



# Vegetable Gardening in Containers

## Instructor's Guide

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## Notes to Instructors

- 1) This curriculum includes portions of two Texas A&M Agrilife Extension publications as well as new material. For full details please see Acknowledgments at the end of this document.
- 2) You may also find it helpful to consult our three-part Backyard Gardening Curriculum for North Texas, which includes lessons on "Soils & Compost," "Planning & Planting," and "Tending & Harvesting." You can download this curriculum under the Backyard Gardens tab at <http://www.tarrantcountyfoodpolicycouncil.org/cgua-working-group.html>.
- 3) Feel free to add or cut material from this curriculum to suit your students' needs.
- 4) The more hands-on activities you can incorporate in your teaching, the better. Don't feel limited to just the one we suggest below.

## Purpose of Workshop

This workshop focuses on how to successfully grow vegetables in containers. But one can also raise herbs and flowers in containers using many of these same principles.

## Active Learning

We recommend instructors teach so as to encourage active learning by students. From this perspective, the primary role of the instructor is to facilitate dialogue among the students, rather than merely lecturing to them. By frequently asking questions that require thoughtful responses from students, and that also ideally encourage discussion among them, instructors can help students participate more actively in the workshop, and therefore learn better. We have included a few such questions below, but we hope instructors will add many more of their own, tailored to the particular audiences (ages, knowledge levels, etc.) and contexts in which you are teaching.

## Lesson Overview

Introduction

Outline

- A. Containers
- B. Soil Preparation
- C. Seeds vs. Seedlings
- D. Fertilization
- E. Watering
- F. Light
- G. Choosing What to Grow
- H. Care Tips for Vegetables in Containers
- I. Common Problems in Container Gardening
- J. Harvesting and End of Season Cleanup
- K. Container Gardening Success
- L. Potting Activity

Resources

Acknowledgments

### Learner Objectives for Education

- Identify if and why a container gardening model suits your food growing needs.
- Understand ideal container growing conditions and characteristics.
- Understand how to buy or mix your own container garden soil.
- Understand how to plant seeds and seedlings in containers.
- Identify how and when to fertilize and water container plants.
- Select the appropriate crop varieties for our region and the season.
- Identify and address common problems.
- Know how to harvest and finish out a season through evaluation.
- Know the keys to success.

### Learner Outcomes for Activities

- Successfully mix soil preparation.
- Be able to plant vegetables or herbs in a container.

### Before the Workshop Begins

- Read through the entire lesson plan to understand activities and learning objectives before participants arrive.
- Adapt the workshop as needed for the specific audience and context in which you will be teaching it.
- Assemble materials for container garden planting.
- Assemble folder for participants that includes:
  - Handout 1: Ideas for Containers (NOTE: it would be best to print this handout in color)
  - Handout 2: Vegetable Planting Guide for North Texas
  - Handout 3: Appendix of Reference Tables

### Workshop Outline

Time	Lesson Format	Key Messages & Discussion	Instructor
10 mins	<b>Introductions</b>	Introduce instructors and lesson topics; ask students to introduce themselves and say why they want to learn container gardening.	
50 mins	<b>Lesson Content</b>	Discuss container benefits, features, and considerations. Discuss mixing soil and selecting location based on light needs. Explain planting seeds vs. transplants and hardening off. Discuss watering and fertilization needs. Discuss crop variety selection for our region. Discuss how to care for container plants and how to address common plant problems. Explain harvesting and evaluation techniques. Present care tips for best success.	
10 mins	<b>Activities</b>	Potting Activity	
10 mins	<b>Evaluation</b>	Instructors should ask questions of the participants to determine	

		what they have learned.	
10 mins	<b>Conclusion</b>  <b>Q &amp; A</b>	Participants will understand: <ul style="list-style-type: none"> <li>• How to select an appropriate container for their space</li> <li>• How to mix a rich soil blend</li> <li>• How to select proper seed and plant varieties</li> <li>• How to plant seeds and seedlings</li> <li>• How and when to fertilize and water</li> <li>• How to harvest and evaluate</li> </ul>	

## Introduction

Begin by introducing the instructors and asking the students to introduce themselves.

**Ask: How many of you have gardened before? (show of hands)**

**How many of you have tried growing in containers? (hands) Would anyone be willing to share their experiences? (pause)**

**If you have never gardened in containers before, what has gotten you interested in doing so?**

If your vegetable gardening is limited by insufficient space, consider raising fresh, nutritious, homegrown vegetables in containers. A sunny windowsill, patio, balcony, or doorstep will provide sufficient space for a mini-garden. Problems with diseases, nematodes (microscopic plant parasites), or poor soil conditions can be easily overcome by switching to a container garden. Easy access to containers means that pest management is easier. Container gardening is also a fun way to introduce children to the joys of vegetable gardening.

## A. Containers

### Why containers?

- Easier to pick a spot for your vegetable garden
- Limited space
- Limited time to care for a garden
- Unsuitable area (e.g., poor soil)
- Fewer disease and pest problems

### Features

Most vegetables do best in full sun (at least 6 hours per day).

Tomatoes, peppers, and other varieties that often get diseases usually stay healthiest in an open spot with plenty of air circulation.

Be careful about setting your container gardens on a cement patio, which may grow too warm for optimum growth. Put larger containers on dollies or carts; you can then move them to various

locations depending on the weather conditions (e.g., you can bring the containers inside if there is a freeze warning).

A few important features to note:

- Happily, most plants aren't fussy about what kind of container they grow in. The only basic requirement is that the container be large enough to hold the plant and that it has drainage holes so that excess water can escape.
- When it comes to size, the bigger the pot, the better, especially for beginners. The reason for this is that large pots hold more soil, and thus hold moisture longer, requiring less watering.
- Look for containers that are at least 10 inches wide and 12 inches deep. Large flowerpots, half barrels, plastic-lined bushel baskets, window boxes, planters, and 5-gallon buckets work just fine.
- Some vegetables need particularly large pots to grow well in a container garden. Standard-size tomatoes and vining crops, such as cucumbers, will do best in large containers 20 inches or more across. Peppers like pots at least 16 inches in diameter. But in a pinch, most will still grow in a 5-gallon or larger container.
- Plant nurseries often have 30-gallon plastic tree containers that they might sell for a nominal price if you ask them.
- If your container does not have drainage holes, you will need to add several. Use a 1/2-inch drill bit to create holes in the bottom or along the sides near the bottom, or punch holes with a large screwdriver. Line the bottom of the pot with screen or landscape cloth to prevent soil from spilling out of the holes.
- Plants that grow tall or produce vines, such as tomatoes and cucumbers, will be more productive if grown on a support in a vegetable container garden. A wire cage, inserted into the container at planting time, will do. Use larger, heavier containers for trellised plants to minimize the risk of tipping.

### Type and Size

**Ask: Let's brainstorm about different things that can be used as garden containers. What are some old standards? What are some newer ideas? How creative can you be?**

- Not sure what type of container to grow your vegetables in? Don't fret--typically, you'll care more about this than your plants will.
- In general, plants in terracotta (clay) need more watering for a vegetable container garden than other types of pots, because of the porous nature of the terracotta.
- Avoid containers made of treated wood (such as railroad ties) since they may contain toxic chemical compounds that could be absorbed by your vegetables (and then you!).
- Also think about the color of the container. Dark colors absorb heat. They may make the soil too warm for some vegetable crops in summer.
- A "tube" or bag garden is a cheap and easy way to grow vegetables in a container. See, e.g., Jean Nick's article on bag gardens at <http://www.rodalorganiclife.com/food/growing-vegetables-bags>.

- Show students the handout in their packets “Handout 1: Ideas for Container Gardens.” If you have access to a Powerpoint projector, you might display some photos of creative containers.

### Drainage

- The practice of filling the bottom of your containers with broken pot shards, pea gravel, or rocks actually impedes drainage and adds extra weight. Such “crocking” is no longer recommended.
- For very large containers try lightweight packing pearls. They raise the bottom of the container, reducing the amount of soil you need. Or you could turn a smaller pot upside down in the bottom of the large container to take up space.
- You may also want to put a saucer wider than the base of the container underneath it to catch excess water, especially if your container is indoors.

## **B. Soil Preparation**

As is the case with most other types of container gardens, your vegetable container garden will do best in potting mixes made for containers. Ask for them at your local nursery or home improvement store.

### Buying or Mixing Your Own

Any growing medium must provide water, nutrients, and a physical support to grow healthy plants. A good growing medium must also drain well.

*Synthetic or soil-less mixes* are well suited for vegetable container gardening and may be composed of peat moss, perlite, or vermiculite, or other materials. These are free of disease and weed seeds, hold moisture and nutrients, but also drain well and are lightweight. Many synthetic soil mixes such as Jiffy Mix<sup>®</sup>, Bacto<sup>®</sup>, Promix<sup>®</sup>, and Jiffy Pro<sup>®</sup> are available at garden centers.

Soilless mixes can also be prepared by mixing horticultural grade vermiculite, peat moss, expanded shale, superphosphate, and garden fertilizer. To about two 5-gallon buckets each of vermiculite and peat moss, add a little less than 2/3 cup (10 Tbs.) of expanded shale, a little less than 1/3 cup (5 Tbs.) of 0-20-0 (superphosphate), and 1 cup of slow-release garden fertilizer such as 6-12-12 or 5-10-10. Mix the material thoroughly while adding a little water to reduce dust. Wet the mix thoroughly before planting.

*Soil mixes* are made up of equal parts of sphagnum peat moss or compost, pasteurized soil, and vermiculite or perlite. A small amount of composted cattle manure or coffee grounds should also be added to soil mixes at planting time to improve the soil’s physical properties and as a nutrient source. Soil mixes tend to hold water better than soilless mixes.

You can save money by blending your own vegetable container garden mix. Use equal parts of peat moss, potting soil, and vermiculite, perlite, or expanded shale, and add a little composted cattle manure. Fill the containers to within an inch or two of the rim.

To determine how much potting mix you'll need, figure:

- 3 pints of mix per 6-inch pot
- 3 1/2 gallons of mix per 12-inch pot
- 6 1/2 gallons of mix per 20-inch pot

If you keep your containers well watered, it is not necessary to mulch them. However, it can be useful to add mulch above the soil mix if you will be growing your plants during hot and dry times of the year, when the soil tends to dry out quickly. Mulch can also reduce the amount of weeds, and frustrate digging pests like squirrels.

If you choose to add a layer of mulch above the soil in your container, make sure to keep it at least 6 inches away from vegetable plants (herbs are less fussy). Also, if you are growing plants from seeds, you should wait until they have gotten at least a couple inches high before adding mulch. Finally, keep in mind that hardwood mulches do not decompose and may retain chemicals, so if you use them, you should only use them for a year. Pine mulch is a good choice, since it decomposes after a year.

You can buy pine bark and other mulches at any nursery or home improvement store. Many cities also offer free wood chip mulch if you go and pick it up yourself; for pickup sites in Fort Worth, see <http://fortworthtexas.gov/forestry/free-mulch/>.

### C. Seeds vs. Seedlings

Plant your vegetable container gardens at the same time you would plant in the yard (see Handout 2: Vegetable Planting Guide). Depending on what types of vegetable you want to grow, you can start seeds directly in your containers, grow transplants from seeds started indoors, or purchase transplants from a garden center.

**Helpful hint:** Start vegetables such as beans, carrots, radishes, and spinach from seeds sown directly in the container.

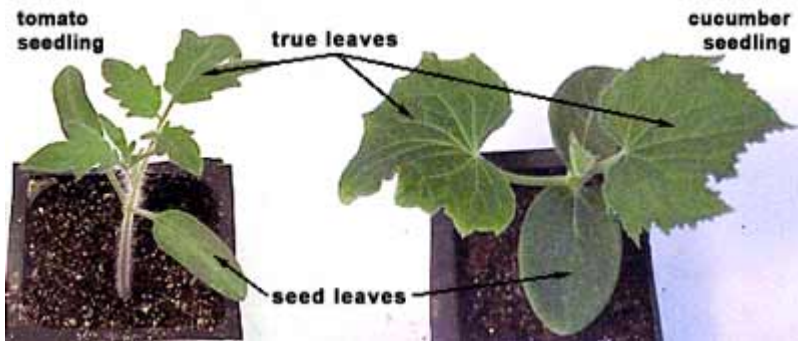
Regardless of whether you are planting seeds or transplants, thoroughly water the container before you plant. Soak the potting mix completely, then allow it to sit for a few hours to drain excess water. But be careful not to keep seeds and seedlings too moist while they grow, or they may suffer from "damping off" caused by fungi.

Plant seeds according to the package directions. Because not all seeds will germinate (sprout), plant more than you need, then thin the excess later by cutting and removing the weakest-looking plants with scissors. Don't try to pull them out, or you may damage the roots of the plants you want to keep.

In general, set transplants at the same level they were growing in their pot. However, for tomatoes, you should strip off their lower leaves and plant them deeper in the container.

After planting, water gently but thoroughly to settle the seeds or transplants. You can keep the soil in your vegetable container garden from drying out as fast by mulching with straw, compost, leaf mold, shredded bark, or a similar material on top of the soil (see section B above).

If you want to grow your own seedlings, plant seeds in a warm area that receives sufficient light about 4 to 8 weeks before you plan to transplant them into the final container. (You can direct students to your favorite seed starting guides online. For example, Gardener’s Supply Company has one at <http://www.gardeners.com/how-to/how-to-start-seeds/5062.html>.) Most vegetables should be transplanted into containers when they develop their first two to three true leaves (see photo below). Transplant the seedlings carefully to avoid injuring the young root system. (See Table 2 in section G below for information about different kinds of vegetables.)



**Helpful hint:** If you start your own seedlings, covering your tray loosely with a plastic bag or dome is a great way to keep the soilless mix moist. Remove after seeds germinate.

### Transition from Pot to Garden

For plants, good transplanting practices soften the transition from the pot to the garden. For people they open the door to an earlier harvest and a more successful garden. To successfully transplant seedlings you’ve started indoors or purchased at a nursery into the garden, follow these four steps:

1. Harden off plants: Introduce seedlings to bright light and breezes gradually, ideally over a period of one to two weeks. You can begin by setting your seedlings outside in a sheltered spot for one or two hours per day, then four hours per day, etc., gradually increasing their exposure to light and air movement. Watch your seedlings closely for signs of drying out, and be ready to shift them to larger containers if you see roots sneaking out of drain holes.
2. Prepare to transplant: While your seedlings are hardening off, prepare soil by adding compost and mixing in your favorite organic fertilizer. After hardening off for a week, plant when the soil temperature is just right for the variety you are planting (see Handout 2: Vegetable Planting Guide). Delay planting if a heat wave is on the way or if the soil is clammy and cold. Drench the transplants with a weak solution of organic fertilizer just before removing them from their plots.
3. Handle with care: Push the plants out from the bottom of their containers, rather than pulling them out by their stems. Place the main stem between your fingers, tip the plant over, and shake or tap to loosen the root ball. As you plant the seedling or transplant use the lowest



leaves as handles. It is best to keep the soil packed around the root ball if possible. Exceptions are seedlings whose roots have grown into a solid mass; in that case you should use a fork or your fingers to tease out a few outer roots. Finish the transplanting process by drenching the soil with water; this encourages the soil's microorganisms to move into the plants' root zone.

4. **Cover plants:** You should temporarily shield transplants from the sun and wind by covering them for at least two days after transplanting. Shield them for even longer if the weather is very sunny, windy, or cold. You can use flower plots, cardboard boxes, or buckets. Remove the covers after a few days.

Once you have successfully transplanted your seedlings into the garden, be sure to water them at least twice a day for the first week after transplanting.

## D. Fertilization

**Ask: Does anyone know what plants especially like to eat?  
(A: nitrogen [N], phosphorous [P], and potassium [K].)**

**Nitrogen helps plants grow strong foliage. Phosphorous helps roots and flowers grow and develop, improves plant vitality, and increases seed size. Potassium improves overall plant vigor and helps make them more resistant to diseases.**

**Helpful hint:** Garden fertilizers are labeled according to how much nitrogen (N), phosphorous (P), and potassium (K) they contain. For example, if a 100-pound bag of fertilizer has an "NPK" ratio of 5-10-10, it contains 5 pounds of nitrogen, 10 pounds phosphorous, 10 pounds potassium, and 75 pounds of filler.

It is best to use either time release or water soluble fertilizers. Time release fertilizer is mixed with the potting medium at planting time. Osmocote® is a pelleted time release fertilizer with 14-14-14 formulation. Water soluble fertilizers, on the other hand, are added to water and used once a week when plants begin to grow actively. Peters® 20-20-20 or Miracle Gro® 15-30-15 are two examples sold in most garden centers. (See box above for an explanation of NPK ratios in fertilizers.)

Organic fertilizer options are also available at stores like Marshall Grain, Redenta's, and Archie's Gardenland. One good organic, locally made fertilizer is Lady Bug Brand. (Organic fertilizers are made directly from plant or animal sources. For a comparison of the benefits of organic vs. synthetic fertilizers, see <http://extension.oregonstate.edu/gardening/node/955>.)

The easiest way to add fertilizer to plants growing in containers is to mix it into water before pouring it into your soilless or soil mix, or spray it directly on the plants' leaves. There are many good commercial fertilizer mixes available. Always follow the application directions on the label.

If you use transplants, begin watering with the nutrient solution the day you set them out. If you start with seed, apply only enough water to keep the soil mix moist until the seeds germinate. Once the plants emerge, begin using the nutrient solution.

It is a good idea to occasionally water with a nutrient solution containing trace elements. Plants need these trace minerals to grow and function at optimal health, which will usually decrease the incidence

of pests and diseases and ensure optimal nutrition in the vegetables we pick to eat. Often these trace minerals are depleted throughout each season of growth or washed away by water, so replacing them is key. Use a water-soluble fertilizer that contains iron, zinc, boron, and manganese and follow the label directions carefully.

At least once a week, it is advisable to leach the unused fertilizer out of the soil mix by watering with water. Add water to the container until it starts to drain out the bottom of the container. This practice will flush harmful minerals out of the soil mix.

## **E. Watering**

**Ask: What do you think is the major difference between growing vegetables in the ground and in containers? Why do you think this is? How often do you think plants in containers need to be watered, vs. plants in the ground?**

Proper watering is essential for a successful container garden; one watering per day is usually adequate. If the vegetable you are growing produces a lot of foliage, twice a day may be necessary, especially in very hot weather. Also, be sure to water twice daily for the first week after transplanting. Plants require less water after they've become established and during periods of slow growth.

However, overwatering combined with poor drainage will slowly kill the plants. If the planting medium becomes waterlogged, the plants will die from lack of oxygen.

Avoid wetting the foliage of plants when watering, since wet leaves will encourage plant diseases.

Remember to use the nutrient solution once a week, as we just discussed.

Water-holding gels are becoming popular for use in container gardening. These starch-based gels are called hydrogels. They absorb at least a hundred times their weight in water and slowly release that water into the soil as it dries. To be effective, they should be incorporated into the soil mix before planting.

Mulches can also be placed on top of the soil mix to reduce water loss if this is a problem. Compost, straw, pine needles, grass clippings, shredded bark, cedar, leaf mold, and moss are examples of mulches.

## F. Light

**Ask: How many of you have tried to plant a garden and found that the plants either weren't growing very well, drooped, or under-produced no matter how much you watered them?**

**It could be they didn't have the appropriate amount of sun! How much sun do you think vegetable plants need every day?**

Nearly all vegetable plants will grow better in full sunlight than in shade. However, leafy crops such as lettuce, cabbage, greens, spinach, and parsley can tolerate more shade than root crops such as radishes, beets, turnips, or onions. Fruit bearing plants, such as cucumbers, peppers, tomatoes, and eggplant, need the most sun of all.

One major advantage to gardening in containers is that you can place them in areas where they receive the best growing conditions, including the right amount of sunlight. The west sun in Texas can also be very harsh in the spring and summer. It may be advantageous to plant in an area that gets some late afternoon shade, but make sure plants will still get about 6 to 8 hours of sunlight. For example, if you notice your container plants severely wilting by the end of the day, even if you have watered them, they may be receiving too much sunlight; try moving them into partial shade and see if they seem happier.

Table 1 below (and in Handout 3) lists the light requirements and other characteristics for some commonly planted container vegetables.

**Table 1. Planting Information for Growing Vegetables in Containers**

Crop	Number of days for germination	Number of weeks to optimum age for transplanting	General size of container	Amount of light*	Number of days from seeding to harvest
Beans	5-8	-	Medium	Sun	45-65
Cucumbers	6-8	3-4	Large	Sun	50-70
Eggplant	8-12	6-8	Large	Sun	90-120
Lettuce, leaf	6-8	3-4	Medium	Partial Shade	45-60
Onions	6-8	6-8	Small	Partial Shade	80-100
Parsley	10-12	-	Small	Partial Shade	70-90
Pepper	10-14	6-8	Large	Sun	90-120
Radish	4-6	-	Small	Partial Shade	20-60
Squash	5-7	3-4	Large	Sun	50-70
Tomato	7-10	5-6	Large	Sun	90-130

## G. Choosing What to Grow

**Ask: What kinds of vegetables or herbs are you most looking forward to growing in your containers?**

Almost any vegetable that will grow in a typical backyard garden will also do well as a container-grown plant. Vegetables that are ideally suited for growing in containers include tomatoes, peppers, eggplant, green onions, beans, lettuce, squash, and radishes. Pole beans and cucumbers can also be grown in containers, but they do require considerably more space because of their vining growth habit. You can give them this space by providing some sort of trellis or support for them to climb. See Table 1 above for a list of some of the best kinds of vegetables to grow in containers and information about how to grow them. See Handout 2 for a local, North Texas vegetable planting guide from Texas Agrilife.

Variety selection is extremely important. Most varieties that will do well when planted in a yard garden will also do well in containers. Some varieties of selected vegetables that are ideally suited for these mini-gardens are indicated in Table 2 below (and in Handout 3).

**Table 2. Recommended Varieties, Pot Size, and Spacing for Container Vegetables in Texas**

<b>Broccoli</b> (2 gallons, 1 plant)	Packman, Bonanza, others
<b>Carrot</b> (1 gallon, 2-3 plants. Use pots 2 inches deeper than the carrot length)	Scarlet Nantes, Gold Nugget, Little Finger, Baby Spike, Thumbelina
<b>Cucumber</b> (1 gallon, 1 plant)	Burpless, Liberty, Early Pik, Crispy, Salty
<b>Eggplant</b> (5 gallons, 1 plant)	Florida Market, Black Beauty, Long Tom
<b>Green Bean</b> (2 gallons minimum, space plants 3 inches apart)	Topcrop, Greencrop, Contender, (Pole) Blue Lake, Kentucky Wonder
<b>Green Onion</b> (1 gallon, 3-5 plants)	Beltsville Bunching, Crystal Wax, Evergreen Bunching
<b>Leaf Lettuce</b> (1 gallon, 2 plants)	Buttercrunch, Salad Bowl, Romaine, Dark Green Boston, Ruby, Bibb
<b>Parsley</b> (1 gallon, 3 plants)	Evergreen, Moss Curled
<b>Pepper</b> (5 gallons, 1-2 plants)	Yolo Wonder, Keystone Resistant Giant, Canape, Red Cherry (Hot), Jalapeno
<b>Radish</b> (1 gallon, 3 plants)	Cherry Belle, Scarlet Globe, (White) Icicle
<b>Spinach</b> (1 gallon, 2 plants)	Any cultivar
<b>Squash</b> (5 gallons, 1 plant)	Dixie, Gold Neck, Early Prolific Straightneck, Zucco (Green), Diplomat, Senator
<b>Tomato</b> (5 gallons, 1 plant)	Patio, Pixie, Tiny Tim, Saladette, Toy Boy, Spring Giant, Tumbling Tom, Small Fry
<b>Turnip</b> (2 gallons, 2 plants)	Any cultivar

## Herbs

Some herbs can also be planted in pots and grown indoors or outdoors. Those best adapted to pot culture include basil, chives, mint, parsley, rosemary, and sweet marjoram.

If you plant your herbs indoors, set the container in a sunny south window, and care for them as you would house plants.

Most garden stores and many grocery stores sell herb transplants in the spring. Check whether there is more than one plant in the pot that you buy; if there are, be sure to plant each one separately in your containers, leaving some space between each plant.

**Helpful hint:** Mint is highly invasive. It will take over whatever container you plant it in, and much of your garden if you let it. Make sure to plant mint in a pot by itself, and check frequently to make sure that its roots and stalks are not sneaking out into the rest of your garden.

## **H. Care Tips for Vegetables in Containers**

**Ask: How many of you have pets? What are some important ways you care for them every day? Think of your garden plants as pets that need food, water, and observation each day. Just as there are certain ways you care for yourself or your animals each day, there are particular ways to care for vegetables that will keep them alive, healthy, and productive.**

Moisture is the most important thing to watch for in your container garden. Inspect your vegetables regularly to make sure the potting mix hasn't dried out. The simplest way to test if your plants need water is to stick your finger in the soil. If the soil is dry to your second knuckle, then it's time to give your plants a drink.

Starting about a month after planting, feed your vegetables once a week with a water-soluble fertilizer, following the package directions.

Also keep an eye out for weeds and other pests; see below.

**Helpful hint:** Make watering your container garden easier by installing drip irrigation. This can automatically irrigate your garden for you. Another option for low maintenance, low usage watering is a wicking bed design (wicking beds have a water reservoir at the bottom from which water is drawn up to the surface).

## **I. Common Problems in Container Gardening: Diseases, Insects, and Other Pests**

**Ask: Raise your hand if you've ever experienced insects feasting on your plants. Have respondents share a story or two about their experiences and how they managed them. If no one volunteers, tell a story from your own experience as a gardener.**

Plants grown in containers are susceptible to the same insects and diseases that are common to any vegetable garden. You should check your plants periodically for diseases and for foliage and fruit-feeding insects. If you detect plant disease or harmful insects, use EPA-approved fungicides and insecticides in a timely manner. There are also many organic insecticides available at Marshall Grain, Redenta’s, and Archie’s Gardenland.

Contact your local county extension agent or Master Gardener Association (see Resources section below) for the latest information on disease and insect control for vegetable plants. You can also visit Texas A&M’s Agrilife Extension web site for brief guides to plant diseases and insect pests in both English and Spanish: <http://aggie-horticulture.tamu.edu/vegetable/easy-gardening-series/>.

If you place your container garden in a wooded area, you may encounter problems with squirrels digging in your containers, sometimes even completely uprooting newly planted vegetables. Adding mulches on top of the soil that are difficult to dig in, like pecan shells or bark, can reduce squirrel damage. If they persist, try covering the soil or mulch with a good amount of cayenne pepper (but make sure not to sprinkle any on plant leaves if you’re going to eat them soon!). You may need to reapply the cayenne several times before the squirrels get the message. Since you’ll use a lot of it, you may want to buy the cayenne in bulk at a grocery store like Central Market or Whole Foods (this is cheaper than buying it in small containers).

Table 3 discusses other common problems encountered in container gardening and how to fix them.

**Table 3. Common Problems in Container Gardening**

Symptom	Cause	Corrective Measure
Plants tall, spindly, and unproductive	Insufficient light	Move container to area receiving more light
	Excessive nitrogen	Reduce feeding intervals
Plants yellowing from bottom, lack vigor, poor color	Excessive water	Reduce watering intervals; Check for good drainage
	Low fertility	Increase fertility level of base solution
Plants wilt although sufficient water present	Poor drainage and aeration	Use mix containing higher percent organic matter; increase number of holes for drainage
Marginal burning or “firing” of the leaves	High salts	Leach container with tap water at regular intervals

Plants stunted in growth; sickly, purplish color	Low temperature	Relocate container to warmer area
	Low phosphate	Increase phosphate level in base solution
Holes in leaves, leaves distorted in shape	Insects	Use EPA-recommended insecticide
Plant leaves with spots; dead dried areas, or powdery or rusty areas	Plant diseases	Remove diseased areas where observed and use EPA-recommended fungicide

## J. Harvesting and End of Season Cleanup

**Ask: Who has eaten something freshly picked from a garden? What stands out to you about the experience? How was it different than buying something from the grocery store?**

Harvest is the most satisfying step. Pick your container-grown vegetables as soon as they reach a size where you will enjoy them. See the “Vegetable Planting Guide” handout’s last column, “Days to Crop Maturity,” to get a sense of when your vegetables will be ready. This may not be obvious for root crops like radishes that you can’t see.

Most vegetables will be more productive if you harvest early and often. Letting plants “go to seed” will often cause them to stop growing new vegetables. Harvest the vegetables at their peak of maturity when their full flavor has developed. Vine-ripened tomatoes, tender green beans, and crisp lettuce will have the best flavor. Harvesting early will also help you get to the vegetables before hungry birds or insects do.

At the end of the harvest season, discard the plant and soil from the pot. Do not reuse the same soil for a second season of production. Infected soil or mix will spread disease into the second season unless it is properly composted. Properly composted planting media can be reused.

Thoroughly scrub the container to remove all soil. Rinse in a solution of 1 part bleach to 10 parts water, then rinse with clean water and store in a dry spot.

It is also a good idea not to plant the same kinds of vegetables in the same pot year after year. Instead, rotate the kinds of plants you grow in each pot. This will help reduce pests and diseases.

## **K. Container Gardening Success**

Container gardening can be very successful if you follow the guidelines above. Plant growth and vigor will vary depending on the location and attention you give your plants. The following guidelines are golden rules for any home garden:

1. Provide adequate space for plants to grow.
2. Avoid afternoon sun if possible, especially when plants are first planted.
3. Group plants with similar light and water requirements together.
4. Inspect your plants daily and, if necessary, water, trim, train them on a trellis (if they are a vining variety requiring support), or prune them.
5. Promptly remove pests and weeds, and treat diseases.
6. Don't fill your containers to the top with potting soil or mulch. Leave at least two inches open so that when you water you can fill the pot to the brim and let the water slowly soak in.
7. Replant several times each year.
8. Continue your education by asking for advice from experienced gardeners. You can also call the Tarrant County Master Gardener Association's Help Desk for advice: 817-884-1944.
9. Make time to sit down and enjoy the fruits of your labor!

## **L. Potting Activity**

1. Mix potting soil properly as a class.
2. Have students select a container and plant or seed variety.
3. Fill pot with soil to appropriate depth and properly plant or seed.
4. Have students say where they plan to keep the container plant at their residence and how they plan to care for it.

## **Resources**

### Garden Shops

Archie's Gardenland

6700 Z Boaz Pl. (just off Camp Bowie)

Fort Worth, TX 76116

tel: 817-737-6614

<http://archiesgardenland.com>

Calloway's Nursery

17 locations in the DFW area

[www.calloways.com](http://www.calloways.com)

Green's Produce and Plants

3001 W. Arkansas Lane

Arlington, TX 76016



tel: 817-274-2435  
<http://greensproduce.com>

Marshall Grain Co.  
2224 E. Lancaster  
Fort Worth, TX  
tel: 817-536-5636  
[www.marshallgrain.com](http://www.marshallgrain.com)

Redenta's Garden Shop  
5111 W. Arkansas Lane  
Arlington, TX 76016  
Tel: 817-451-2149  
[www.redentas.com](http://www.redentas.com)

#### Videos

Backyard Farmer's Container Gardening Videos  
<https://www.youtube.com/playlist?list=PLEDE6FE971159F301>

North Texas Container Gardening Videos  
[https://www.youtube.com/playlist?list=PL\\_1rRhnVdDICI\\_Bf6V0pdKFaVgMIIM7gT](https://www.youtube.com/playlist?list=PL_1rRhnVdDICI_Bf6V0pdKFaVgMIIM7gT)

#### Web Sites

Agrilife Extension, Texas A&M  
<http://agrilifeextension.tamu.edu>

Lady Bird Johnson Wildflower Center: Container Gardening with Texas Native Plants  
[www.wildflower.org/clearinghouse/articles/Container\\_Gardening.pdf](http://www.wildflower.org/clearinghouse/articles/Container_Gardening.pdf)

North Texas Vegetable Gardening  
<http://dcmga.com/north-texas-gardening/vegetable-gardening>

Plant Answers for Texas  
<http://www.plantanswers.com/resources.htm>

Tarrant County Master Gardener Association  
Help Desk telephone: 817-884-1944  
<http://tarrantmg.org>

## **Acknowledgments**

Lance Jepson, Katey Rudd, and Dave Aftandilian compiled, edited, and wrote portions of this curriculum. We relied especially on two Agrilife Extension publications from Texas A&M: 1) “Vegetable Gardening in Containers” by Joseph G. Masabni, based on earlier versions by Sam Cotner; and 2) “Growing Herbs in Texas,” by Joseph G. Masabni, based on an earlier version by Thomas Longbreak.

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Front cover photo is by Clemson Extension.

## **Disclaimer of Liability**

This curriculum is intended solely for informational purposes. Instructors and students use it at their own risk. None of the individuals or organizations named above bear any liability, financial or personal (or otherwise), for injuries, property damage, or other perceived harms that may occur during the use of this curriculum.

## **Other Gardening Curricula Available from the Tarrant County Food Policy Council**

The Community Gardens & Urban Agriculture Working Group of the Tarrant County Food Policy Council has also developed a three-part Backyard Gardening Curriculum, which is available free of charge. This curriculum consists of three lesson plans, which are intended to be taught over three consecutive weeks. Each session will last approximately 1.5 to 2 hours. The three lesson plans cover:

- 1) Composting & Soils
- 2) Planning & Planting
- 3) Tending & Harvesting

To download PDF files of these lesson plans, visit our web site at <http://www.tarrantcountyfoodpolicycouncil.org/cgua-working-group.html>.

## Handout 1: Ideas for Container Gardens: Found, Reused Items

You've decided to plant a container garden. Now you need containers! While you can go to a garden center and purchase pots, below are a few container ideas to spark your imagination about alternatives to plastic pots, many of which you may be able to find around your own home.

### Container Requirements

- **Space:** Make sure your container is deep and wide enough to support plant root growth. This will vary with each vegetable variety. Educate yourself on the planting space requirements of the vegetables you want to grow to ensure that you select appropriate containers.
- **Drainage:** Water can stagnate and rot or suffocate roots if it has no way to slowly drain out. If your desired container does not have drainage holes you can poke or drill your own.



## Handout 1: Ideas for Container Gardens: Found, Reused Items



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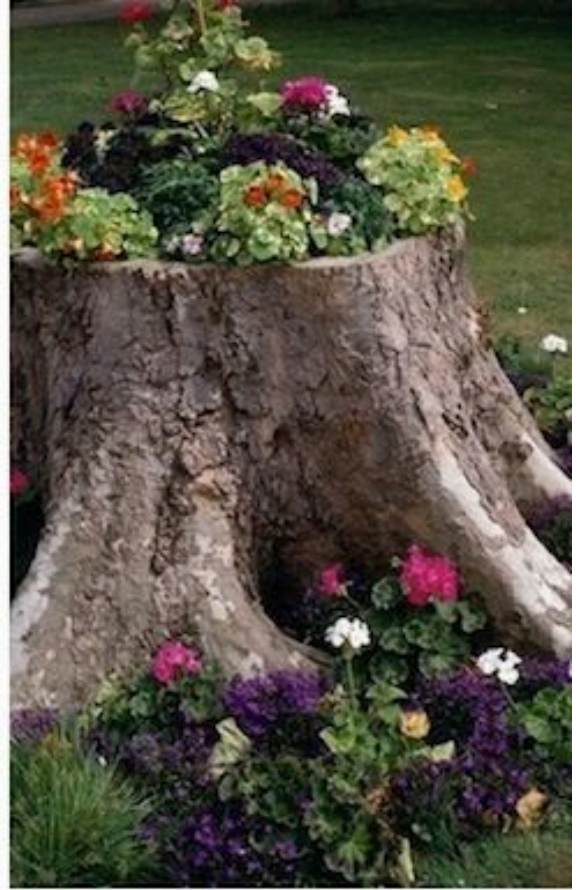
## Handout 1: Ideas for Container Gardens: Found, Reused Items



## Handout 1: Ideas for Container Gardens: Found, Reused Items



## Handout 1: Ideas for Container Gardens: Found, Reused Items





## Handout 1: Ideas for Container Gardens: Found, Reused Items



# Vegetable Planting Guide

## Planting Times for North Central Texas

Vegetable Types	Planting depth in inches	Distance between rows	Average crop height ft	Spring planting dates* North Central Texas	Fall planting dates* North Central Texas	Days to crop maturity
Asparagus	8-12	48-60	5	Feb. 1 - Mar. 1	Not Advised	700
Beans, snap bush	1-1 1/2	24-36	11/2	Mar. 18 -Apr.15	Aug. 1 - Sep. 15	45-60
Beans, snap pole	1-1 1/2	36-48	6 - 8	Mar. 18 -Apr.15	Jul. 30 -Aug. 10	60-70
Beans, Lima bush	1-1 1/2	30-36	11/2	Mar. 18 -Apr.15	Aug.15 - Sep.15	65-80
Beans, Lima pole	1-1 1/2	36-48	6 - 8	Mar. 18 -Apr.15	Jul. 25 -Aug. 15	75-85
Beets	1	12-24	11/2	Feb. 1 - Feb 15	Sep. 1 - Oct. 1	50-60
Broccoli	1/2	24-36	3	Feb. 1 - Feb 15	Aug.15- Sep.30	60-80
Brussels Sprouts	1/2	24-36	2	Feb. 1 - Feb 15	Aug.15- Sep.30	90-100
Cabbage	1/2	24-36	11/2	Feb. 1 - Feb 15	Aug.15- Sep.30	60-90
Cabbage, Chinese	1/2	18-30	11/2	Feb. 1 - Feb 15	Aug.10- Aug.30	65-70
Cantaloupe	1	48-96	1	Apr. 5 - May 1	Jul. 30 -Aug. 10	85-100
Carrot	1/2	12-24	2	Feb. 1 - Feb 15	Sep.1 - Sep.30	70-80
Cauliflower	1/2	24-36	3	Feb. 1 - Feb 15	Aug.15 -Sep.20	70-90
Chard, Swiss	1	18-30	2	Feb. 1 - Mar. 3	Aug.15 -Sep.15	45-55
Cilantro	1/2	12-24	2	Feb. 1 - Apr. 1	Sep. 1 - Sep. 30	40-60
Collard (Kale)	1/2	18-36	2	Feb. 1 - Mar. 3	Aug.25- Sep.20	50-80
Corn (sweet)	1/2	24-36	6 - 8	Mar. 18 -Apr. 30	Aug.10 -Aug.25	70-90
Cucumber	1/2	48-72	1	Mar. 18 -Apr. 30	Aug. 25-Sep. 10	50-70
Eggplant	1/2	24-36	3	Apr 1.- Apr. 30	Jul. 30- Aug. 25	80-90
Garlic	1 - 2	10-18	1	Feb. 1 - Feb 15	Not Advised	140-150
Kohlrabi	1/2	12-18	11/2	Feb. 1 - Mar. 10	Aug.15 - Sep.20	55-75
Lettuce	1/2	12-24	1	Feb. 1 - Mar. 31	Sep. 1 - Sep. 30	40-80
Okra	1	24-36	5 - 7	Apr. 1 - Apr. 30	Jul. 1 - Aug. 25	55-65
Onion (plants)	1/2 - 1	12-18	11/2	Jan. 1 - Feb. 15	Aug.15 -Sep.15	80-120
Onion (seed)	1/2	12-18	11/2	Jan. 1 - Feb. 15	Sep. 1 - Sep. 20	90-120
Parsley	1/2	12-24	11/2	Feb. 1 - Mar. 15	Aug.15 -Oct. 10	70-90
Peas, English	2 - 3	18-36	2	Jan. 20 - Mar. 3	Sep. 15 - Nov. 1	55-90
Peas, black-eyed	2 - 3	24-36	2 1/2	Mar. 30- Apr. 30	Aug.15 - Sep. 1	60-70
Peppers	1/2	24-36	2 - 3	Mar. 30- May 30	Jul. 30 -Aug. 25	60-90
Potato, Irish	4	30-36	2	Feb. 1 - Feb 15	Jul. 30- Aug. 10	65-100
Potato, Sweet	3 - 5	36-48	11/2	Apr.15 - Jun. 1	Not Advised	100-130
Pumpkin	1 - 2	48-96	11/2	Mar. 25 -Apr. 25	Aug.10 -Aug. 25	75-100
Radish	1/2	12-18	1/2	Feb. 10 - Apr. 15	Sep.20 - Nov.15	25-40
Spinach	1/2	12-18	1	Jan. 20 - Mar. 10	Sep.15 - Nov. 1	40-60
Squash, Summer	1 - 2	24-60	2	Mar. 25 - Apr.15	Aug. 1 - Aug.30	50-60
Squash, Winter	1 - 2	48-78	1	Mar. 25 - Apr.15	Aug.10 - Aug.30	85-100
Tomato	4 - 7	24-48	3 - 6	Mar. 20 - Apr. 30	Jun. 15 - Jul. 30	55-100
Turnip, Greens	1/2	12-24	11/2	Feb. 1 - Mar. 10	Aug. 25 - Nov.1	30
Turnip, Roots	1/2	12-24	11/2	Feb. 1 - Mar. 10	Aug. 25 - Nov.1	30-60
Watermelon	1 - 2	60-96	1	Mar 30 - Apr. 30	Jul. 20- Aug. 10	80-100

\* Last avg. frost date March 20 - First avg. frost date Nov. 17

## Soil Temperature Requirements

The numbers in parenthesis indicate minimum soil temperatures at which each vegetable should be planted in order to obtain optimum germination of seed and growth of transplants. Planting in soil that is too cool can lead to poor germination, seed rot, diseases and slow root and top growth of plants. For best results, plant during recommended dates, but only when soil temperatures reach the point designated. Proper temperature should be maintained to a depth of 6 to 8 inches. A kitchen thermometer (probe type - temperature range is 0° to 220°) is the easiest, most available and least expensive product to use for this purpose.

### Vegetables from Transplant (Optimum Soil Temperature for Planting)

Onions (45) Broccoli (50) Kohlrabi (50) Cabbage (55) Chinese Cabbage (55) Tomatoes (60) Peppers (70) Eggplant (75)

### Vegetables from Seed (Optimum Soil Temperature for Planting)

Carrots (50) Onions (50) Leeks (50) Peas (50) Potatoes (50) Spinach (50) Lettuce (50) Radish (50) Parsley (55) Chard (55) Collards (55) Cabbage (55) Beets (55) Chinese Cabbage (55) Snap Beans (60) Cucumbers (60) Turnips (60) Sweet Corn (65) Black-eyed Peas (65) Lima Beans (70) Squash (70) Watermelon (70) Cantaloupe (75) Okra (75) Sweet Potatoes (75)

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CEA-Horticulture  
Texas AgriLife Extension Service  
10056 Marsh Lane, Suite B-101  
Dallas, Texas 75229-6071

## Handout 3: Appendix of Reference Tables

**Table 1. Planting Information for Growing Vegetables in Containers**

Crop	Number of days for germination	Number of weeks to optimum age for transplanting	General size of container	Amount of light* required	Number of days from seeding to harvest
Beans	5-8	-	Medium	Sun	45-65
Cucumbers	6-8	3-4	Large	Sun	50-70
Eggplant	8-12	6-8	Large	Sun	90-120
Lettuce, leaf	6-8	3-4	Medium	Partial Shade	45-60
Onions	6-8	6-8	Small	Partial Shade	80-100
Parsley	10-12	-	Small	Partial Shade	70-90
Pepper	10-14	6-8	Large	Sun	90-120
Radish	4-6	-	Small	Partial Shade	20-60
Squash	5-7	3-4	Large	Sun	50-70
Tomato	7-10	5-6	Large	Sun	90-130

**Table 2. Recommended Varieties for Container Grown Vegetables in Texas**

<b>Broccoli</b> (2 gallons, 1 plant)	Packman, Bonanza, others
<b>Carrot</b> (1 gallon, 2-3 plants. Use pots 2 inch deeper than the carrot length)	Scarlet Nantes, Gold Nugget, Little Finger, Baby Spike, Thumbelina
<b>Cucumber</b> (1 gallon, 1 plant)	Burpless, Liberty, Early Pik, Crispy, Salty
<b>Eggplant</b> (5 gallons, 1 plant)	Florida Market, Black Beauty, Long Tom
<b>Green Bean</b> (2 gallons minimum, space plants 3 inches apart)	Topcrop, Greencrop, Contender, (Pole) Blue Lake, Kentucky Wonder
<b>Green Onion</b> (1gallon, 3-5 plants)	Beltsville Bunching, Crysal Wax, Evergreen Bunching
<b>Leaf Lettuce</b> (1 gallon, 2 plants)	Buttercrunch, Salad Bowl, Romaine, Dark Green Boston, Ruby, Bibb
<b>Parsley</b> (1gallon, 3 plants)	Evergreen, Moss Curled
<b>Pepper</b> (5 gallons, 1-2 plants)	Yolo Wonder, Keystone Resistant Giant, Canape, Red Cherry (Hot), Jalapeno
<b>Radish</b> (1gallon, 3 plants)	Cherry Belle, Scarlet Globe, (White) Icicle
<b>Spinach</b> (1 gallon, 2 plants)	Any cultivar
<b>Squash</b> (5 gallons, 1 plant)	Dixie, Gold Neck, Early Prolific Straightneck, Zucco (Green), Diplomat, Senator
<b>Tomato</b> (5 gallons, 1 plant)	Patio, Pixie, Tiny Tim, Saladette, Toy Boy, Spring Giant, Tumbling Tom, Small Fry
<b>Turnip</b> (2 gallons, 2 plants)	Any cultivar

### Handout 3: Appendix of Reference Tables

**Table 3. Common Problems in Container Gardening**

Symptom	Cause	Corrective Measure
Plants tall, spindly, and unproductive	Insufficient light	Move container to area receiving more light
	Excessive nitrogen	Reduce feeding intervals
Plants yellowing from bottom, lack vigor, poor color	Excessive water	Reduce watering intervals;
	Low fertility	Check for good drainage Increase fertility level of base solution
Plants wilt although sufficient water present	Poor drainage and aeration	Use mix containing higher percent organic matter; increase number of holes for drainage
Marginal burning or firing of the leaves	High salts	Leach container with tap water at regular intervals
Plants stunted in growth; sickly, purplish color	Low temperature	Relocate container to warmer area
	Low phosphate	Increase phosphate level in base solution
Holes in leaves, leaves distorted in shape	Insects	Use EPA-recommended insecticide
Plant leaves with spots; dead dried areas, or powdery or rusty areas	Plant diseases	Remove diseased areas where observed and use EPA-recommended fungicide