

# Family Vegetable Gardening

Container Gardens

Benson Institute



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## SECTION 1: PLANNING CONTAINER GARDENS

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### WHERE SHOULD I PLANT MY GARDEN?

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- Your garden should be close to home or work and easily accessible. You'll soon grow tired of commuting to a distant location.
- If you have no usable soil, you can build open-bottom containers on top of almost anything—even driveways, patios, and roofs.
- Choose a location that receives full sunlight all day long (or at least from mid-morning through the afternoon).
- Avoid trees, buildings, tall fences, hedges, and bushes that would block out the sun. Shade retards plant growth.
- For better results and less work, choose a level area. A slight southern slope (toward the sun) is ideal.
- Avoid north slopes (away from the sun). They have more shadows, less direct sunlight, and are sometimes too cold.
- If your ground is on a hillside, plant on the contour. Always level the ground under the containers.
- Locate your garden near a readily available source of good water.
- *Do not* use low spots where drainage is poor. Plants must have oxygen and will suffocate in standing water.
- Avoid windy areas, or build windbreaks. Tender plant leaves are easily damaged by strong winds.
- Fence the area to protect against animal and human intruders. If small animals are a problem, use wire mesh at ground level.

## HOW BIG SHOULD MY GARDEN BE?

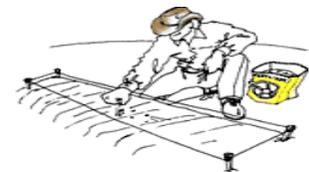
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- Available sunny space often dictates the size of your garden. A small, well-tended, sunlit garden will yield more than a larger garden in poor conditions.
- Container dimensions:
  - For two rows of plants, containers are ideally 10' long, 18" wide, and 8" high.
    - Placing two rows of plants close together reduces watering and fertilizing by 50%.
  - Include a 3' to 3 ½' aisle between containers, and at least one end aisle of 5'.
    - Wide aisles give ready access to plants for feeding, watering, inspection, and harvesting.
- Start small and provide regular care, and your success will give you the training and incentive to increase your garden size.

## HOW SHOULD I ARRANGE MY PLANTING AREA?

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- First create a blueprint of your garden area on scaled grid paper, showing the number, location, and size of your containers.
- Orient your containers for maximum advantage of sunlight, watering, and access.
- As you place plants on your blueprint, put tallest varieties on the north and east sides. Never shade short plants with taller ones.
- If necessary, place leafy crops, such as lettuce and spinach, in locations with less optimal sunshine.



## WHAT SHOULD I PLANT?

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- Choose varieties that do well in your climate. If you live in a cooler northern climate, do not try to grow long-season crops like peanuts or sweet potatoes.
- Plan for only those vegetables that your family will eat, and only in quantities you can use, preserve, give away, or sell quickly, while fresh.
- Single-crop varieties like lettuce, broccoli, and cauliflower mature all at once, and so must be used quickly. Don't grow too much of these!
- Ever-bearing crops like pole beans, cucumbers, eggplant, peppers, squash, and tomatoes mature a little at a time, feed you all season long, and have a high value for the amount of space used, especially if grown vertically.
- Single-crop varieties that are grown for storage may be important for your winter emergency preparedness. Consider fall potatoes, cabbage, onions, winter squash, and carrots. Cool storage (40–50 degrees Fahrenheit) will preserve these vegetables.
- You can grow two crops of many single-crop varieties if you learn to grow and transplant healthy seedlings.

## WHAT IS THE EXPECTED YIELD?

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One ten-foot long container, if properly cared for, will produce the following amounts of vegetables in a growing season:

Variety	# Plants	Yield
Potatoes: 8" apart, both sides of bed	32	50-100#
Beans, bush: 3" apart, both sides, 2 crops	82 X 2	50- 70#
Beans, pole: 2" apart, one side of bed	122	60-100#
Cabbage: 12" apart, both sides, 2 crops	22 X 2	75-130#
Corn: 8" apart, both sides, 2 crops	32 X 2	60-75ears
Eggplant: 8" apart, one side of bed	16	80-160#
Lettuce, head: 12" apart, both sides, 2 crops	22 X 2	75-130#
Peppers, sweet: 12" apart, both sides	22	60- 90#
Squash, zucchini: 21" apart, one side	7	75-200#
Tomatoes: 8" apart, one side of bed	16	150-300#

**Important Note:** With just ten 10'-long containers, or 500 square feet (just over 1/100<sup>th</sup> of an acre), your family can produce from **700#** to **1,300#** of fresh produce!

## WHEN SHOULD I PLANT?

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- Proper planting time depends on your garden's climate and growing season.
  - Your growing season is related to the time between the last spring frost and the first fall frost.
  - Planting time is determined by (1) the average date of last frost and (2) the hardiness—or frost tolerance—of the crop you're planting.
    - Find out the *average day of last frost* for your garden area from your County Extension Office or a computer database.
- Vegetable plants are classified into 4 levels of hardiness:
  - **Hardy** plants can handle frost and cold, and can be planted three to six weeks before the average last frost date.
  - **Moderately hardy** plants handle some cold and very light frost. These can be planted two to three weeks before the average last frost date.
  - **Cold and frost-sensitive** plants do not do well with cold weather or frost. Plant these on the average last frost date.
  - **Frost intolerant** plants will be killed by any frost, and must be planted two to three weeks after the average last frost date.
- You can extend your growing season and greatly increase your yield by transplanting healthy seedlings into your garden on the recommended planting dates.
- The following table lists common vegetables according to their frost tolerance. Just insert your area's *average last frost date* to know the recommended planting dates for each plant in your garden.

## Plant Hardiness (Frost Tolerance) & Planting Times

<b>Plant Type</b>	<b>Hardiness</b>	<b>When to Plant</b> Based on Average Day of Last Frost (ADLF)
Beans, bush & pole	frost-sensitive	On ADLF
Beets	moderately-hardy	2-3 weeks before
Berries	moderately-hardy	2-3 weeks before
Broccoli	hardy	4 weeks before
Cabbage	hardy	4 weeks before
Carrots	moderately-hardy	2-3 weeks before
Cauliflower	hardy	4 weeks before
Celery	moderately-hardy	2-3 weeks before
Chard	moderately-hardy	2-3 weeks before
Corn	frost-sensitive	On ADLF
Cucumbers	frost-intolerant	2-3 weeks after
Kohlrabi	hardy	4 weeks before
Lettuce, leaf & head	hardy	4 weeks before
Melons	frost-intolerant	2-3 weeks after
Onions, green & bulb	hardy	4 weeks before
Parsley	moderately-hardy	2-3 weeks before
Parsnips	moderately-hardy	2-3 weeks before
Peas, bush & pole	hardy	4 weeks before
Peppers	frost-intolerant	2-3 weeks after
Potatoes	moderately-hardy	2-3 weeks before
Radishes	hardy	4 weeks before
Spinach	hardy	4 weeks before
Squash	frost-intolerant	2-3 weeks after
Tomatoes	frost-sensitive	On ADLF
Turnips	moderately-hardy	2-3 weeks before

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## WHAT TOOLS DO I NEED?

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- A long-handled irrigation (or round-headed) shovel is important for initial soil preparation and to remove perennial weeds and their rhizomes.
- A strong 12"- or 14"-wide garden rake is good for removing weeds and leveling the soil, as well as for mixing and leveling the custom-made soil in the containers.
- A two-way hoe, sometimes called a scuffle or hula hoe, is best for early weeding of small weed seedlings in the aisles. It cuts them off just below the soil surface with very little movement of the soil. Container gardens rarely require weeding.
- If you're watering by hand, a garden hose with a gentle watering wand will let you water quickly without washing out the custom-made soil from your containers.
- Plant-spacing markers save time and give your garden a professional look while providing equal light, water, and nutrition to each plant. Two rows of ½" dowels, spaced 6" and 7" apart, will help you plant most varieties properly.
- A wheelbarrow or large cart is useful for larger gardens.



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## HOW SHOULD I PLAN MY TIME?

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- Schedule the time to create and grow your garden. Like a cow that has to be milked twice daily, your garden needs daily care and attention to produce a high yield of healthy crops.
- Make a garden calendar and list the projects that need attention. That way you will not forget important things like planting dates.
- Plan on these time estimates for a garden of ten container beds that are each 10'-long:
  - Six to eight hours to clear the area, construct containers, and make aisles.
  - Four to six hours to prepare the custom soil, apply fertilizers, plant seeds, and transplant seedlings.
  - Twenty minutes per day, preferably in the early morning, to water, feed, prune, and otherwise care for your plants.
  - Two to ten minutes per day to harvest, depending on what and how much you are harvesting.

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## SECTION 2: PREPARING CONTAINER GARDENS

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### HOW DO I PREPARE MY GARDEN?

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- Clear your garden area of everything—whether living or dead—including trees, shrubs, bushes, flowers, grass, and trash.
- Eliminate weeds, both annual and perennial.
  - Annual weeds can be plowed under or removed with a shovel, rake, or hoe.
  - Perennial weeds continue growing year after year. These must be removed—roots, rhizomes (underground stems), and runners. Otherwise they will be a constant problem.
- Measure and stake the corners of your garden as planned. Make sure your dimensions fit the number of containers you want to have.

## HOW DO I BUILD THE CONTAINERS?

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- Effective containers can be made from wood, cinder blocks, concrete, or another long-lasting material. Directions for building wood containers:
  - After identifying the location of your containers, level the ground under each container area.
  - Place stakes and string to outline the exact container locations.
  - Nine inches from the end of one side, drive 18"-long stakes nine inches into the ground every 30 inches, on the outside of the string.
  - Place a 1" X 8" or 2" X 8" board (preferably painted or treated) along the string against the stakes for the length of the container.
  - Drive the first stake into the ground until the top is flush with the top edge of the board, then nail the stake to the board.
  - Place a level on the top edge of the board and adjust the height of the board until it is level along the entire length.
  - Adjust other stakes to be flush with the board; then nail all stakes to the board.
  - If your container is longer than your board, nail a 12"-long 1" X 8" board on the inside across the joint where two boards meet.
  - Nail an 18" end-piece to each end of the leveled side board (or 4' end-pieces can also be used for containers with two sets of two plant rows).
  - Drive a stake nine inches into the ground at the center of both end-pieces, level the end-pieces, make stakes flush with the tops, and nail stakes to the end-pieces.
  - Place opposite side-board against end-pieces, check for levelness, then drive stakes flush with the side-board, and nail in place.
- Tools and materials you will need:
  - Claw hammer
  - Three-pound hammer
  - Level (two feet long)
  - String
  - Pointed stakes, 18"-long, 1" X 2"-wide
  - Wood or other materials for making the container sides and ends

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## WHY CUSTOM-MADE SOIL?

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- Custom-made soil is designed to perform all of the functions of an ideal natural soil, using inert and clean organic materials such as perlite, sand, peat moss, sawdust, etc.
- Advantages of custom-made soil include the following:
  - Provides excellent drainage and aeration for roots, and balanced feeding for plants.
  - Keeps subsoil damp and soft, allowing roots to penetrate and obtain additional minerals.
  - Allows for earlier planting, since it warms up sooner in the spring.
  - Keeps roots cool, helping plants to thrive in hot weather.
  - Virtually eliminates weeds, if built and cared for properly.
  - Saves water because organic materials hold water longer and better than most mineral soils.

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## HOW DO I PREPARE CUSTOM-MADE SOIL?

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- A good soil mix should be between 25% and 35% clean concrete sand (medium coarse).
- Inert materials such as perlite and vermiculite can be a part of the other 65% to 75%.
- Numerous clean organic materials can also be used—alone or in combination. Examples include sawdust, peat moss, ground-up pine needles, tree bark or coconut coir, and rice hulls.
- Sawdust from most kinds of wood is safe to use, even fresh from the saw. Avoid walnut as it is harmful to tomato and other nightshade plants.
- Do not include wood shavings; they are too coarse, do not hold or provide water and nutrients, and sometimes turn sour.
- Keep a record of the soil mix you have chosen, comparing your results year by year until you find the ideal mix for your garden.

## HOW DO I PROPERLY FILL THE CONTAINERS?

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- Rake the soil at the bottom of the container to make it level and flush with the bottom edge.
- Mix your choice of ingredients thoroughly on a clean dry surface, or in the container.
- Apply one ounce of calcium per running foot to the soil at the bottom of the container. Use gypsum if you receive less than twenty inches of annual rainfall, and lime if rainfall is more than twenty inches. Ideally, this “pre-plant” application should consist of a mixture of calcium, Epsom salt, and borax in a ratio of 80:4:1, respectively.
- Spread custom soil in the container in shallow layers, and water to make a damp mix.
- Because the custom-made soil has almost no natural fertility, you must supply all the nutrients your crops will need, as instructed:
  - As you fill the container with soil, apply another 1 ounce of “pre-plant” plus ½ ounce of a balanced nutrition mix per running foot to the container. Instructions for making these are in the [Feeding Container Gardens](#) section.
  - Use a rake or shovel to mix the materials and fertilizers together.
  - Fill the container level-full only; a crown would encourage water run-off and make watering difficult.
  - Water thoroughly, and sprinkle again before planting to keep moisture in the soil surface.

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## SECTION 3: WATERING CONTAINER GARDENS

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### HELPFUL TIPS ABOUT PLANTS AND WATER

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- A plant is a continuous water pipe from the tip of the deepest root to the end of the tallest leaf.
- More than 80% of a plant's weight is water. The plant must have constant access to water at its roots.
- Water keeps the plant from wilting and carries nutrients from the soil through the roots to the plant.
- Dry fertilizer is not useful until it's dissolved, so the nutrient compounds must be water-soluble.
- Plants stay cool by transpiration. Plants with a larger leaf area require more water for transpiration.
- Soils are not dams for storing water; therefore frequent small waterings are better than a flood once each week.



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### WHAT IS THE BEST WAY TO WATER CONTAINERS?

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- A hose and rag is not a very effective way to water containers, since water won't travel the length of the container, but instead drains to the bottom.
- Manual watering with a watering wand applied to the soil surface, and not on plant leaves, is effective.
  - Sprinkling is a very inefficient method of watering. It wastes water, encourages weed growth in the aisles, and promotes fungus diseases such as mildew and mold.
- Repeat for every container. After the first watering this should take less than 5 minutes per bed.
- Automate your watering with drilled holes in PVC pipe for the quickest and most efficient system of watering containers.
- Water the beds daily unless you receive a soaking rain.
- The best time to water is early in the morning. But if your plants need water, do it any time. Don't wait!

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## SECTION 4: FEEDING CONTAINER GARDENS

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### WHY FERTILIZERS?

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- Fertilizers are essential-mineral raw materials from which plants make food.
- Custom-made soil has little natural nutrition, so adding small amounts of balanced nutrition guarantees plants receive what they need.
- Plants, like people and animals, need balanced nutrition. Plant nutrition consists of 16 nutrients, 3 of which come from the air.
- The 13 mineral nutrients man can supply are abundant throughout the earth, and are mined for use as fertilizers.
- Mineral fertilizers are classified as major, secondary, or micro nutrients, depending on how much of each the plants use:
  - Major Nutrients
    - Nitrogen (N)—gives green color, rapid growth, high protein, and yield.
    - Phosphorus (P)—affects early vigor, healthy roots, and quality.
    - Potassium (K)—produces healthy plants, and high-quality seeds and fruit.
  - Secondary Nutrients
    - Calcium (Ca)—promotes early root growth, high vigor, and seed formation.
    - Magnesium (Mg)—associated with chlorophyll, oil, and fat formation.
    - Sulfur (S)—aids in root growth, green color, and seed production.
  - Micro Nutrients or Trace Elements
    - Zinc (Z)—aids chlorophyll formation.
    - Boron (B)—increases yield in root crops, affects seed germination and terminal bud formation.
    - Manganese (Mn)—aids seed germination and vigor.
    - Iron (Fe)—associated with chlorophyll formation.
    - Copper (Cu)—affects enzyme systems in new tissues.
    - Molybdenum (Mo)—vital to nitrogen fixation by microorganisms, and nitrogen processes in plants.
    - Chlorine (Cl)—essential for healthy plant growth.

## WHAT FERTILIZERS ARE BEST?

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- The minerals used by plants are the same whether they come from compost, organic matter, or fertilizer from a bag. On a molecular level, nitrogen is nitrogen, regardless of its source.
- Plants need an accurate and proper balance of all nutrients. Remove guesswork from your feeding by using just what's needed.
- Twelve of the thirteen nutrients that plants get from the soil occur naturally in the soil and are mined, packaged, and sold commercially.
- Mined minerals are concentrated, so we know what we are buying, and have been cleansed of impurities and heavy metals.
- Mix the nutrients according to the needs of most vegetable plants, and then apply small amounts to the soil; this assures none pollutes the water supply or is wasted.
- You can find a recommended amount of fertilizer for your plants, wherever mineral nutrients are available.
- Calcium is as important for plants as it is for humans, but it's often neglected in the small garden. Before planting, mix 1 ounce of calcium per foot into your soil-bed. The recommended mix is 80 parts calcium, 4 parts magnesium, 1 part boron.
- Small amounts of the other minerals are also applied (1) before planting and (2) weekly after plants emerge. A temporary weekly mix includes six pounds of 16-16-16 (NPK), one pound of Epsom salt (magnesium sulfate), and one teaspoon 20 Mule Team Borax (boron). Each application is ½ ounce per foot.
- If packaged minerals are not available, compost and manure can be used. Avoid unsterilized material, as it may introduce weed seeds, bugs, and disease into your garden. Mix ½ inch into the soil surface before planting, and ¼ inch biweekly after plants emerge.



## WHEN SHOULD I APPLY FERTILIZER?

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- Plants need constant nourishment throughout their growth cycle. Therefore regular, small feedings produce larger, healthier crops for a longer time.
- Because it's easier, many families apply several inches of manure or compost to their garden only once—before planting. But fertilizers are salts, so germinating seeds and small plants can be burned by too much of a good thing.
- Also, if not used by the plants, nutrients are leached out of the soil with repeated watering, and after only a few weeks the plants are hungry.

## HOW MUCH AND HOW OFTEN SHOULD I FEED MY GARDEN?

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- Before planting, spread 1 ounce “pre-plant” mix and ½ ounce (1 tablespoon) balanced nutrient mix per foot of container row, and mix with the soil.
- When plants emerge apply ½ ounce per foot of balanced mix down the center of the container, at least four inches from the plant stems.
- Water after feeding to dissolve the minerals and make them available to plant roots.
- For transplants, apply ¼ ounce of nitrogen per foot immediately after transplanting, and water thoroughly.
- Feed your plants weekly until three weeks before maturity for single-crop varieties, and until eight weeks before frost for ever-bearing crops.

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## SECTION 5: WEEDING CONTAINER GARDENS

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### WHEN SHOULD WEED CONTROL BEGIN?

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- Properly prepared containers require very little weeding.
- Using clean, weed-free materials for your growing medium is essential. Do not use soil, dirty sand, compost, or manure.
- There are two main types of weeds:
  1. Perennials, which grow for many years from rhizomes (underground stems) and runners (above-ground stems).
  2. Annuals, which grow from new seeds every year.
- There are two main times to control weeds:
  1. While preparing your garden soil before planting: remove all weeds, including perennial rhizomes and runners.
  2. Immediately after weeds sprout, usually 7–10 days after planting your vegetable crop: weed thoroughly now!

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### HOW CAN I PREVENT WEEDS?

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- Using a non-soil growing medium is one of the best ways to prevent weeds in your garden.
- Other ways of preventing weeds from getting into your containers include:
  - Irrigating with well water, the culinary water supply, or filtered water.
  - Maintaining a wide weed-free perimeter around your garden. Weed seeds often travel through the air.
  - Staying out of the containers. Shoes can carry weeds and diseases.
  - Removing all weeds from the aisles when they are small and before they produce seeds.

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## SECTION 6: HARVESTING CONTAINER GARDENS

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### HOW CAN I PROTECT THE HARVEST?

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- Keep crops off the ground to prevent spoilage and pest problems.
- Allow crops to ripen on the vine, but pick immediately when mature.
- Harvest in the early morning, while it is cool.
- Handle produce gently to prevent bruising.
- Remove dirt and outer leaves if necessary, and clean thoroughly.
- Package, remove from the garden, and cool promptly.
- Use while fresh for maximum flavor and quality.

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**WHEN SHOULD I HARVEST?**


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<b>Variety</b>	<b>Optimum Harvesting Time</b>
Beets – leaves	While young and tender
Beets – bulbs	While bulbs are solid and crisp, before becoming woody
Broccoli	When heads first begin to loosen, before flowers appear
Cabbage	After heads become solid, and before they split
Cantaloupe	When the stem end separates easily from the vine
Cauliflower	When heads first begin to loosen, before flowers appear
Chard	While leaves are tender
Corn	After kernels develop, while they still have milk
Cucumber	Before seeds develop
Potatoes – New	While the skin slips easily
Potatoes – Storage	After leaves and vines dry
Radishes	Before bulbs are pithy – best in cool weather
Squash – zucchini and yellow	While smaller, and before seeds develop
Tomatoes	When full color is reached
Turnips	While bulbs are solid and crisp

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## SECTION 7: ADVANCED GARDENING TOPICS

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Advanced gardening topics you might be interested in researching:

- Growing vertically to maximize yield in minimum space
- Automating your watering
- Understanding fertilizers
- Recognizing nutritional deficiencies
- Solving soil problems
- Controlling destructive insect
- Producing your own seedlings
- Common plant diseases and what to do
- Cold-weather gardening—extend your season