

GROWING from Seed: *A HANDBOOK*



Seed Savers
EXCHANGE



AIMS TO CONSERVE AND PROMOTE
AMERICA'S CULTURALLY DIVERSE
BUT ENDANGERED GARDEN AND
FOOD CROP HERITAGE FOR FUTURE
GENERATIONS BY COLLECTING,
GROWING, AND SHARING
HEIRLOOM SEEDS AND PLANTS.



There's something almost magical in the process of planting a tiny, humble seed, and watching it transform into a plant with broad, green leaves, magnificent flowers, and delicious fruits. The experience not only inspires awe of the wonders of nature, but also fosters an appreciation for all of the diverse foods that we prepare in our kitchens and serve on our plates.

We think that everyone should get to experience this magic. That's why we've created this handbook, to give you step-by-step instructions and expert tips to help ensure that your garden gets off to a great start.

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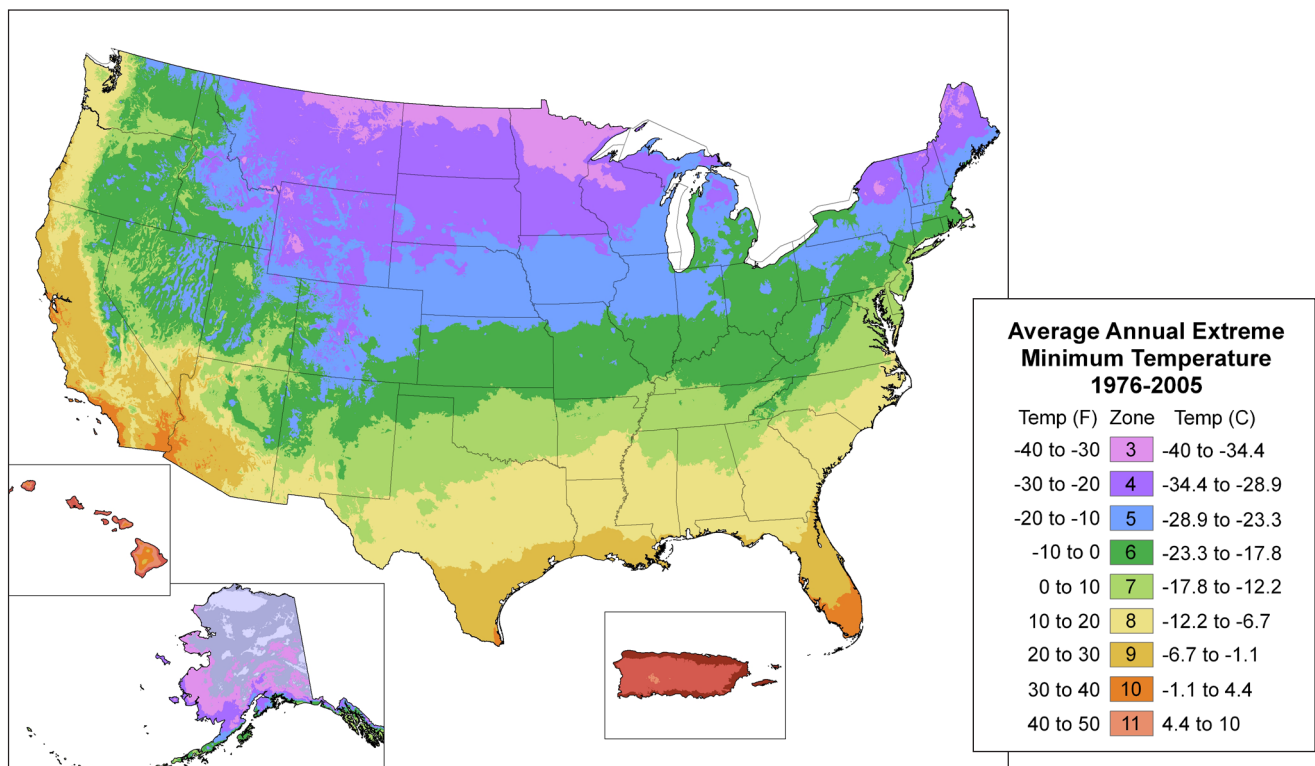
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Part One: Planning and Preparing

A successful garden begins with smart planning. By learning about your climate and garden conditions, and by choosing varieties suited to your location, you can help prevent problems before they arise. Follow the steps below to create a plan that will help your garden thrive through the growing season.

Know Your Climate → Before you choose which varieties to grow, learn a little about the climate in your region. The USDA has a map that divides the U.S. into zones, providing information about the climate and average temperatures; these are called plant hardiness zones. These zones inform planting dates and tell you the length of the growing season where you live. From there, you can find your average first and last frost dates, which are essential for timing your outdoor plantings and knowing when to start seeds indoors. The Farmer's Almanac can provide average frost dates based on your zip code. The last spring frost date informs you when you can start planting; the first fall frost dates informs you when your growing season will be winding down.



QUICK TIP

Keep Good Records

It's useful to keep records throughout the season, so that in future seasons you can see what worked and what didn't. Start your garden journal in the planning stage, and record all of the information that you find useful for future reference. Useful details to record include: planting date, crop and variety name, seed source, spacing, and whether you direct sowed or transplanted. You'll thank yourself next year when you're planning your garden!



Crops grown for their leafy greens (like kale, lettuce, and spinach) can usually tolerate some degree of shade, and shade may even be beneficial to them if you're growing them into the warm season or in a less temperate climate. Crops grown for their roots (like carrots, radishes, and beets) can also tolerate a little shade. But crops grown for their fruit (like tomatoes, squash, watermelon, and eggplant) generally require full sun.

Know Your Garden → After learning some general information about your region—like the length of your growing season and average frost dates—it's time take stock of your garden site. Below is a list of questions to ask yourself while planning your garden space. The answers to these questions will provide guidance on how much and how often to water your plants, where to plant certain varieties, and how best to prepare your soil before planting.

- **How much sun does your garden get?** Many of our common garden crops in the U.S. require full sun (eight or more hours a day) in order to thrive, but most home gardens have some degree of shade at some point in the day. However, some crops can tolerate partial shade, so don't despair if sections of your garden are occasionally shaded. Plants that like partial shade, like leafy greens and root crops, require at least three to six hours of sunlight a day, and morning and early afternoon sun is generally best.
- **What type of soil do you have?** Soil types range from sand to clay, and everything in between. Sandy soils drain very quickly, and tend to require more frequent watering and fertilizer applications. Clay soils hold water and nutrients for longer, and drain more slowly. After learning about your soil type, look into what nutrients are available in your soil, which will help you prevent problems that may arise. You can get this information through a simple soil test. If you want to get a soil test, contact your local extension office to learn about the proper soil sample size. For a small fee, your extension office will send you the results of your soil test, which will show what type of soil you have and the nutrient content of your soil. If your soil lacks sufficient amounts of key nutrients, or if the pH of your soil is off, you may want to amend your soil before you start planting, so that your plants can grow healthy and strong.

A Note on Soil pH

Most common crops have an optimum pH range of 6.5 to 7.5. Plants can suffer if the soil pH falls either above or below this range, but the good news is that you can amend your soil if its pH is outside of this range. Testing a soil sample before you start planting can help prevent these types of growing difficulties from arising. Reference the chart below when addressing soil needs in your garden, but only add what's needed to your soil. Adding extra amendments to your garden that aren't needed can also cause problems.



QUICK TIP

Common Soil Deficiencies and How to Address Them

Deficiency	Symptoms	How to Address the Problem
Nitrogen	Pale green/yellow leaves; poor plant growth and spindly plants	Add a nitrogen source to the soil (liquid fertilizers for quick release, solid fertilizers for more gradual release). Animal byproducts, like chicken feather meal, are good organic sources of nitrogen.
Phosphorus	Purple leaves; weak plants	Add phosphate or green sand to the soil.
Potassium	Brown tint around edges of leaves; curled leaf edges; purple spots on the underside of leaves	Add potassium or potash to the soil.
Low pH	Symptoms include wilting leaves and yellow spots	Add lime to the soil.
High pH	Availability of plant nutrients in the soil is decreased; stunted growth	Add sulfur to the soil.

- **Have you gardened in this location before?** If this isn't your first year gardening at your current site, it's best to rotate your crops. Many plant diseases are soilborne and can survive in the soil for many years. Often, plant diseases are specific to particular plant families, so try not to plant a crop from the same family (see below) in the same spot year after year. If you planted tomatoes in the east corner of your garden last year, it's best not to plant any crops from the nightshade family in that corner for a few years. If you don't have space in your garden to rotate your crops, fear not! You will likely still have success.

Some Common Plant Families and Their Crops

- **Nightshades** (*Solanaceae*) - tomatoes, peppers, eggplant, ground cherry, tomatillo
- **Legumes** (*Fabaceae*) - peas, beans
- **Grasses** (*Poaceae*) - wheat, oats, rye, corn
- **Cucurbits** (*Cucurbitaceae*) - cucumbers, watermelon, squash
- **Brassicac** (*Brassicaceae*) - broccoli, cabbage, mustards, collards, kale, Brussels sprouts, cauliflower, kohlrabi





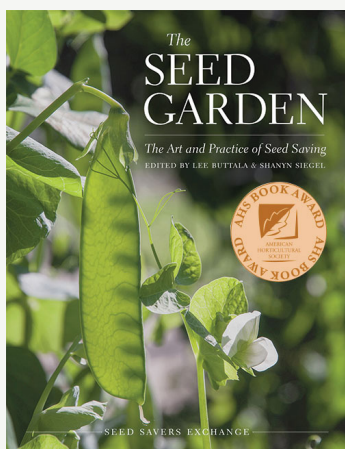
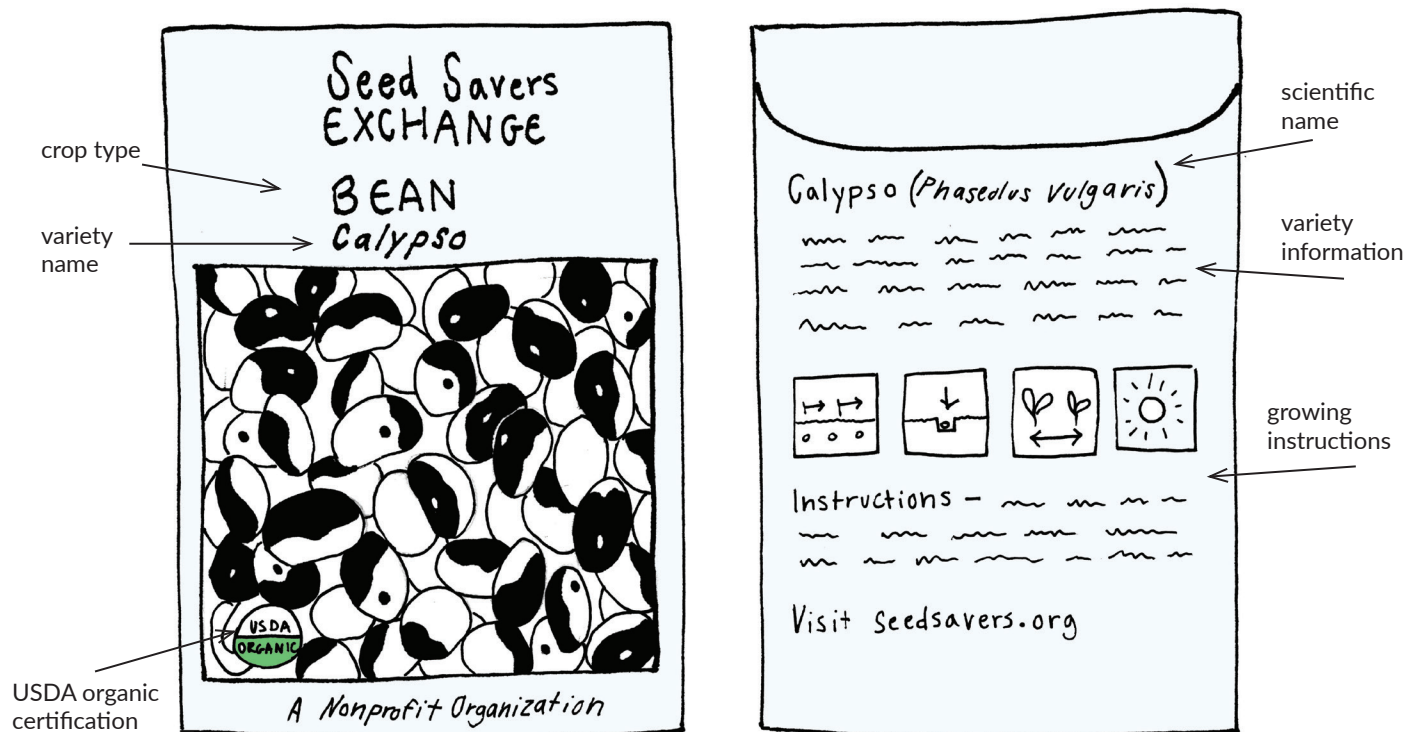
A Note on Day-Length Sensitive Plants

In addition to having preferred temperatures for growth, some vegetable crops also have preferred day lengths. Some crops, like turnips, thrive when grown after the summer solstice and into the fall, but tend to quickly “bolt”—grow tall and begin to produce flowers—when planted in the spring. Even though the temperatures at these two times of year may be similar, it’s the day length that matters to many plants. Long-day plants (including carrots, turnips, beets, dill, lettuce, onions, radish, and spinach) will flower when days are longer than 12 hours. Planting these crops in the mid-summer or early fall (depending on your region) will encourage them to put their energy into vegetative and root growth, instead of flowering too soon.

Choose Your Varieties → After researching your climate and garden conditions, you’re ready for the most fun part of garden planning: choosing what to grow. A variety is a named subset of a species that displays common traits. For example, tomatoes belong to the species *Solanum lycopersicum*, and ‘Cherokee Purple’ is a variety of tomato. While there are some crops and varieties that fare better in particular regions, you can mainly focus on choosing varieties that appeal to you. Order your longtime favorites, or choose varieties that are new to you. When in doubt, or if you’re just starting out, talk to other gardeners in your area to learn what grows well for them. Contact your local Master Gardener program to get expert advice specific to your region.

- ***Make sure the variety has time to mature in your zone:*** Seed packets typically have days to maturity listed on them. For example, if the seed packet says “60-70 days to maturity,” that means it will take 60 to 70 days from the time you put the seed in the soil for it to be ready to harvest and eat. Some crops (like cowpeas, squash, and melons) take a long time to mature, and may not have enough time to reach maturity in cooler, more northern climates. If a crop prefers to be started indoors and transplanted out into the garden at a warmer time, the seed packet may list days from transplant instead of days to maturity. This just means that the estimated time to maturity is from the date of transplant, not of the date that you started seeds indoors.
- ***Choose varieties that fit your climate needs:*** If you live in a region with specific climate needs, look for varieties that have proved successful in that climate. For example, if you live in the arid southwest, you may want to look for varieties that are drought-tolerant. If you live in a less sunny region like areas of the Pacific Northwest, you may want to grow more shade-tolerant varieties.
- ***Choose varieties with stories that interest you:*** At Seed Savers Exchange, we believe that a seed’s story is just as important as the plant it will grow into. Some varieties have existed for hundreds of years, others have been passed down within the same family for generations, and still others have interesting historical and cultural uses. By choosing a variety with a story, you get to become a part of that story.
- ***Choose open-pollinated varieties:*** If you want to try your hand at saving seeds from a couple of your garden crops, you’ll need to start with open-pollinated varieties. An open-pollinated variety is one that, when allowed to cross-pollinate only with other members of the same variety, produces offspring that display the characteristic traits of that variety. Some hybrid varieties do not produce seeds at all, and seeds can never be reliably saved from hybrids because the next generation of plants will not resemble the parent plants. All of the varieties offered by Seed Savers Exchange are open-pollinated.

How to Read a Seed Packet



Take it to the next step!

If you can grow a garden, you can save seeds. Seed Savers Exchange's book, *The Seed Garden*, is the go-to guide for gardening and seed saving. (Find it online at seedsavers.org.)

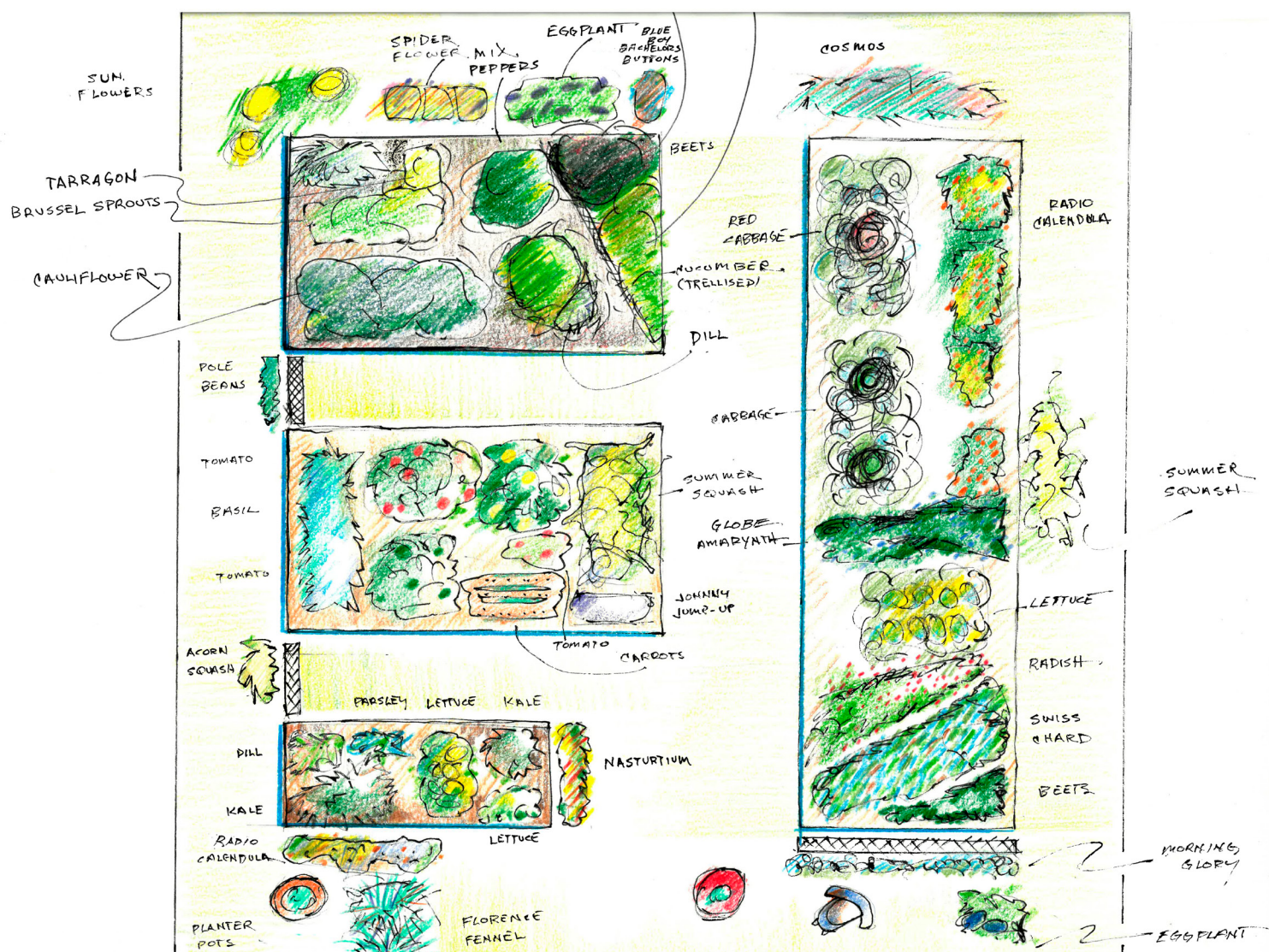
A Note on Common Seed Packet Terms

- **After danger of frost has passed** - sometime after your region's average last spring frost date
- **As soon as soil can be worked** - when the soil has warmed sufficiently in the spring to be able to prepare beds and sow seeds
- **Hardy** - can tolerate cold winter temperatures
- **Able to withstand hard frosts** - refers to especially hardy plants that can survive even when a "hard frost" hits, ie. temperatures of 28 degrees Fahrenheit or below

Decide Whether to Start Seeds Indoors or Direct Sow in the Garden →

While many crop types will do fine planted directly in the garden soil when temperatures are warm enough (ie. direct sowing), some crop types do best when started indoors. (Page 10 has details on which crops should be started indoors—depending on where you live—and which are easy to sow directly in the garden.) If you are direct sowing or transplanting warm season crops, you should wait to sow seeds until danger of frost has passed. If you are starting seeds indoors, you can sow seeds one to three months before the last frost date, depending on the crop type. Refer to your seed packet, or to Seed Savers Exchange's online "Grow and Save" guides (seedsavers.org/learn), to get a better sense of when to start specific crops.

Create a Garden Layout Plan → Now that you've figured out all of the details, it's time to plan the layout of your garden. Having a plan will not only save you time when you start preparing your beds, but will also help you estimate how many plants you need. Look at the seed packets you've chosen, and note the spacing requirements of each crop you want to grow. After estimating how many plants can fit in your garden at their recommended spacing, make sure you have enough seeds to sow more than you need in case a few don't germinate. Seeds have different rates of germination depending on the crop type and the age of the seed.



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Take it to
the next
step!
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Succession Plantings For most gardeners, planting is not a once-a-year experience, but one repeated throughout the growing season as crops mature and are harvested and removed from the garden. You can start your first planting in early spring, when the ground is warm enough for cool-season crops like peas, broccoli, lettuce, and other greens. As the ground and air temperatures warm and summer approaches, it's time for a second planting. As plants mature and are harvested from the garden, you can fill those newly vacant spots in your beds with warm-season crops like tomatoes, peppers, and eggplant. For regions with especially hot or dry summers, gardens may go dormant in the hottest summer months and a second planting of cool-season crops takes place in the fall. As the days begin to shorten and cool down, some gardeners can even fit in a third planting. To know if you can manage a third planting, refer to your average first frost date and the days to maturity on your seed packet. You can also use succession planting to ensure a continuous harvest throughout the season. Plant crops like lettuce and radishes every two weeks throughout their growing season to have a steady supply of these crops.

Prepare Your Garden Beds → You may choose to prepare your garden beds in the fall and let them rest for the winter, or in the spring as soon as the garden soil can be worked. Whichever option you choose, work the soil when it is warm and dry; frozen soil is difficult to loosen, and recently thawed or wet soil can become easily compacted, making it difficult for a plant's roots to grow.



Loosen the soil - We recommend loosening the soil to eight inches deep. This process allows roots plenty of space to grow, but also makes it easier for weeds to germinate and flourish, so only loosen soil in the areas that you will be planting, and leave paths and gaps between planting areas unworked.

Make your beds - Many people like to build areas of raised soil in which to plant their seeds and seedlings to more clearly designate planting areas, and to provide plants with plenty of loosened soil in which to grow and thrive. You can do this with simple hand tools like shovels and hoes, or if you have a large space, you may consider using a walk-behind tiller. While traditional rows are a popular choice and help create straight lines of organized plantings, you can also choose to grow in blocks of four square feet or less (small enough that you can reach plants in the middle without stepping in your block and compacting the soil). Raised beds are another great option, especially for gardens that have poor soil, or for gardeners who have difficulty kneeling.

Add amendments - Using the results from your soil test, add the recommended nutrients back into the soil (see page 4 to learn about how to get a soil test). Choose a product that will break down slowly in the soil and continue to provide nutrients to your plants for the entire growing season. Whatever fertilizer you choose, sprinkle it on top of your beds and then gently incorporate it into the soil with a rake or a hoe.

Compost - Even if your soil has a perfect nutrient balance, it's always a good idea to add compost to the soil before every growing season. In addition to adding nutrients to the soil, compost helps increase the soil's level of organic matter, which increases the soil's ability to absorb water. Compost also reduces the need for fertilizer, improves soil quality, helps with disease suppression, and increases crop yield. Before planting, add two inches of compost to the surface of your garden and mix it into your soil with a garden tiller, rake, or hoe. You can make your own compost from kitchen scraps and garden waste, or look for a local source.

Part Two: Starting Seeds

Most crop types can be started either indoors or directly in the garden, and you can choose the method you prefer.

Some people like the process of starting seeds indoors and setting out equally spaced transplants in the garden. Starting seeds indoors and then transplanting also gives seedlings a chance to outcompete weeds in the garden that may germinate alongside seeds sown directly into the garden, rather than waiting for a seedling to emerge along with competing weeds. Some crop types benefit from beginning their lives indoors, usually because they have long growing seasons and need the extra time to mature. Crops that benefit from being started indoors include tomatoes, peppers, kohlrabi, eggplant, ground cherry, and tomatillo. When transplanting any crop, it's best to be very gentle with the plant's roots to prevent what's known as "transplant shock"—ie. the stress a plant goes through when being uprooted and moved from one location to another.

While most crops can be successfully started indoors, some prefer to be direct seeded and would suffer more from transplant shock. These crops include beets, carrots, cucumbers, radishes, corn, okra, beans, poppies, and peas. Transplanting these crops can be especially damaging to their roots, and most gardeners have better luck sowing these seeds directly in the garden.

QUICK TIP

Supplies

The following list of supplies will help make gardening a breeze, but all that you really need to get started is a hand tool, some seeds, and a place to start planting.

To get started: seeds, water source (hose, watering can, irrigation), planting labels, gloves, trowel, compost/fertilizer

To take it to the next level: shovel, rake, hoe, tape measure, row covers (to protect from pests and cold), trellises (for vines like pole beans, peas, and tomatoes), soil thermometer



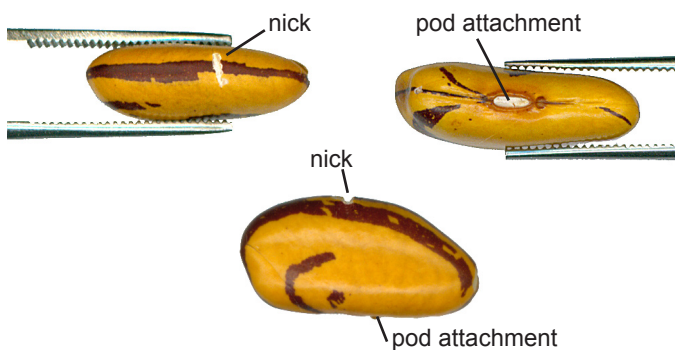
A Note on Surface Sowing:

Some crops need light to germinate, so they need to be sown right on the surface of the soil. Generally, very small-seeded crops need to be on the surface of the soil or just very lightly covered by soil. A few crop types that prefer surface sowing include lettuce, ground cherries, dill, amaranth, flowering tobacco, carrots, parsnip, celery, celeriac, poppies, and many wildflowers.

QUICK TIP

Hard Seeds

Some seeds—like okra, lima beans, and some other types of beans—need extra preparation to germinate successfully. Water has a hard time penetrating their hard seed coats and this can slow or halt germination. To help promote germination, cut a small opening in the seed coat where water can be absorbed (this is called scarification). The best place to nick the seed is opposite the point of pod attachment, and be sure to cut only the seed coat. A deeper cut may harm the seed's growing tissues. Simply use the corner of nail clippers to make a small, shallow cut.



Starting Seeds Indoors

Depending on where they live and how quickly they want to start harvesting from their garden, many gardeners choose to start long-season crops indoors in order to get a jump start on the growing season.

Know When to Sow → Getting the timing right when starting seeds indoors is especially important, because if plants remain in their small containers for too long, they will become root-bound and likely not do well when moved to the garden. The good news is that calculating timing is easy. Refer to the average last spring frost date that you found while doing your planning, and use our “Grow and Save” guides (seedsavers.org/learn) to see how many weeks ahead of that date a crop should be started indoors.



Gather Your Supplies → Having the right supplies makes seed starting easy. You don't need complicated or expensive tools, and you might find that you have most of what you need on hand already. Below are supplies that will help you get started.

Seed trays/containers - If you're sowing many seeds at once, you might opt for a seed tray. You can buy these in many sizes, from four cells to over 100 cells. These typically come in black plastic (which can be sanitized at the end of the season and reused next year) or in a biodegradable material (which can be planted in the soil along with the seedling, or simply composted). You can also upcycle items you have on hand, like serving-sized yogurt containers. Make sure that the containers you choose have drainage holes, or use a drill or punch to create holes if they aren't already there.

Soil mix - Choose a sterile, commercial mix that includes key nutrients. This will give your seeds a good start, and you won't need to fertilize your seedlings for a few weeks.

Water source - When watering seeds and small seedlings, you'll want to make sure the water pressure is gentle, so as not to blast the seeds too deep into the soil or damage the growing plant. Use a hose and nozzle set to a gentle setting, a watering can with a rose end or attachment that will disperse the water more softly, or even a spray bottle to mist crops with small seeds.

Plant labels - Labels are an essential part of any garden. Without them, you may not remember what you planted in which container. You can buy small plastic labels, or use wooden tongue depressors or craft sticks. Use pencil or a permanent marker to record the crop, variety, and planting date, and tuck the labels into the soil in a cell of your seed tray. These labels can be moved with the plants into the garden as well, as knowing what is planted where in the vegetable garden is equally important.



Fertilizer - If you choose a soil mix that already contains nutrients, you may not need to fertilize many of your seedlings until they make it to the garden. However, for crops like peppers and tomatoes that will remain in trays/containers for a long time (six to eight weeks), a liquid fertilizer from your local garden store will give your plants the nutrition they need. Be careful to follow the directions on the fertilizer so as not to over-fertilize your seedlings. You may need to use at half-strength or less when seedlings are young.

Heat mat (optional) - Bottom heat from a heat mat can help speed up germination, which crops like peppers, tomatoes, and melons appreciate.

Grow lights (optional) - While grow lights are optional, many gardeners find that a sunny windowsill does not provide sufficient light for seed starting. In the absence of a greenhouse, grow lights are the best way to start seedlings indoors. You don't need anything fancy, and many gardeners find that fluorescent tube lights work well. Ideally, select one tube that emits warm light and one tube that emits cool light for the best results.

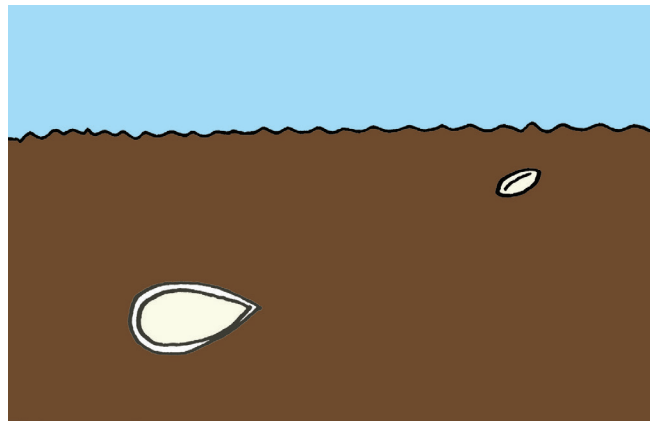
Get Sowing → You've gathered your supplies, you've decided what to start indoors, and you've planned your planting around your region's frost dates. It's time to sow your seeds! Before you fill the seed tray or container with soil, pre-moisten the soil mix. Water the soil mix or potting medium until it is as wet as a well-wrung-out sponge, damp, but not dripping, even if squeezed. Then, fill the cells on your seed tray with soil almost to the top, leaving a little space so that soil won't run off when you water it. Don't pack the soil in too tightly, as compacted soil can lead to poor root growth.

Planting the seed at the right depth is vital, and your seed packets should give you this information. Make small indentations in the center of each seed tray cell before dropping seeds in and covering them up.

After sowing your seeds, you'll need to water them. Generally speaking, seeds only need a few things to germinate: warmth, water, and light (for some species). You've given them a light-drenched, warm spot; now all you need to do is give them water. However, over-watering is more dangerous than under-watering for a seedling, so be sure not to over-saturate the soil.



Large seeds are typically planted deeper than smaller seeds. Refer to your seed packets for specific suggestions.

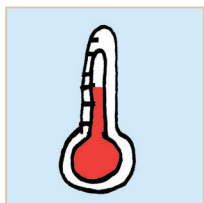


With plants you have surface-sown, you may want to initially use a spray bottle or mister setting on a hose nozzle, so that you don't blast the seeds out of the tray. With surface sowing, it's also especially important to keep the surface of the soil moist during germination. A seed exposed on the surface of the soil will dry out much more quickly than a seed further down in the soil. You can buy plastic dome covers from your local garden store to place over your seed tray in order to help retain moisture on the surface of the soil, but be sure to remove these domes when plants start sprouting to reduce the chance of fungal disease.

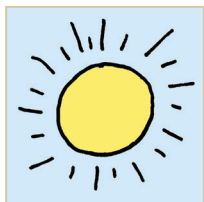


Seeds and seedlings started indoors should be watered only when the soil has begun to dry. If you watered the soil yesterday and return today to find that it's still damp to the touch, wait before watering again. Overwatering can cause root rot and other fungal problems. Roots need to access oxygen, and too much water in the soil can remove air spaces and ultimately kill the plants.

Caring for Your Seedlings → There are a few key steps to take to ensure your seedlings are strong and healthy when it's time to move them out to the garden. Most of these steps involve tending to a plant's basic needs, but some extra care should be taken when tending to young plants.



Temperature - Occasionally, seed packets will include the variety's preferred soil temperatures. While germinating, many seeds like to be warm, so take care to select a warm site for your seeds, or supplement with a heat mat. Generally, soil temperatures should be 60 degrees Fahrenheit or warmer for germination, although some crop types germinate in cooler soils.



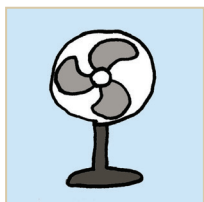
Light - Only a few plants need light in order to germinate, but once the seeds push forth leaves and stems, all plants will need light to continue their growth. While a sunny window may be sufficient, many home gardeners find that additional light is needed. You can use florescent tube lights, suspended a couple of inches above your young seedlings. Be sure the light source is close to your plants, or else they will stretch to reach the light, becoming thin and weak.



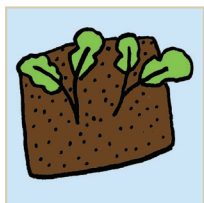
Water - Just as with watering seeds, be vigilant not to overwater young seedlings. As seedlings start to emerge, use a mister or water plants from the bottom by filling your sink or a plastic tub with about an inch of water, and placing your seed trays in the water, so that just the bottom of the seed tray is under water. The water will slowly move up the soil. When you notice that the soil surface has darkened, remove your trays from the water.



Humidity - A warm, humid environment promotes germination. Some people choose to buy plastic domes to cover their seeds, but you can also use resealable plastic bags. Once you notice the first spots of green popping up out of the soil, remove the covering so that plants can get good airflow.



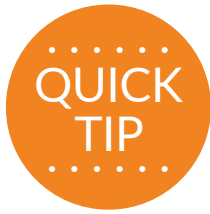
Ventilation - Good airflow is instrumental in preventing disease. As your plants get bigger, consider setting up a small fan near your seedlings. Running the fan on low will accomplish two things: providing airflow and making your plants stronger and better prepared for life out in the garden.



Thinning - It's likely that a couple of seeds snuck into the same cell of a tray when you were sowing. If you notice two or more seedlings have emerged from the same cell, remove all but one of them once they have produced one or two sets of true leaves. If you're very careful, you can gently separate the two seedlings from each other and move one of them to an empty cell, being careful not to damage the roots. Otherwise, use small scissors to cut the extra plant at the soil surface. If you leave both seedlings in the same cell, they will compete for space, nutrients, and water, and neither plant is likely to grow very well.



Fertilizer - Plants need nutrients in order to grow strong. If you're using a commercial seed starting mix, you likely don't need to fertilize for at least one month, as the mix already has nutrients in it. If you're using a peat mix, you'll need to fertilize just after seedlings emerge and leaves appear. Liquid fertilizer, like fish emulsion, is best, as it is easy to apply and produces quick results. Make sure that you read the instructions on the bottle and dilute the mix; too much fertilizer can burn your plants.



Troubleshooting

Refer to the guide below to help diagnose some common problems you might experience with young seedlings.

Symptoms	Causes	Solutions
Leggy plants/spindly growth	• Poor lighting • High temperatures • Overcrowded plants	<u>Poor lighting</u> - You may need to add supplemental lighting. If you have a grow light and are still experiencing problems, be sure the light is only a couple of inches above the seedlings. <u>High temperatures</u> - Reduce the temperature by removing the heat mat or adding fans. <u>Overcrowded plants</u> - Thin plants or move them into larger containers so that they are not competing for space and light.
Withered stem/seedling collapse	“Damping off” - caused by a number of pathogens and most prevalent in wet and cool conditions	Prevent by maintaining good circulation, avoiding overwatering, and ensuring that your soil medium is sterile. Remove any seedlings that have been affected to prevent the problem from spreading.
Poor root growth/root rot	• Poor drainage • Compacted soil	<u>Poor drainage</u> - Be sure to use containers with adequate drainage and don’t overwater. <u>Compacted soil</u> - Be sure not to pack soil too tightly when filling seed trays.
Mold on soil surface	Overwatering	Only water plants when the soil is dry.

RULE of THUMB

About a week before you plan on transplanting seedlings into the garden (time this so that outdoor temperatures have reached a level that is appropriate to that crop -- for many this is past the last frost date), you should begin the hardening-off process. Bring plants outdoors for a couple of hours, in a spot out of direct sunlight and sheltered from the wind. Repeat this each day. A couple of days before planting, leave the plants outside for the entire day and night.



Transplant Seedlings into the Garden → After all of your hard work and likely some troubleshooting along the way, it's (almost) time to take your plants to the garden. Before you do, you'll want to take one last step to ensure that your seedlings have a successful transition to the garden. This step is called "hardening off." During this stage, you want to gradually acclimate your plants—which have thus far been coddled in a warm, stable environment—to the outside environment, where they will spend (and hopefully thrive!) the rest of their lives.

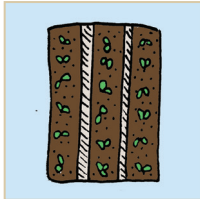
After hardening off, your seedlings are ready for planting. Prepare your garden beds and transplant your crops at recommended spacing (see your seed packet) to ensure each plant has enough space to reach full size. When transplanting, be gentle with your plants' roots. If using a seed tray, lightly squeeze the bottom of the cells to loosen the plant from the tray. If necessary, use a pencil or your finger to gently press on the soil from the hole in the bottom of the tray, which should help ease the plant out. Try to keep as much of the seedling's soil and roots intact when moving it to the garden soil.

Direct Sowing in the Garden

Sowing seeds directly into your garden beds is the easiest and quickest way to garden. While there are some different challenges seeds and young seedlings will face being started outdoors, if you sow a few more seeds than you think you need, you'll have a flourishing garden in no time.

Time Your Plantings → To determine which crop types should be direct-seeded for best results, refer to page 10. Now that you know what you're going to direct seed, it's time to figure out when to sow. Each crop type has a certain time of year that it prefers to be planted, based mainly on temperature (both the soil temperature and air temperature). Refer to your seed packets to know when to plant your selected varieties, or explore our "Grow and Save" guides (seedsavers.org/learn). Some crop types require specific soil temperatures. To see if your soil is warm enough for planting, use a soil thermometer (sold at hardware or garden stores). Check the soil temperature early in the morning to establish the soil's lowest daily temperature. Put the tip of the thermometer at least two inches into the soil. If the reading isn't high enough, hold off planting and check again in a few days. Seeds planted in soil that is too cold are more susceptible to rotting.

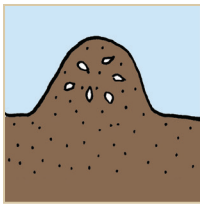
Get Sowing → When soil and air temperatures are right, it's time to start planting. Collect your tools, seeds, and garden plan, and head out to the garden.



If you're planting in prepared rows: Read the recommended direct-seed spacing on your seed packet and follow the instructions suggested there. These instructions often have you sow a few more seeds than you need in case some don't germinate, so don't worry if it feels like seeds are being spaced too closely together. Placing a tape measure across the length of the bed can help you achieve straight lines and get the proper spacing. Be sure to plant seeds at the depth recommended on the seed packet. Depending on the width of your planting area and the crop type, you may be able to fit more than one row in the prepared space. If you're uncertain, stick to one row so that plants have plenty of room to reach their mature size.



If you're planting in blocks: Follow the same instructions listed above for row plantings, but be mindful of the row spacing recommendations so that mature plants don't overcrowd one another.



Hill/mound planting: Some vining crops such as squash and melons can be planted in hills or mounds. Generally, you'll create mounds that are six to eight feet apart from each other in all directions, in order to give the vines plenty of space to spread. Sow six to eight seeds per mound in a circle with a 12-inch diameter, and later thin each mound to leave the healthiest three to four seedlings.



Cut-and-come-again sowings: Some gardeners will plant greens like lettuce, spinach, and arugula closer than recommended, and harvest the plants as baby greens. For this type of planting, you will broadcast (or evenly distribute) the seeds across your planting area, and then very lightly cover your seeds with soil or compost. With this method, you don't have to be precise about plant spacing. The entire area that you broadcast with seed should grow, creating a space filled with greens. When plants have reached a good height (six to eight inches), harvest the greens by cutting them about two to three inches above the soil. The harvested greens are great for salad mixes, and you can return to your garden plot in a week or two and harvest again.

QUICK TIP

Don't Panic!

Some crop types, like carrots and okra, can take two or more weeks to germinate, so if you don't see emerging seedlings right away, don't fret. If you still don't see any evidence of germination in a few weeks, sow a second planting. Be sure to water consistently when soil is dry, as seedlings need consistent moisture in order to germinate.



Caring for Your Plants → After you have sown your seeds, you might be tempted to sit back and relax, but before you do, make sure your seeds have the environment they need in order to grow.

Water - Seeds need water in order to grow, so be sure to water the soil regularly to provide the right moisture level, especially as seeds are germinating.

Manage weeds - Weeds should be removed throughout the gardening season, but weed removal is especially important when plants are young and small. Young seedlings struggle for resources when competing with weeds, so carefully remove the weeds as they appear to ensure your seedlings have the resources needed to keep growing. Pulling weeds while they're young will also help prevent them from setting seed; if you wait until weeds grow tall and produce seeds, they will just create more weeds.



Mulch - Consider putting a thick layer (about three inches) of mulch, like straw, in the aisles and areas of the garden that have not been planted. Not only will this suppress weed growth, it will also help prevent valuable soil from washing away with the rain. Once seedlings have grown a few inches above the soil, it's a good idea to add mulch around their stems for the same reason, being sure to keep the mulch about an inch away from the base of the plants.

Fertilize - After seedlings have established themselves, consider boosting their growth with a liquid fertilizer like fish emulsion. Be sure to dilute the solution as recommended on the bottle's label, and pour the fertilizer on the soil at the base of the plants. (Never pour on top of the plant; fertilizer can burn a plant's leaves.)

Thin - Once seedlings have established themselves, it's time to thin. Thinning simply means removing the extra plants so that the remaining plants are at proper spacing (usually listed on the seed packet) and have room to mature. It's important to thin when plants are relatively small, before their roots are intertwined with one another, and before they have begun competing with one another for resources.



Creating an Abundant Garden

- Plant a variety of different flowers throughout your garden to ensure something is always blooming. This will help attract pollinators for the entire growing season. Pollinators help many flowering plants (such as tomatoes, peppers, and squash) to produce fruit, so they are essential to every garden ecosystem.
- Consider companion planting when planning your garden. Companion planting simply means planting mutually beneficial crops next to one another. Some crops are natural pest repellents for other crops, making them good companions. Other companions may maximize the use of space in the garden. For example, planting a deep-rooted plant such as tomatoes next to a shallow-rooted plant such as garlic helps those plants to use water and nutrients from the soil more efficiently.
- Use all of your garden space, even the borders. Vining flowers can be planted along fence lines to create an attractive border that also attracts important pollinators. Get creative!



Garden Maintenance

As your garden grows and flourishes throughout the season, you'll have some additional tasks to maintain your vegetables, flowers, and herbs, and to ensure a bountiful harvest. Try to stay ahead of weed growth throughout the season by taking a bit of time each day to pull weeds while they're young. Observe your garden closely and you'll be able to catch pest and disease problems before they spread out of your control. Contact your local extension office agent to help you diagnose any issues you may experience with your plants, and to find a method of pest control that works for you. As vining plants stretch and spread, you'll want to provide them the support they need. Adding trellises—structures that plants can climb—helps provide support for your plants, and expands your garden space vertically, saving ground space and allowing you to grow even more plants.

Most of all, have fun! Gardening is a trial-and-error process, so don't worry if everything isn't going as planned right away. With a little practice and a lot of learning along the way, you'll have an abundant garden in no time.



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