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Day 3: Seed Saturation

Quick Glance

In this lesson, campers will:

- ✓ Explore the parts of a seed and how they grow into plants
 - ✓ Examine different types of seeds
 - ✓ Recognize the many benefits of seed saving
 - ✓ Try out some beginning seed-saving steps
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Tasks:

- ✓ Discussing seeds
- ✓ Dissecting a lima bean
- ✓ Sorting seeds
- ✓ Explaining how seeds are dispersed
- ✓ Saving seeds
- ✓ Gardening

Day 3: Seed Saturation

About:

Campers explore the world of seeds, looking at their parts, with a focus on: reproduction; where they come from, sorting and categorizing them; and finally trying their hand at some simple seed saving.

Achievement-Based Objectives:

These describe what the camper will have learned and might apply during and beyond the gardening session. At the end of this lesson, campers will have:

Named common seed parts
Sorted and organized seeds by category
Recognized why seed saving is good for gardening
Practiced seed saving
Applied their gardening skills in the Frost Valley garden

Lesson Focus:

Seed parts and function, seed sorting and identification, seed saving, hands-on gardening

Grade Level	Time	Main Topic
4-6	60 minutes	Seed Exploration

NOTE: As with the other lessons, instructors can modify and adapt these tasks.

Materials and Prep:

Make sure to prepare the following materials before the session. Handouts and items to duplicate and/or enlarge are in **Lesson Docs** at the end of the lesson.

Task	Items	Preparation
Starter	<ul style="list-style-type: none"> ✓ Doc 1: What campers will learn ✓ Self-adhesive chart paper ✓ Markers 	Reproduce the camper-friendly objectives on chart paper. Find a place near the garden to post, and also post in an indoor classroom (the greenhouse, for example) where rainy-day gardening tasks take place.
Inside the Seed	Doc 3: Lima Bean Dissection (see task for specific materials)	
Seed Savvy	<ul style="list-style-type: none"> ✓ Various plants from the garden ✓ Various types of produce from the garden or produce representing what is planted in the garden ✓ Seed packets representing selected plants ✓ Magnifying glasses ✓ Plastic knives (strong enough to cut produce) ✓ Pencils and paper ✓ Doc 2: How to Read a Seed Packet ✓ Doc 4: Different Types of Seeds 	<ul style="list-style-type: none"> ✓ Place various plants and their matching seed packets on tables for campers to explore ✓ Distribute enough magnifying glasses to accommodate small groups of campers ✓ Have enough pencils and sheets of paper for each camper ✓ Have enough small knives to accommodate small groups of campers
Seed Saving	Doc 5: Seed Saving All of the materials necessary for the tasks are presented here. Note that there is a task for seed saving for tomatoes: This task requires creating a liquid base that has to rest for a few days. Also note that for this seed-saving task, it might be necessary to locate dried plants in order for seeds to be gathered.	Prepare as required in the learning task, noted in Doc 5.
Gardening	All items for general gardening tasks are listed in the Frost Valley Gardening Session Overview.	Review the overview carefully. Focus on materials required, as well as the planting schedules.

Procedures

Step	Task 1: Starter
1	When campers arrive, if desired, have them take a quick look around the garden to check in. They will have more time in the garden later.
2	Have everyone sit in a circle. Ask the group if any gardening thoughts have come to mind that they want to share. Record questions and comments. Provide feedback where you can, and if you can't, tell campers you will get back to them.
3	Share what campers will be learning, referring to Doc 1: What campers will learn.

Step	Task 2: Inside Seeds
4	Discuss with campers what seeds are: Where do they come from and what do they do? OPTION FOR YOUNGER CAMPERS: Read a picture book to introduce campers to seeds. Possible books include: <ul style="list-style-type: none">✓ <i>Seeds, Seeds, Seeds</i> by Nancy Elizabeth Wallace✓ <i>Planting a Rainbow</i> by Lois Ehlert✓ <i>Sunflower House</i> by Eve Bunting✓ <i>The Tiny Brown Seed</i> by Daniele and Craig Frazier✓ <i>Seed Folks</i> by Paul Fleischman
5	Tell campers they are going to learn more about what is inside a seed so they can understand what makes them grow into plants. Have campers do the lima bean task below, Doc 2: Lima Bean Dissection.

	Task 3: Seed Savvy
6	Distribute the knives and the magnifying glasses, or situate them for easy access. Invite campers to take a look at the various plants and types of produce that have been collected. Tell students they can open the produce using the knife, dissect the plant, and use the magnifying glass to identify and locate seeds. Ask them to look closely to determine where the seeds rest. Work with campers to identify the location of the seeds and/or the seed origin within the different plants.
7	Distribute seed packets. Using Doc 2: How to Read a Seed Packet , help campers read the packet. FOR YOUNGER CAMPERS: Reproduce a seed packet on a large piece of paper and walk through the seed description with the entire group.

8	<p>Have campers explore the seeds from each seed packet. They can write or draw their observations on paper. Prompts include:</p> <ul style="list-style-type: none"> ✓ What are the colors, shapes, and sizes of the seeds? ✓ Are any of the seeds edible? ✓ What do the seeds feel like (exploring texture)? ✓ What type of plants do they come from? (Flowers? Trees? Fruit? Vegetable?) ✓ What are the similarities among the seeds? (Campers group like seeds.) <p>OPTIONAL: Select a range of other seeds that campers can differentiate among and group. See Doc 4: Different Types of Seeds to guide this exercise.</p>
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9	<p>Campers can delve briefly into the way seeds are dispersed (other than being planted). Primary ways seeds are dispersed:</p> <ul style="list-style-type: none"> • Wind Maple seeds, dandelions, artichoke, milkweed • Edible fruits, animals eat and disperse seeds Tomatoes, apples, squash, raspberries, corn • Nuts buried and forgotten by squirrels Acorns • Seed cases attach to animals fur Burdock • Float on water Coconut • Bursting Balsam <p>Some fun ways to do this:</p> <ul style="list-style-type: none"> • Describe the dispersal methods, each one on a separate strip of paper. Place the strips in a bag. Individual campers or pairs select a strip and act it out for their peers. • Provide pictures that campers use to guess the method and then describe. • Use other types of objects, e.g., a stuffed animal with seeds on it, etc., to demonstrate the methods.
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10	<p>Explain that in addition to the natural ways seeds are dispersed, people disperse seeds by planting them. Discuss with campers how people obtain seeds. Validate contributions, underscoring those who mention getting seeds directly from the plants.</p>
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11	<p>Introduce the concept of seed saving. Invite campers to discuss the role of seed saving in the garden: What's involved? Why is it good to save seeds? Build on responses referring to the key concepts in Doc 5: Seed Saving.</p>
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12	<p>Refer to Doc 5 to introduce campers to basic seed-saving concepts and methods. Whether you do all or one of the tasks, ask campers at the end of each task how seed saving would be beneficial to the Frost Valley garden and its users.</p>
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Step	Task 4: Seed Discussion
13	<p>Ask campers to talk about what they learned about seeds and if they did decide to save seeds, which would those be and why.</p>

LESSON DOCS

Doc 1: What campers will learn

Doc 2: How to Read a Seed Packet

Doc 3: Lima Bean Dissection

Doc 4: Different Types of Seeds

Doc 5: Seed Saving

Doc 1: What campers will learn

Reproduce the following on a sheet of self-adhesive chart paper. Post so campers can see the list. Modify accordingly.

You, the campers, will learn:

- What the parts of a seed are and how they grow into plants

About different types of seeds

- How seed saving has many benefits in the garden and beyond
- How to begin saving some seeds

Doc 1: How to Read a Seed Packet

The back of a seed packet lists all the information one needs to directly sow seeds in the ground.

1. Seed packets will give the name of the item, and maybe the family to which it belongs, along with its Latin name.
2. **Planting Depth** When we make a trench to lay our seeds, the distance from the soil line to the bottom of the trench is the planting depth.
3. **Seed Spacing** This refers to the distance in the trench between seeds. Don't overseed. It makes thinning later more difficult.
4. **Days to Sprout aka Days to Germination** This refers to the length of time between a seed is first planted and when it first appears above ground.
5. **Spacing after Transplanting or Plant Spacing** This refers to the distance between plants once all thinning and transplanting has been done.
6. **Row Spacing** This refers to the distance between the rows.
7. **Days until Harvest aka Days to Maturity** This is the time it takes to go from seed to table. Some will start from the day the seeds are planted, while others use the day the seedling are transplanted to their final position.
8. The following information is sometimes included but not always: light requirements, soil requirements, irrigation suggestions, when and how to harvest, fertilization requirements, and growing suggestions.

CAULIFLOWER, Early Snowball -- *Brassica oleracea (Botrytis)*

When planted in early spring or late summer so that it can mature in cool weather, this popular cauliflower variety rewards you with large heads of snowy white curds. Enjoy this mild-flavored vegetable raw, steamed or pickled.

Planting Depth	Seed Spacing	Days to Sprout	Spacing After Transplanting	Spacing Between Rows	Days until Harvest
1/2"	2 seeds per pot or cell	5-10	18"	24-36"	60*

*From setting out transplants.

PLANTING: For a spring crop, start seeds indoors 4 to 6 weeks before planting outdoors. Harden off seedlings by putting them outside during the day for 1 week before transplanting. Plant after danger of a hard spring frost is past. For a fall crop, transplant seedlings into the garden in mid to late summer. Before transplanting, enrich the soil with compost.

GROWING: To avoid disease problems, don't plant where cauliflower or related plants grew within the last 2 years. Water regularly and fertilize monthly. When the head begins to form, tie the outer leaves up over the top of the head to "blanch" it (make the curds white).

HARVESTING: Cut the stem just below the central head while the flower buds are small and tight.



Source: <http://schoolgardenweekly.com/instructional-activities/how-to-read-a-seed-packet#sthash.yvgv1Kii.dpuf>

Doc 3: Lima Bean Dissection

Key Concepts

Most plants grow from seeds, which come in a variety of shapes, sizes, and textures. Seeds contain everything a plant needs to grow and reproduce.

There are three parts to a seed. They are the:

- Testa (seed coat)
- Cotyledon (seed leaf)
- The embryo

The testa, which is the outer covering, protects the embryo from drying out and injury. The testa can be thin and soft or thick and hard.

The cotyledon, or seed leaf, is where the plant stores its food. It is usually stored in the form of endosperm, which is a temporary food supply that the embryo uses to grow until the plant can manufacture its own food.

This is the first part of the plant you see when it starts to grow and is the seedling's food supply until it can produce its food.

The embryo is made of two parts: the radicle (root) and the plumule (shoot). The shoot is what will become the new plant.

The outside covering of seeds is called the seed coat. It protects the baby plant, or embryo, inside the seed.

Some seeds, such as grass, begin life with one leaf. These kinds of seeds are monocots.

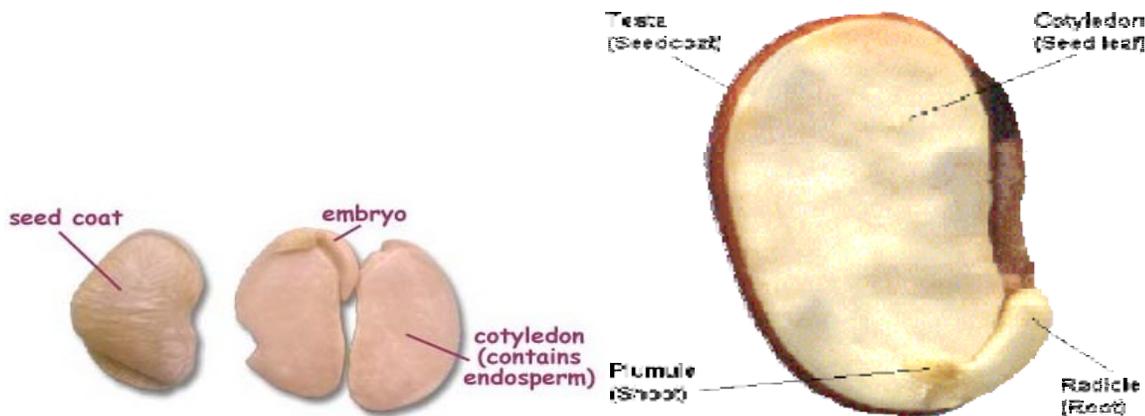
Other seeds, such as beans, begin life with two leaves. These kinds of seeds are dicots.

Materials

- Pre-soaked lima beans
 - Dry lima beans
 - Magnifying glass
 - Tooth picks
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Steps

1. Pre-soak the lima beans overnight in water.
2. Divide campers into small groups.
3. Give each group several lima beans, toothpicks, a sheet of paper, and a magnifying glass.
4. Instruct the campers to gently remove the seed coats using the toothpick. Then have them open the seed (it should easily be halved) to begin exploring its inner workings.
5. Campers discuss and illustrate what they see with one another and make some guesses about what each part is and does.
6. Distribute to each camper a Seed Parts worksheet (below). Describe each part, validating camper contributions. Explain that all seeds, no matter their size, have similar parts and reproduce to form the edible plants they grow in the garden.



Adapted from: The Great Seed

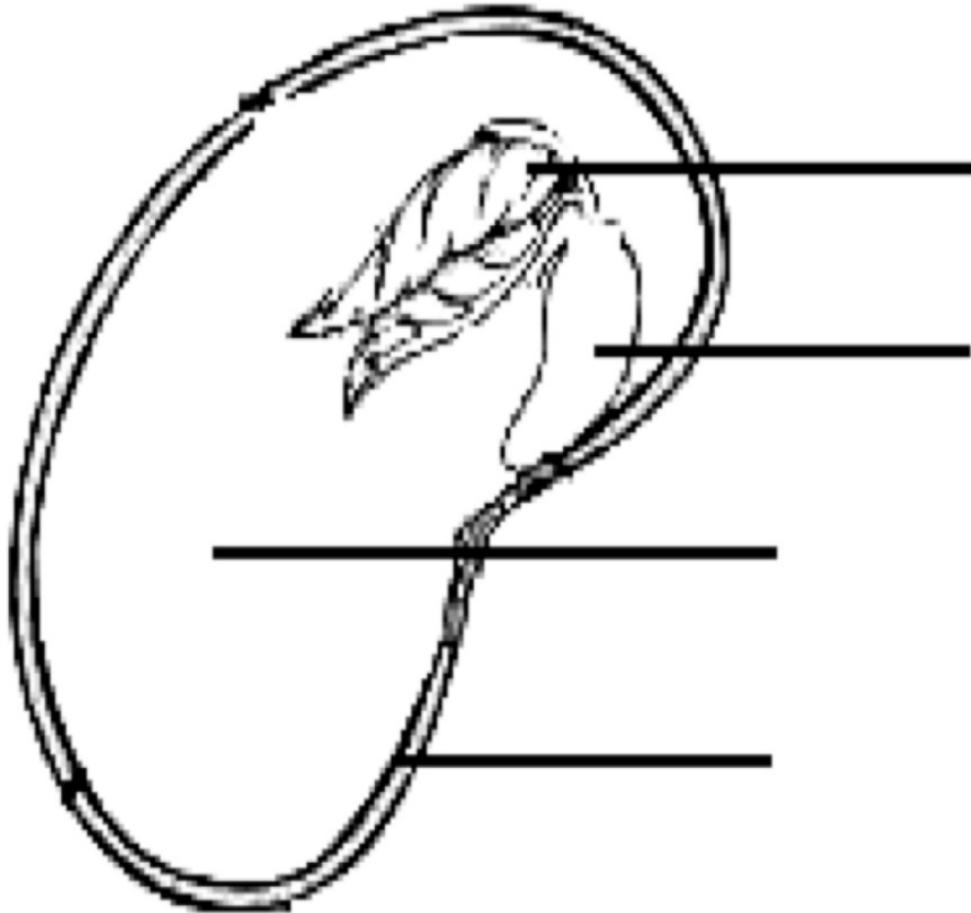
DiscoveryCmse.olemiss.edu/files/2011/11/Great_Seed_Discovery.pdf;

Look at those Seeds GrowSciencelinks.com/lessons/look-at-those-seeds-grow

Seed Parts

Name: _____

Directions: Label the parts of the seed on the correct line.



Word Bank			
Plant	Radicle	Branch	Test a
Cotyledon	Pumule	Endosperm	Trunk

Doc 4: Different Types of Seeds

Different Types of Seeds

<http://www.buzzle.com/articles/different-types-of-seeds.html>



Different Types of Seeds

The classification of different types of seeds can be based on the shape of the seeds, the use of the seeds, or according to the plant that will grow out of the seed. Mentioned in this Buzzle article are the types of seed according to their use...

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Seeds are very vital, because through them plants reproduce. However, some plants instead of producing seeds release **spores** for reproduction.

There are around a million different types of seeds, so division of a specific type of seed is a bit difficult. There are also some seeds which fall into more than one category, like sunflower beans, which are used for plantation purposes or used as bird seeds. Seeds are very significant to our lives, whether it is to growing cereals, herbs, fruits, vegetables, or using them for culinary purposes like using kidney beans for making enchiladas.

No matter which category the seed falls under, it is important to select healthy seeds to get the maximum benefits from the seeds. Given below are the two major categories of seeds; seeds used for plantation and seeds used for eating. Also, there are pictures of some attractive-looking seeds, which you can collect.



Types of Seeds for Plantation

With organic farming gaining popularity day-by-day, the planters are left with two choices: whether to go for genetically modified hybrid seeds or to opt for organic seeds to get an organic yield. In my opinion, organic seeds are a better choice, as they are more safe and natural. However, while selecting a particular type of seeds for sowing make sure the variety of seeds, whether organic or hybrid, has been used before and has given a healthy yield.

Seeds for Growing Cereal Plants

You can find these plant seeds for sowing at a farmers market, or order them online. Select good quality seeds to grow your cereals, and seek advice from the supplier for the care instructions. Some of the cereal plant seeds are bran, wheat, rice, corn, etc.

1 of 10

6/17/14 9:33 AM



Rice



Corn



Wheat

Seeds for Growing Fruit/Flower Plants

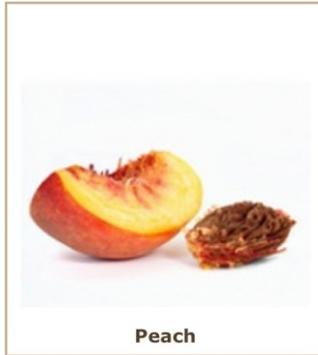
Fruit and flower seeds are easily available at a nursery; again make sure you select good quality fruit tree seeds, and select the variety of fruit you want to grow. For example, there are various varieties of apples, try to get your hands on the seeds that are native to your region. Some of fruit and flower plants grown using seeds are peaches, apricots, nectarines, roses, sunflower, etc.



Apple



Avocado



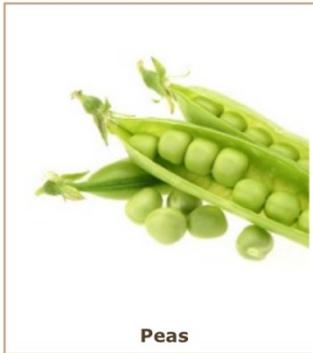
Peach

Seeds for Growing Vegetables

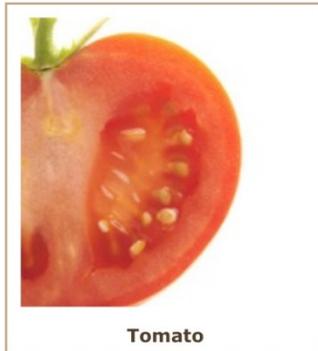
Again, you can find seeds to grow vegetables or herb plants at your local nursery. Pick out healthy, non-bruised, and large seeds to get a healthy yield. Examples of easy-to-grow vegetables by using seeds are tomato, squash, beans, cucumbers, spinach, etc.



Capsicum



Peas



Tomato

Seeds for Growing Grass

To grow beautiful grass you can buy seeds from online suppliers or at your local nursery. It is okay if you go with the quality grass seeds which are non-organic varieties, as grass is used only for decorative purpose.



Dry grass seeds



New grass seeds

Seeds for Growing Herbs

Herbs add great flavor to a recipe. Many people tend to keep a small herb garden near their kitchen. It is possible to grow herbs in small containers, and many herb plants don't need much maintenance. Some examples of easy-to-grow herbs are parsley, mint, rosemary, sage, and chives.



Coriander



Fennel

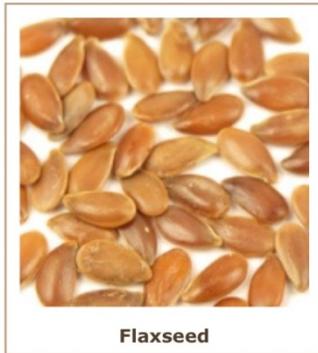


Types of Edible Seeds

Some of the above types of seeds also fall in the edible seeds type, for example cereals, many fruits, and vegetable seeds are edible such as cucumber seeds and tomato seeds. Given below are the types of edible seeds used in the kitchen and the ones used to feed birds.

Seeds That Can Be Eaten Raw

Many seeds can be eaten raw, and can be found at a supermarket. Make sure you select a packet of good quality ones. Some examples of such seeds are: mung bean seeds, peanuts, radish, sunflower, clover, etc.





Sesame

Seeds That Need to Be Cooked Before Eating

There are many seeds which need to be soaked for many hours. After some time these seeds sprout, and become edible. While some seeds are soaked for hours, and then cooked well for them to become edible. Some examples of such seeds are pinto, kidney beans, white kidney beans, green gram, soybeans, broccoli, etc.



Borlotti beans



Garbanzo beans



Red kidney beans

Seeds That are Used for Making Beverages

There are some specific seeds which are not eaten, but used to make beverages. The most common example is of coffee beans. Coffee is one of the most popular beverage around the world and many prefer to grind these beans at home to make fresh coffee, rather than using the store-available powder. Similarly, chia seeds are used to make energy drink, while rose hips are used to make tea.



Coffee beans



Chia seeds



Rose hips

Seeds to Feed Birds

For feeding the birds there are various kinds of seeds used. However, certain bird seeds attract specific group of birds. The seeds used to feed birds are sunflower, millet, cracked corn, thistle, wheat, oats, etc.



Millet



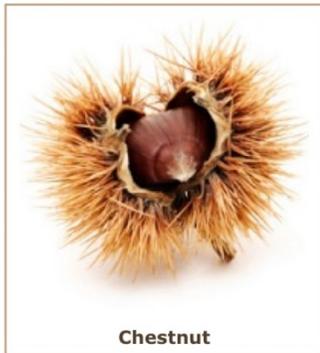
Niger seeds



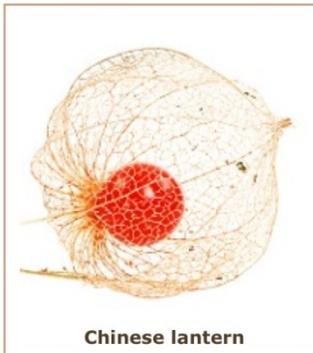
Sunflower seeds

Some Interesting-looking Seeds

Many people tend to collect seeds which are beautiful. Given below are pictures of some interesting seeds, some are in their pods, some have a hard shell, while some have a fuzzy cover on them. There are also few interesting seeds like that of the Chinese lantern plant which after drying gets a hollow, intricate-looking shell.



Chestnut



Chinese lantern



Clematis seed



Geranium seed



Lotus seeds



Magnolia seed



Pine cones



Star anise

So no matter what type of seeds you are looking for, ensure you select the good quality seeds to get the best out of them.

By [Pragya T](#)

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Doc 4: Seed Saving

Key Concepts

Seed saving is a great way to preserve seeds from garden produce. Saving seeds allows for:

- Maintaining heirloom plant variety (plant types that been passed down from generation to generation, and represent a variety that are special, not likely to be available in a store)
- Retaining the purity of seeds (not often the case for seed companies, which tend to develop hybrids)
- Preserving varieties suited to specific growing conditions
- Maintaining genetic diversity, which keeping vegetable and fruit world diversified
- Saving money (no need to buy seeds)
- Reducing the carbon footprint that comes with the production of seeds for industrial agriculture

Saved seeds are usually bigger and stronger than store-bought seeds. This is because larger farms get first dibs on the best seeds, while retail customers get second rate, less robust seeds.

Saving seeds over a few generations allows gardeners to select the largest seeds from the strongest plants.

Seed saving, as a serious gardening method, takes time, and requires an understanding of differences among types of plants.

Sources: A Handful of Seeds www.oaec.org/sites/default/files/A-Handful-of_Seeds_0.pdf; From Generation to Generation www.fedcoseeds.com/forms/seedschool.pdf

Tomatoes

Materials

- Heirloom tomatoes (purchased or grown)
 - Jars with lids
 - Masking tape
 - Permanent markers
 - Knives (consider age when distributing) and spoons
 - Strainers
 - Paper envelopes
-

Steps

Show campers examples of seed diversity. Try to include some seed-saving examples of “dry” and “wet” fruiting bodies. For “dry”, include both dried flower seed heads and pods.

Tomatoes (NOTE: This requires a bit more preparation time.)

1. Label each jar with the variety of tomato. If the variety is unknown, just describe it.
2. Slice tomatoes and scoop out the seeds with a spoon. Do not clean the seeds. Put them and their attached pulp into the jar.
3. Add a few tablespoons of water and stir.
4. Leave the jar uncovered for 3–days, stirring once every day.
5. Fermentation should loosen the gelatinous coating around the seeds (some will float to the top).
6. When done, rinse all seeds in a strainer. Use your fingers to loosen and remove any additional pieces of tomato pulp.
7. Empty out the seeds from the strainer and spread onto a piece of wax or parchment paper on a plate.
8. Allow the seeds to dry in a warm place for a week or two. (Place in a location, like the greenhouse, where campers who started the seed saving can check on their status and progress during free time.)
9. Campers from gardening sessions that sync with time the seeds are ready can store them in paper envelopes (and design them!)

Pods (legumes or brassicas)

Materials

- Dried seed pods
 - Paper envelopes
 - Pens or pencils
 - Sieve (optional)
 - Label envelope
-

Steps

1. Empty out dried legume pods. Gather seeds and put them in an envelope.
 2. **OPTIONAL:** For smaller seeds, such as the brassicas, you can use a sieve or strainer that has holes big enough to pass the seeds, but will keep the stems and pod material.
-

Dried Flowers

Materials

- Dried-flower seed heads that need to be broken apart (i.e., marigolds, zinnias, sunflowers, Black-eyed Susan, lettuce, etc.).
 - Paper envelopes
 - Pens or pencils
-

Steps

1. Break apart flower, removing the seeds.
 2. Store seeds in envelope.
-

Other

- Umbelifers (carrots, celery, parsley, cilantro, dill, fennel, etc.) Pull apart the dried clusters
- Dried flowers or pods that just need shaking (i.e., basil, salvia).
- Seeds gathered from the wild
- Save seeds from pumpkins and squashes (these are a bit easier to save)

Seed Bombs

Seed bombs have been used to reseed areas where full-fledged gardening is not always possible, like empty lots. In places like that, seeds are typically thrown above ground, remain unprotected, open to elements...and thus don't readily take root to grow. The seed bombs are a self-contained "garden" that contains elements that will protect and allow seeds to grow. They:

- Have an outer layer of clay that protects the seeds from the sun's heat and prevents animals from nibbling them to get at the seeds
- Are heavy enough so that wind and heavy rains won't respectively blow them away or easily destroy them
- Are shaped into a ball that gives enough shade to conserve moisture.
- Begin to break apart as the seeds germinate
- Crumble and as a result, provide the start for the root system.
- Are heavy enough to anchor the emerging seeds to the ground
- The seeds begin to germinate and the ball breaks apart. The small pile of crumbles provides the start for the root system, but is still heavy enough to anchor the emerging seeds to the ground.
- Are really easy and fun to make. They can be tossed into places where gardening is not possible.

Materials

- Clay (available from craft stores)
- Compost or potting soil
- Seeds (easy-to-grow or native varieties, like wildflowers)

Steps

1. Divide materials to have:
 - 5 parts clay
 - 1 part compost/potting soil
 - 1 part seeds
2. Have campers combine the clay and compost. Add a little water if the mixture is dry. The mixture should be moist but not dripping wet.
3. Have campers add the seeds to the clay and compost, and thoroughly combine the materials with their hands.

4. Instruct campers to shape the mixture into a ball the size of a golf ball. They can plant the seed bombs while wet, if desired. Or, they can wait until they are dry and plant them some other time. As long as the seed bombs are watered (by hand or by rain), once planted, the clay will break down and the seeds will grow.

Adapted from: How to Make a Seed Bomb

<http://www.kidsgardening.org/sites/www.kidsgardening.org/files/Seed%20Bomb%20Activity.pdf>

Seed Saving Guidance

Note on dried seedpods: In order for seeds to mature and be viable, the plants need to go through their natural process, continue to get watered as normal, etc. Some plants may die when the pods are ready to dry, but remember that a neglected, dead plant doesn't yet have mature seeds, and thus doesn't have the "dried seedpods" seed saving requires. Also, a gardener cannot simply harvest a green pod and dry it. Pods must dry on the living plant.

Brassicas These are typically annuals, including radishes, arugula, and the many varieties of Brassica rapa (turnips, broccoli rabe, bok choy, pak choy, Chinese cabbage, mustard greens). They bolt during their first few months when planted in the spring or early summer. If planted in the late summer or early fall, they can overwinter and bolt in early spring. Arugula and radishes are the quickest to bolt. Each plant will have a center stem and many flowers. Each individual flower will wither away after a few days or a week, and can be replaced with a small, narrow seedpod. These green seedpods may take up to a month or two to mature and dry.

Biennials, mostly Brassica oleracea varieties (cabbage, cauliflower, broccoli, kale, collards, kohlrabi and Brussels sprouts) bolt by early May. The appearance of their flowers and seedpods will be similar to the annuals mentioned above. They too may take a few months to dry.

Recommendations for Brassicas: Radish

Legumes Peas and beans can be kept on the plants to dry out. Some may only take a few extra weeks for the shell to turn tan and dry. It's important to harvest one and make sure that the beans/peas are dry and hard.

Recommendations for legumes:

- Bush beans, as they are quicker to produce than pole beans
- Dwarf or Tom Thumb peas, also quicker to produce than taller peas

Mint Family Basil flowers are the quickest and easiest for seed saving. Allow a few basil plants to go to seed. As the flowers start to wither away, their remaining

seed encasements turn brown and dry. They can be picked and broken apart if shaken. Little black seeds pop out. If they are still white or green, they are not ready.

Aster Family Examples include zinnias, marigolds, calendula, sunflowers, black-eyed Susan, and lettuce. All of these have quick-blooming flowers, which dry out pretty quickly if left on the plant. Once all petals wither away, and the remaining seed head turns tan or brown, they can be picked and broken apart to release the seeds.

Recommendations for asters: All are pretty easy, but zinnias may be the best.