therefore a key concept for home and community seed banking.

Importance of Community Seed banking

Objectives:

- To Maintain the conservation of our Heritage crops
- Accessibility of planting materials for farmers and community
- Availability of seed supply
- Sustainability of Agricultural Bio-diversity
- to prevents the loss of genetic diversity in rare plant species.
- Improving local seed system

---

1. Preservation of Crop Diversity for future generation

This is the most important reason for the storage of seeds. Just as human beings and animals are adapted to different conditions for survival, so are crops. Different types of the same species exist due to this adaptive nature. Therefore, it is of critical necessity that such diversity is preserved.

---

2. Protection from Climate Change

One thing is certain about the future: higher temperatures, too much or too little rain will increase the risks and bring in unpredictability which will make our food systems vulnerable.
For a couple of decades now, the world has witnessed radical climatic change that has been accelerated by increased industrial pollution. Crop extinction is enevitable with such extreme changes. If seeds are stored in seed banks, the danger of total elimination of certain species of crop is eliminated.

3. Protection from Natural Disasters

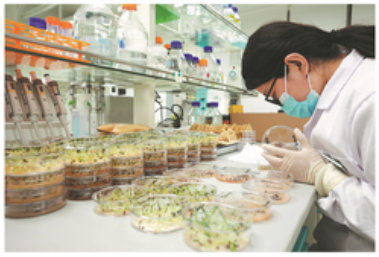
Natural disasters are unforeseen events that could lead to complete annihilation of crops from the face of the earth. The foresight of keeping seeds in a seed bank could save such a situation. Malaysian rice paddies for example, were wiped out during tsunami and international seed banks provided farmers with seeds that helped them start over.

4. Disease Resistance

Crop diseases are highly contagious and very deadly to plants. a serious break out could completely eliminate crops. Where diseases have ravaged crops and left no traces that farmers could start on, seed bank can intervene and provide them with seeds that will enable them to start on a clean slate.

5. Provide seed material for research

Seeds that are stored in seed banks can be made easily available to scientist and researchers who wish to study the seeds specially in such research could lead to improvement of crop production



6. Preservation from Man-made Disasters

Man-Made disasters such as war and oils spills could lead to the annihilation of crops. Countries that engaged in war make it difficult for farmers to continue farming and its easy for crops to disappear. One peace is stored seeds can be retrieved from seed banks and replanted.

Basic Concept/Principles of Community Seed banking

1. Seed Production

- ✓ What is seeds
- ✓ Cycle of seeds
- ✓ Parts of seeds
- ✓ Kind of seeds
- ✓ Effect of environment in seed production
- ✓ Steps
  - Plant timing/distance
  - Seed purity
  - Nutrition
  - Watering
  - Pest management

2. Seed selection, Harvesting and collection and extraction

3. Seed drying and storage

- Moisture Content
- Temperature
- Pest
- Labelling

4. Testing seed Quality

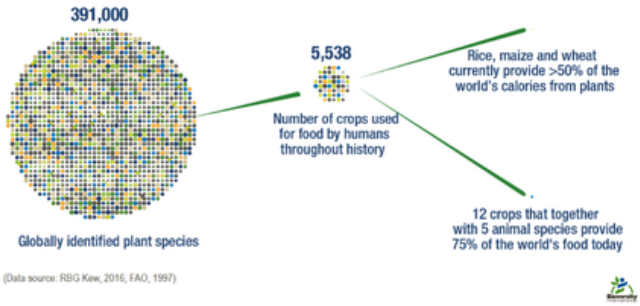
- Seed vigor
- Seed health
- Moisture content
- Percentage of Germination

Conservation of Agro-biodiversity

AGROBIODIVERSITY

The **variety** and **variability** of **animals, PLANTS and micro-organisms** that are **used directly or indirectly for food and agriculture** including crops, livestock, forestry and fisheries.

AGROBIODIVERSITY



Why Conservation of Biodiversity is important?

- It is important for preserving the diversity of species.
- It also helps in sustainable management and utilization of species and ecosystems.
- Biodiversity conservation is critically important for economic development and for poverty alleviation.
- As the agriculture sector is highly dependent on biological diversity, its loss would lead to decreased agricultural production.

Agro-biodiversity conservation is central to food and nutrition security.

We need to maintain inter-species diversity (lots of crops) and also intra-species diversity (e.g. lots of varieties of one crop).

Maintaining genetic diversity (crops, livestock, trees) is essential if we are to reduce vulnerability to climate change, natural disasters.

Maraming Salamat Po!

Any questions?

Download the PowerPoint Presentation:
Orientation on Basic Concepts of Community Seed Banking
in this link or scan the QR Code:

https://tinyurl.com/FOODHIVES-CSBTraining-PPT01

ANNEX B

Presentation:
Setting Up - Community Seed Banking

Setting up Community Seed Bank

PRRM
Celebrating 70 Years of RR Tradition

Basic consideration:

Location: A CSB should have separate rooms for acquiring seed checking, cleaning and seed storage. Clear entry and exit routes need to be established. Good hygiene and regular surface cleaning with alcohol are important to avoid contamination. Avoid wood or porous material surfaces. For storage ideally temperature should be

Equipment: A CSB can operate with very basic equipment. The minimum are sieves with mesh appropriate to the seed being handled, plastic buckets and containers, vacuum packing machine and weighing scale. For pre storage temperature treatments, a deep freezer (-20°C) and an air dryer (e.g. food dryer) are essential.

Data management: All seed entering and leaving the CSB should be recorded. It's important to record the origin of the seed, local name, who grew it, harvest year. Data can be recorded on paper or digitally, ideally both. For seed distributed outside the CSB it's advisable to use the Standard Material Transfer Agreement.

Requirements in stablishing Community banks

A. CSB site selection and establishment

B. Organize cooperative, PO,s, farmers Association

C. Provision of Starter seed

D. Capacity building of farmers in community seed banking

E. Listing of most preferred crops for seed banking

Regions	Most Preferred Traditional Varieties
CAR	Palawan, Mimis, Azucena, Pinilisa, Ballatinaw
1	Palawan, Kamuros, Inumay
2	Palawan, Mimis, Galo, Kamuros, Pinilisa
3	Palawan, Galo, Binernal white, Dinurado, Binundok
4A	Binerhen, Kinamuros, Kinandang, Inipot-ibon, Pirurutong
4B	Kamuros, Inipot-ibon, Inasucena, Dinurado, Milagrosa
5	Dinorado, Palawan, Gios, Binerhen, Black rice
6	Dinorado, Malido, Manumbalay, Azucena, Palawan
7	Dinorado, Kamuros, Azucena,

Thanks You!!!

Download the PowerPoint Presentation:
Setting Up - Community Seed Banking
in this link or scan the QR Code:

https://tinyurl.com/FOODHIVES-CSBTraining-PPT02

ANNEX C

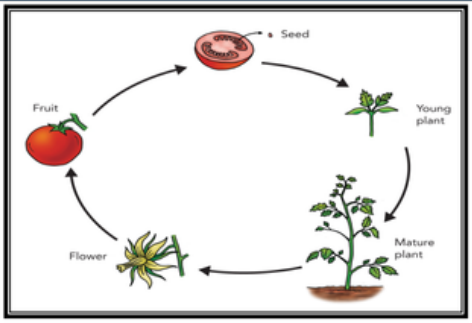
Download the PowerPoint Presentation:
Pagbibinhi (Seed Production)
in this link or scan the QR Code:

https://tinyurl.com/FOODHIVES-CSBTraining-PPT03

ANO ANG BUTO?

Ang buto ay ang gumulang at pertilisadong *ovule* ng bulaklak ng isang halaman.

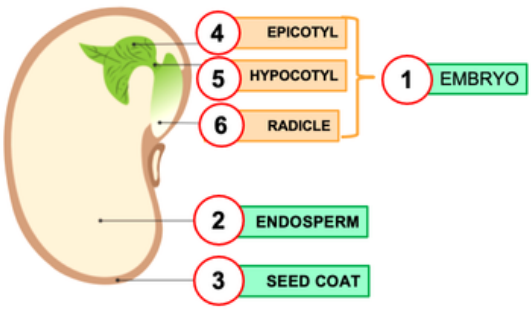
SIKLO NG BUHAY NG BUTO



MGA URI NG BUTO

1. Open-Pollinated Seeds (OP) o Mga Tradisyunal na Buto
2. Hybrid Seeds (F1)
3. GMO Seeds

MGA BAHAGI NG BUTO



Mga Uri ng Buto

1. Open Pollinated (OP) o Tradisyunal na Buto

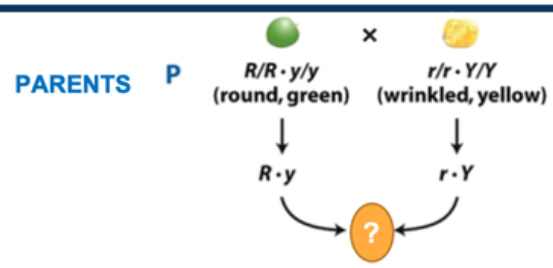
Mga buto na maaaring itanim nang paulit-ulit at tutubo na kapara ng mga magulang.

Mga Uri ng Buto

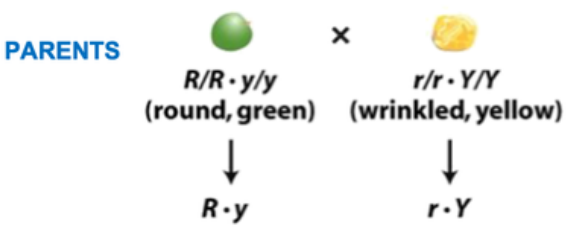
2. Hybrid (F1)

Mga buto na resulta ng pagsasama (*cross*) ng magaganda o piling katangian ng dalawang halaman (*parent plants*).

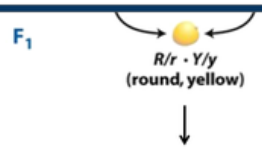
Maaari bang butuhan ang *hybrid seed*?



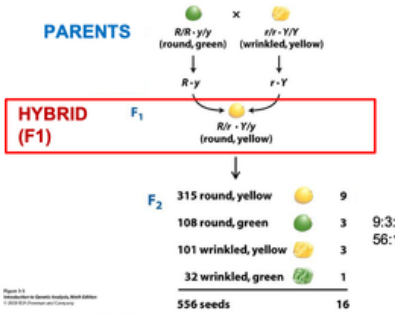
Maaari bang butuhan ang *hybrid seed*?



Maaari bang butuhan ang *hybrid seed*?



Maaari bang butuhan ang *hybrid seed*?



Bakit Hindi Dapat Binubutuhan ang Hybrid?

- Ang mga halamang tutubo ay magkakaiba o hindi pare-pareho ang laki
- Magkakaiba ang hugis at sukat ng bunga
- Magiging magkakaiba na rin ang mga katangian ng halaman sa populasyon sapagkat lalabas ang mga hindi magagandang katangian ng mga *parent plants*
- Mas mababa ang ani kaysa sa pinanggalingang F1 at mahihirapan sa paghihiwalay o pagkaklase-klase ng inani bago dalhin sa pamilihan

F2

MGA URI NG BUTO

3. GMO seeds
Genetically Modified Organism

Ito ay nagmula sa halaman na nilagyan ng DNA mula sa ibang organismo upang mapaunlad ang katangian nito. Karaniwang isinasagawa sa mga *laboratory.*

Hal. BT corn

MGA EPEKTO NG KAPALIGIRAN

1. *Photoperiodism*
2. Temperatura
3. Ulan
4. Hangin
5. Lupa

Mga Epekto sa Kapaligiran

1. PHOTOPERIODISM

- Pamumulaklak ng halaman base sa haba ng araw (liwanag) at gabi (dilim)

Mga Epekto sa Kapaligiran

1. PHOTOPERIODISM

A. LONG DAY PLANTS
- Namumulaklak at namumunga sa mga buwan na **mahaba ang araw at maiksi ang gabi** (mula Marso hanggang Agosto)
- Sibuyas, letsugas

B. SHORT DAY PLANTS
- Namumulaklak at namumunga sa mga buwan na **maiksi ang araw at mahaba ang gabi** (mula Setyembre hanggang Pebrero)
- Bataw, patani, sigarilyas, kadyos, utaw

C. DAY NEUTRAL PLANTS
- Namumulaklak at namumunga nang **buong taon**
- Sitaw, okra, talong, kamatis, upo

MGA EPEKTO NG KAPALIGIRAN

2. TEMPERATURA

- **May direktang epekto sa pamumulaklak at pagbibinhi**

A. TROPICAL PLANTS
- Namumulaklak at nakakapagpabinhi sa mga maiinit na lugar. Karamihan ay matatagpuan sa buong bansa.
- Hal. Kamatis, okra, sili, paayap, okra

B. TEMPERATE PLANTS
- Namumulaklak at nakakapagpabinhi sa mga malalamig na lugar. Karamihan ay matatagpuan sa malalamig na bahagi ng bansa tulad ng sa Baguio at Tagaytay.
- Hal. Repolyo, petsay, labanos, sibuyas, karot

MGA EPEKTO NG KAPALIGIRAN

3. ULAN

- Ang tamang dami ng tubig ay kailangan sa wastong paglaki ng halaman

MGA EPEKTO NG KAPALIGIRAN

3. ULAN

Epekto ng labis na ulan:

1. Hindi nalilipat ang *pollen* ng mga bulaklak; hindi nabubuo ang mga buto mula sa mga bulaklak
2. Mas matagal gumulang ang bunga at makapagbinhi
3. Maagang sumibol ang buto kahit hindi pa naaani mula sa halaman
4. Mas matrabaho ang pag-aani ng bunga
5. Mas madaming peste at sakit ng halaman
6. Nababawasan ang dami ng butong aanihin

MGA EPEKTO NG KAPALIGIRAN

4. HANGIN

- Ang lakas at direksyon ng hangin ay nakakaapekto sa *pollination* ng mga bulaklak

5. LUPA

- Ang lupang malusog ay nagdudulot ng magandang kalidad na mga halaman na bibinhian.

MGA GAWAIN

1. PANAHON NG PAGTATANIM
2. DISTANSYA SA PAGTATANIM AT DAMI NG ITATANIM
3. PAGPAPANATILI NG *SEED PURITY*
4. NUTRISYON
5. PAGDIDILIG
6. PAMAMAHALA SA MGA PESTE AT SAKIT

1. PANAHON NG PAGTATANIM

Pagtatanim sa panahon ng tag-ulan upang tuloy-tuloy ang suplay ng tubig sa pananim

2. DISTANSYA SA PAGTATANIM AT DAMI NG ITATANIM

- Mas malawak ang distansya ng mga halaman kapag gagamitin sa **produksyon ng buto**.
- Mas malawak din kapag **hindi mataba ang lupa** at sa panahon ng **tag-ulan**.

Para sa produksyon ng mga buto

Para sa produksyon ng gulay, atbp.

3. PAGPAPANATILI NG *SEED PURITY*

a. DISTANSYA NG PAGTATANIM *(PLANTING DISTANCE)*

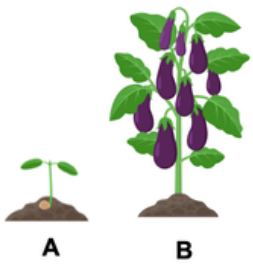
Self-pollinated: ≥10 meters

Cross pollinated: ≥100 meters

3. PAGPAPANATILI NG *SEED PURITY*

b. *PLANTING TIMING*

Iwasan ang pagtatanim ng sabay sa mga halamang magkakapamilya o mga halamang pareho ng uri pero magkaiba ng *variety*.



A B

3. PAGPAPANATILI NG *SEED PURITY*

c. PAGGAMIT NG *WINDBREAKS*

Magtanim ng mga matataas na halaman sa pagitan ng mga pananim.

3. PAGPAPANATILI NG *SEED PURITY*

IIRR

d. Pagtanggal sa mga di nais na halaman (off-types, may sakit, ibang *variety*)

3. PAGPAPANATILI NG *SEED PURITY*

e. *BAGGING* AT *CAGING*

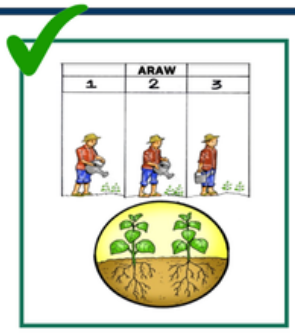
Pagtatakip at pagprotekta ng mga halaman para maiwasan ang *pollination* mula sa mga halaman na ibang *variety* o uri.

4. NUTRISYON

Ang wastong pag-aalaga at **tamang nutrisyon** ay kailangang ibigay sa halaman upang magresulta sa maganda at mataas na ani ng mga buto.

5. PAGDIDILIG

Ang dami at dalas ng pagdidilig ay dapat isaalang-alang para sa magandang ani ng mga buto.



6. PAMAMAHALA SA MGA PESTE AT SAKIT NG HALAMAN

Ang mga peste at mga sakit ng halaman ay nakakaapekto sa kalidad at dami ng aanihing buto.

6. PAMAMAHALA SA MGA PESTE AT SAKIT NG HALAMAN

- Pagtatanim ng **sari-saring gulay**
- Paggamit ng mga **organikong pestisidyo**
- Paglilinis ng taniman
- Paggamit ng magandang klase ng buto o mga **tradisyunal na buto**

WAKAS
Module 2

ANNEX D

Presentation:
PAGPILI NG BINHI, PAG-AANI AT PAGKUHA NG BINHI
(Vegetable Seed Production)

VEGETABLE SEED PRODUCTION

PAGPILI NG BINHI, PAG-AANI AT PAGKUHA NG BINHI

PRRM
Celebrating 70 Years of RR Tradition

A. Pagpili ng Binhi

Tamang pagpili sa Halaman na pagkukunan ng binhi

1. Pumili ng **matibay** at **malusog** na halaman sa iyong mga tanim.
2. Matatag sa anumang uri ng mga peste at sakit
3. Matatag sa anumang uri o iba't-ibang kondisyon ng kapaligiran (hal. tagtuyot, init, baha)
4. Panahon ng pagbunga ng halaman
5. Dami ng bunga

A. Pagpili ng Binhi

6. Katangian ng bunga at buto (gaya ng: kulay,laki,hugis or pagkakayari atbp.)
7. Kalidad ng pagluluto at pagkain
8. Itinatagal ng buhay ng buto sa lalagyan o imbakan
9. Iba pang katangian ayon sa gamit (gamot o mga likhang sining)

A. Pagpili ng Binhi

Mga Paraan sa Wastong Pagpili ng Pananim na Pangbinhi

1. Pumili ng masiglang halaman sa iyong mga pananim at lagyan ito ng tanda o marka upang di aksidenteng maani, at mabigyan ng kaukulang pangangalaga.
2. Piliin o kilalanin ang unang bunga na lumaki na pagkukunan ng binhi.
3. Protektahan ang halaman at bunga nito laban sa mga peste at sakit.

B. Pag-aani ng Bungang Binhian

Kailangan na sapat ang gulang ng bunga para binhian.

Ano ang palatandaan kung ang Bunga ay Magulang na?

1. **Ang bunga ay may guwang na tunog**
   Tulad ng : Kalabasa, pakwan, upo, melon
2. **Kulay, laki at hugis ng bunga**
   - kamatis & sili (pula);
   - paayap at iba pang legumbre (dilaw hanggang *brown*);
   - talong (dilaw)

B. Pag-aani ng Bungang Binhian

3. **Nasisira ang bunga**
   Tulad ng: Mga legumbre /butong gulay
4. **Humihiwalay ang bunga sa kanyang sanga**
   Tulad ng : (Kalabasa, pakwan, upo, melon)
5. **Bilang ng araw**
   depende kung pamilyar ang magsasaka sa uri ng halaman

Huwag hayaang mahinog ang bunga sa puno, maaring tumubo ang buto sa loob ng bunga (hal. kalabasa, upo, patola)

B. Pag-aani ng Bungang Binhian

B. Pag-aani ng Bungang Binhian

PAALALA:

- **Huwag mag-ani ng buto kapag umuulan o kaya sa umaga kung saan mayroon pang hamog.**
- **Huwag mag-aani kapag nasa kalagitnaan ng araw kung saan madaling mag-*crack* ang bunga at tumapon ang buto sa lupa.**
- **Huwag hayaan na madikit sa lupa o organismo ang mga buto sapagkat bababa ang kalidad nito.**

C. Pagkuha ng Binhi

Katangian ng Magulang na bunga

			
• Turns brownish in purple varieties and brownish yellow in green varieties • 60-80 DAT	• 40% orange to red • 60-80 DAT	• Yellow-orange • Presence of powdery ash • Peduncle is dry and brown • 120-125 DAS	• Yellow- orange • Fruits have yellow streaks • 20-24 days from flowering

C. Pagkuha ng Binhi

DRY SEEDS FROM DRY FRUITS OR PODS

- **patani, kadios, sitaw**

✓ Gamit ang kamay
✓ Alugin o bugbugin sa sako o sa *net*.

C. Pagkuha ng Binhi

Kailangang maingat sa pag-aani ng binhi upang masigurado ang mataas na kalidad nito. Tanging ang magulang na bunga lamang ang maaaring aanihin para sa binhi.

Dry seeds from dried fruit/pods

Wet seeds from fleshy fruits

Dry seeds from fleshy fruits

C. Pagkuha ng Binhi

WET SEEDS FROM FLESHY FRUITS

- **talong, pipino, kamatis, ampalaya, patola, upo**

1. Kunin ang buto gamit ang kamay o kutsilyo
2. Buruhin ang seeds ng (2-3days)upang mapadali ang pagtangal ng buto.
3. Ibabad sa tubing ng (1-2days).

C. Pagkuha ng Binhi

DRY SEEDS FROM FLESHY FRUITS

- **sili, okra**

✓ Patuyuin and bunga bago tanggalin ang buto.
✓ Ibabad sa tubig ng 2-3 araw (sili)

C. Pagkuha ng Binhi




WET SEEDS FROM FLESHY FRUITS

Talong, pipino, kamatis, ampalaya, kalabasa, patola, upo

WAKAS
Module 3

Download the PowerPoint Presentation:
PAGPILI NG BINHI, PAG-AANI AT PAGKUHA NG BINHI
(Vegetable Seed Production)
in this link or scan the QR Code:

https://tinyurl.com/FOODHIVES-CSBTraining-PPT04

ANNEX E

Presentation:
PAGPAPATUYO AT PAG-IIMBAK NG BUTO
(Vegetable Seed Production)

VEGETABLE SEED PRODUCTION

PAGPAPATUYO AT PAG-IIMBAK NG BUTO

PRRM
Celebrating 70 Years of RR Tradition

PAGPAPATUYO NG BUTO

•Patuyuin ang mga mamasa-masang buto bago iimbak.

• Ang mga buto na may mataas na *moisture content* ay mas madaling masisira bago pa ito maiimbak.

PAGPAPATUYO NG BUTO

Mga Dapat Tandaan:

1. Huwag hayaang mahulog ang mga buto sa lupa.
2. Patuyuin ang mga buto gamit ang isang bagay na may butas sa ilalim gaya ng sako, bilao, banig para tumagos ang hangin at mas mabilis na matuyo.

PAGPAPATUYO NG BUTO

Mga Dapat Tandaan:

3. Huwag madaliin ang pagpapatuyo ng mga buto dahil maaaring lalong bumaba ang pagsibol nito.
4. Bago umulan o dumilim, siguraduhing takpan ang mga buto o ipasok sa loob upang maiwasan ang pagtaas ng *moisture content*.

PAG-IIMBAK NG BUTO

Dodoble ang haba ng buhay ng buto kapag mapababa:

A. ang *moisture content (MC)* ng 1%

Hal. Seed A ay may MC na 14% at tatagal ng 2 taon.

- Kapag napababa pa ng **13% ang MC** nito, ay posibleng tumagal ng hanggang **4 na taon** ang buhay ng buto (doble sa inisyal na haba ng buhay nito na 2 taon).

PAG-IIMBAK NG BUTO

Dodoble ang haba ng buhay ng buto kapag mapababa:

B. ang temperatura ng lugar na pag-iimbakan ng 5 °C

Hal. Seed B ay nakaimbak sa lugar na may temperatura na 15 °C at tatagal ng 3 taon

- Kapag naiimbak ito sa lugar na may temperatura na **10 °C**, maaaring humaba ang buhay nito hanggang **6 na taon**.

PAG-IIMBAK NG BUTO

Mga Salik na Nakakaapekto sa Haba ng Buhay ng Buto habang Nakaimbak

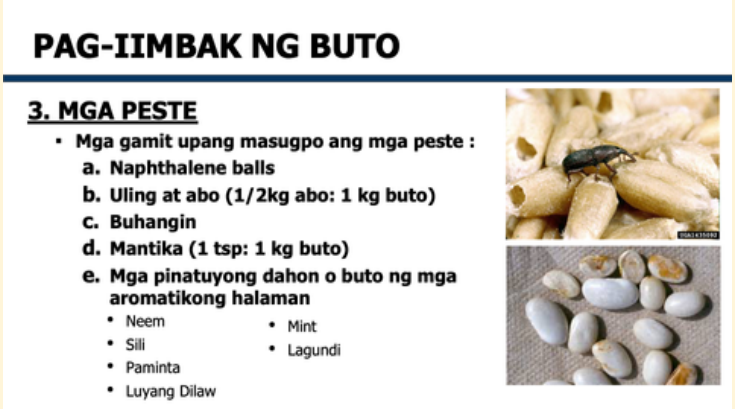
1. *MOISTURE CONTENT* NG BUTO (7-8%)

- Itago ang mga buto sa mga *air-tight containers*
- Siguraduhing laging tuyo ang mga buto sa pamamagitan ng paglalagay ng *desiccants* o iba pang bagay na na nakakasipsip ng moisture (hal. uling, abo, silica gel) sa loob ng sisidlan.
- Palitan ang *desiccants* sa tuwing bubuksan ang sisidlan.
- Patuyuin sa araw ang mga buto paminsan-minsan

PAG-IIMBAK NG BUTO

2. TEMPERATURA

- Ang buhay ng mga buto ay napapahaba kapag ito ay nakaimbak sa malamig na lugar (pero hindi nagyeyelo)
- Kung walang refrigerator o *air-conditioned room*, maaaring pumili ng malamig na lugar (hal: malapit sa ilog, sa ilalim ng puno, sa loob ng banga
- Siguraduhin na hindi mababasa ang mga buto



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PAGPAPATUYO AT PAG-IIMBAK NG BUTO
(Vegetable Seed Production)
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ANNEX F

Presentation:
PAGSUBOK SA KALIDAD NG BINHI
(Vegetable Seed Production)

VEGETABLE SEED PRODUCTION

PAGSUBOK SA KALIDAD NG BINHI

PRRM
Celebrating 70 Years of RR Tradition

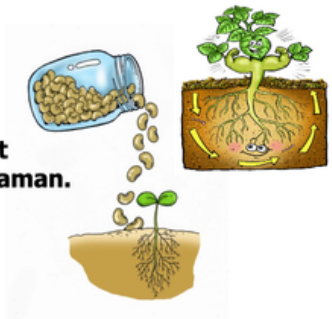
Pagsubok sa Kalidad ng Binhi

1. **Seed vigor (lakas ng binhi)**
2. **Seed health (kalusugan ng binhi)**
3. **Moisture content of seeds (halumigmig na nilalaman ng binhi)**
4. **Percentage of Germination (bahagdan ng tumubo/sumibol)**

Pagsubok sa Kalidad ng Binhi

1. LAKAS NG BINHI
(Seed Vigor)

May potensyal na mabilis at pantay na pagsibol ang halaman.



Pagsubok sa Kalidad ng Binhi

Flotation Method
(Pagpapalutang ng mga buto)

1. Ang mga binhi na nakalutang ay mahina na.
2. Ang mga binhi na nanatili sa ilalim ay may kakayahang mabuhay.

Pagsubok sa Kalidad ng Binhi

2. KALUSUGAN NG BINHI
(Seed Health)

- Ang malusog na binhi ay ligtas sa peste at sakit na maaring pumatay at makapinsala.
- Paghiwalayin ang malusog na binhi sa nasira at di na maganda ang itsura. Ang mga binhing ito ay maaring maging sanhi ng bagong peste o sakit at di na karapat-dapat na pangtanim.

Pagsubok sa Kalidad ng Binhi

3. MOISTURE CONTENT (MC) NG BUTO

- **Ang mataas na halumigmig ay nakakabawas sa kakayahang mabuhay ng mga binhi.**
- **14% MC sa mga binhi na di madulas.**
  Hal. okra, petsay
- **12% MC sa mga binhi na madulas**
  Hal. soya, mani, sitaw at munggo

Pagsubok sa Kalidad ng Binhi

4. Percentage Germination

- Ang bahagdan ng pagsibol ay nagbibigay ng ideya kung ang mga binhi ay hindi na dapat pang itago o itanim. **Hindi na dapat itago ang mga binhi kung ang bahagdan nito ay mababa na sa 50%.**

PARAAN NG PAGPAPATUBO

- **Para sa malalaking binhi:** Gumamit ng **buhangin sa ilog or malinis na lupa** (kadalasan tubig na kumukulo ay ibinubuhos sa lupa bago gamitin para patayin ang mikrobyo) bilang isang paraan ng pagpapatubo.
- **Para sa maliliit na binhi: papel** (example: filter paper, tissue paper) **o tela** (hal: *cheese cloth*) ang maaaring gamitin bilang paraan ng pagpapatubo.

Pagsubok sa Kalidad ng Binhi

Rag-doll Method

Pagsubok sa Kalidad ng Binhi

GERMINATION RATE (%) = $\frac{\text{Bilang ng mga butong sumibol}}{\text{Kabuuang bilang ng mga buto}}$ **X 100**

Halimbawa:

Gamit ang *rag-doll method*, napag-alaman na mula sa 50 piraso ng buto, 40 piraso lamang ang sumibol. Gamit ang *formula*, kuhain ang *germination rate (%)* nito:

$$\text{GERMINATION (\%)} = \frac{40 \text{ pcs}}{50 \text{ pcs}} \times 100$$

GERMINATION (%) = 80%

BILANG NG BUTO NA DAPAT ITANIM $= \frac{\text{Bilang ng NAIS na dami ng halaman}}{\text{\% germination}}$

100 halaman ang nais mong mabuhay mula sa binhi. Mula sa 80% *germination rate*, ilang buto ang dapat itanim upang maseguro ang dami ng nais itanim?

$$\text{BILANG NG BUTO NA DAPAT ITANIM} = \frac{100 \text{ pcs}}{.80}$$

BILANG NG BUTO NA DAPAT ITANIM = 125 pcs. ng buto

Pagpapabilis ng Pagsibol ng Buto

Seed Scarification

Para sa mga binhi na mahirap tumagos ang tubig at hangin. (Hal: sigarilyas, ampalaya, patola)

1. Sugatan ang *seed coat* gamit ang *nail cutter*
2. Tusukin ang *seed coat* gamit ang karayom
3. Gasgasin ang *seed coat* gamit ang *sand paper.*

Pagpapabilis ng Pagsibol ng Buto

Hot Water Treatment

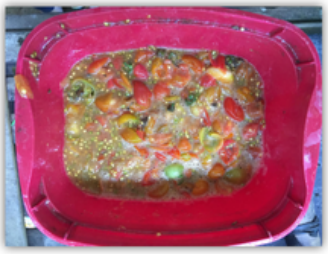
Ibuhos ang mainit na tubig **(pinakuluan at pinalamig ng 10-15 minuto)** sa isang lalagyan na may binhi **(10 bahagi ng tubig sa 1 bahagi ng binhi).** Hayaan sa loob 3-10 minuto o hanggang lumamig ang tubig.

EXTRACTION

Magbabad ng mga binhi sa ordinaryong tubig nang magdamag

• Magbabad ng binhi sa tubig sa loob ng 12-48 oras.

• Ang paraang ito ay hindi inirerekomenda sa lahat ng binhi lalo na sa mga binhi na madaling sumipsip ng tubig katulad ng mga butong gulay (*legumes, hal. munggo*)



Mga Katutubong Gulay

- Angkop sa kondisyon kung saang lugar sila lumaki.
- Maraming bahagi ang nakakain at nagagamit
- Karamihan ay matibay sa peste, sakit at pabagu-bagong kondisyon ng kapaligiran, tulad ng tag- tuyot.
- Mataas ang taglay na sustansya.
- Walang panahon na mataas ang ani. Kaya tuloy-tuloy lang ang pag-ani sa mahabang panahon. Nakapagbibigay ng araw-araw na mapagkukunan ng pagkain para sa pamilya.
- Nakapagbibigay ito sa *breeders* ng mga magagandang katangian na kinakailangan para mapataas ang kalidad ng halaman at mapagbuti ang ani.

WAKAS
Module 5

Download the PowerPoint Presentation:
PAGSUBOK SA KALIDAD NG BINHI
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Institute for Social Entrepreneurship in Asia

Philippine Rural Reconstruction Movement
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COMMUNITY SEED BANKING TRAINING MODULE

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