



Container Vegetable Gardening: Healthy Harvests from Small Spaces

Introduction

Growing vegetables is great fun, good exercise and a sure way to more nutritious eating. But for many of us, simply wanting to plant a garden may not be enough. We may lack a good site, or be too busy with other things. Container gardening is a simple and fun way to grow edible crops in just about any situation. It's growing in popularity because it's easy to get started and enables anyone to be successful—including those who think they have a "brown thumb". Even if you have an in-ground vegetable garden you may find it desirable to have edible containers of herbs and salad greens near the kitchen door. This fact sheet has the basic information you'll need to grow some of your own organic produce spring, summer, and fall!



The Growing Advantages

- It's perfect for all kinds of people—kids, people with physical limitations, college students, renters, novice gardeners, and any gardener wanting to cut back, downsize, and save time. (You can water and harvest 10 containers in 10 minutes.)
- There is no digging or tilling. You can garden in the rain without getting your shoes muddy!
- Container gardening is virtually weed-free.
- It's inexpensive to get started. Few tools are needed.
- Helps to overcome some common gardener complaints:
 - backyards that are too shady for tomatoes
 - compacted, poor quality soils and soils contaminated with lead
 - persistent soil-borne disease like *Fusarium* wilt of tomato.
- Temporary or permanent containers (including window boxes) can be fitted to any location—balcony, deck, stoop, concrete pad, or any part of your yard.
- You can locate containers where they are most

convenient for you and where they will grow best (place the tomatoes in full sun and the lettuce in partial shade.)

- Better control over growing conditions (water, sunlight, nutrients) can lead to higher yields with less work than a conventional garden (10 sq. ft. can produce 50 lbs. of fresh organic produce).
- Container gardens are easier to protect plants from weather extremes, insect pests and bigger critters.
- Get a quicker start in the spring and grow further into the fall.
- Vertical growth saves space and allows use of exterior walls.

Why Organic?

Organic gardening emphasizes soil improvement through the regular addition of organic matter, and biological and genetic diversity to manage insect and disease problems. A growing number of Marylanders are interested in buying and growing organic produce to reduce exposure to chemical pesticides.

For most gardeners, “organic” means no chemical fertilizers or pesticides. Luckily, it’s pretty easy to grow container vegetables organically. There are many types of organic fertilizers. And spraying, even with an organic pesticide, should rarely be necessary. This fact sheet emphasizes organic and sustainable growing practices that will save you money and put nutritious food on the table. For example, using recycled materials for containers, filling those containers with backyard or locally produced compost, and planting flowers to attract beneficial insects are all ways to create a low-cost, ecological garden.

Getting Started

There are a few simple ingredients for success—a little bit of room, sunlight, containers, growing media (a.k.a. “potting soil”), water, and nutrients (fertilizer). The single most important ingredient for success is **Tender Loving Care** because your container plants have to depend entirely on YOU for all of their needs. It’s always best to start small the first year. Share ideas and create a plan with the other people in your household. Plant crops that you and your family like to eat, and keep your containers filled with edible plants through the entire growing season.



Location

Incorporating containers into outdoor living space requires some basic knowledge about the needs of the plants you want to grow. An eye for design will produce more pleasing, aesthetic results.

- Containers can be placed on any level surface—decks, balconies, and along driveways and sidewalks. You can also set them on bare ground and allow the plant roots to grow down into the soil or place them on top of a mulched area. Edibles can also be grown in hanging baskets and window boxes.
- Southern and western exposures will be the sunniest and warmest, while northern and eastern exposures will be shadier and cooler.
- You’ll need 6-8 hours of direct sun for warm-season crops (tomato, pepper, eggplant, squash) and 3-5 hours of direct sun for cool-season crops (lettuce, spinach, Asian greens).
- Easy access to water is crucial. Some containers will need watering every day when the weather is hot and dry.
- Consider the microclimate in the container garden

area. Watch out for heat sinks created by brick, concrete, and reflective surfaces.

Cautionary notes:

- Containers and the water that drains from them can mark and stain concrete and wood decking. Using self-watering containers or plastic saucers to catch water will prevent this problem (and is very helpful if you are gardening “above” your neighbour’s balcony.)
- The light weight of large plastic containers leads gardeners to believe they can be easily moved. But a 20-inch diameter container filled with moist growing medium and plants can weigh 100 lbs! (You can buy or make plant caddies to make heavy containers portable.)



Container Types

Containers can be temporary or permanent, practical or whimsical, artistic or utilitarian, expensive or free. When selecting containers, use your imagination and creativity, and know how much room your crops will need to grow to their full potential. And you’ll need to decide where and how to store the containers that are portable and used only during the growing season.

- Dozens of commercially produced containers can be purchased at garden centers and through mail order catalogs (see “Resources” on page 8).
- Dozens more everyday objects can be recycled or transformed into suitable containers- 5 gallon plastic buckets, truck tires, hypertufa troughs, wooden crates, ½ whiskey barrels, nursery pots, kids’ wading pools, plastic trash bags, and plastic storage containers.
- Avoid treated lumber products and be aware that plastics not made for outdoors use can become brittle from exposure to the elements.
- Except for the self-watering types described on page 5, all containers should have holes or slats in the bottom to allow water to drain out.
- Dark colors will create higher temperatures that could injure young tender roots and prevent the full development of a plant’s root system.
- Containers made from porous materials (clay, ceramic, concrete, and wood) will dry out more quickly than containers made from plastic, or metal.



Qualities of Different Types of Growing Media

- Garden Soil— never use this by itself for container gardens. Soils hold water and nutrients very well and can drown roots growing in a container. Diseases and weed seeds can also be a problem. And soil is heavy which is an advantage if you are trying to anchor top-heavy plants and pots, but a disadvantage if you want to move pots.
- Commercial Soil-Less Mixes— these are an excellent choice for containers. They are lightweight, drain well, hold water and nutrients, and are generally free of weeds, insects, and diseases. They have a pH of about 6.2 and are typically comprised of sphagnum peat moss, perlite, vermiculite and small amounts of lime and fertilizer. Examples of soil-less mixes are ProMix™, ReddiEarth™, Jiffy Mix™, and Sunshine Mix™. (To produce “organic” soil-less mixes, suppliers omit chemical wetting agents and substitute organic for chemical fertilizers.)
- Other Types of Commercial Mixes— are advertised as “top soil”, “planting soil”, “planting mix”, or “potting soil”. They vary a great deal in composition and quality. Avoid mixes that contain sedge peat, feel heavy or gritty, have very fine particles, or appear clumped.
- Sharp Sand— use only coarse builder sand, not play sand. Sand increases porosity because of the large particles. It is relatively inexpensive and heavy.
- Bark Fines and Wood Mulch— these are high in carbon and low in nutrients and not recommended for container vegetables.

What’s the “Dirt” on Growing Media?

The material that your plants grow in is called the “growing medium”. Dozens of different ingredients are used in varying combinations to create homemade or commercial growing media. By understanding the functions of growing media, you can evaluate the qualities of individual types and select which ones might work best for your container vegetable garden. The choice is very important because your plants are dependent on a relatively small volume of growing medium. Unlike their cousins growing in garden soil, containerized plant roots cannot grow around obstacles or mine the soil far and wide for nutrients and water.

- Growing medium has three main functions- 1) supply roots with nutrients, air, and water, 2) allow for maximum root growth, and 3) physically support the plant.
- Roots grow in the spaces between individual particles of soil. Air and water also travel through these pore spaces. Water is the medium that carries nutrients that plants need to fuel their growth, and air is needed for root growth and the health of soil microorganisms that help supply plants with nutrients.
- Irrigation water moves through the pore spaces, pushing out the air. If excess water cannot drain away, fresh air cannot enter and roots will suffocate.
- Select light and fluffy growing media for good aeration and root growth.

What do I do with last year’s “potting soil”?

Dump it in your garden or woods OR reuse it next year (but only if you noted no disease problems the previous season). If reusing it’s best to store the media in plastic bags or trashcans— don’t leave it exposed to the elements. You’ll need to fertilize more frequently the second year because many of the nutrients will have been used by plants or leached out the first season. Organic media will weather over time causing a decrease in the size of particles and pore spaces. This may slow water drainage and root growth to a small extent.

Compost: In a Class By Itself

Compost is the dark, crumbly, earthy-smelling product of organic matter decomposition. Leaves, grass clippings, wood waste, and farm animal manures are some of the common ingredients that are combined with water in piles or windrows and digested by huge populations of oxygen-loving microorganisms. LeafGro™ is a well-known commercially available yard waste compost in Central Maryland. It's highly recommended to include some compost in the growing media for your containers.

- Compost contains all the major and minor nutrients that plants need for good growth. This makes it an excellent substitute for sphagnum peat moss, which has very few nutrients (although it does hold water better than compost). Composting effectively recycles the nutrients from gardens, landscapes, and farms thereby reducing nutrient pollution of waterways. However, fertilizing is still necessary because the nutrients in compost are released slowly and are usually not sufficient for an entire season.
- Vegetables, herbs and flower plants can be successfully grown in 100% compost or leaf mould. Baltimore City community gardeners have been doing this for decades!
- Vegetable plants generally grow best when soil pH is in the 5.5-7.0 range. Many composts have a pH over 7.0 but research has shown that there is no benefit in reducing the pH to a more desirable level, because nutrients in compost are available over a wide range of pH values.
- Properly made compost is turned multiple times and reaches temperatures that kill weed seeds and plant and human pathogens.

Hold the Salt

Soluble salt levels in compost may be high, especially those made with animal manure, like mushroom compost. High salt levels can prevent or retard seed germination and burn plant roots. There is a simple way to test a compost that is suspected of having a high salt level. Bean seeds are very sensitive to high salt levels, so fill a small container with the compost, plant some seeds, and check the results. If the seedlings are stunted or leaves appear scorched, you will need to leach out the excess salts by thoroughly watering the compost 2-3 times before planting.

Some good media mixtures for container vegetables:

- 100% compost
- 100% soil-less mix
- 25% garden soil + 75% compost
- 25% soil-less mix + 25% garden soil + 50% compost
- 25% garden soil + 75% soil-less mix
- 50% soil-less mix + 50% compost

Happy Roots

Water

The limited volume of growing medium available to container vegetable plants makes it critical to keep the root system moist at all times.

- Watering needs will vary depending on container size, ambient temperature, wind, sunlight, and humidity. You can count on watering most container vegetable plants daily during the summer months. The growing media should always be moist, but not soggy. Add water slowly until you see it drain out the bottom (except for "self-watering" types.)
- Use a watering can or nozzle on the end of a hose that produces a soft stream of water. Be careful not to use hot water! It can burn leaves and young roots.
- Eating quality and yield will be greatly reduced if plants are allowed to wilt due to a lack of water. Drought stress will kill feeder roots and slow plants down.
- Water-holding polymers can be purchased and mixed with growing media to help containers retain moisture. Although effective, these products are not necessary for success.
- Small containers dry out more quickly than large containers. Use a saucer to catch excess water.
- Large, mature plants need more water than seedlings and young plants.
- Micro-irrigation with soaker hoses and drip emitters is efficient, convenient, and relatively inexpensive. You can water all of your containers automatically using a series of drip emitters on a timer.

Fertilizers

Regardless of the growing media used you will need to fertilize plants regularly. University of Maryland researchers were able to double pepper production when 5-gallon buckets containing 100% compost were fertilized, at planting, with a slow-release fertilizer. This occurred because **nitrogen is usually the limiting nutrient. This highly soluble nutrient is required in large quantities by vegetable crops and is easily lost in the water that drains from the bottom of your containers.**

- The questions “how much” and “how often” to fertilize will depend on many factors— type of fertilizer, plant needs, type of container, etc.
- Even “quick” crops like leaf lettuce or broccoli raab that mature in 35-45 days may need to be several times.
- Long-season crops like tomato, cucumber, eggplant, and pepper may need to be lightly fertilized every 2 weeks or so, to produce a continuous harvest.
- Soluble fertilizers in liquid or powder form are very convenient to use and effective because the nutrients are immediately available. They are mixed with water and poured around plants according to label directions.
- Liquid sea kelp and fish fertilizer, and compost tea are excellent organic fertilizers that you mix with water and apply around plants.
- Blood meal, composted chicken manure, nitrate of soda, cottonseed meal and alfalfa meal, and worm castings are all dry organic fertilizers that you can mix into growing media at planting and re-apply as needed.
- Many non-organic fertilizers are available for container gardening. They are usually either fast-acting soluble “plant foods” that are mixed with water, or pelletized slow-release fertilizers that are relatively expensive but can provide nutrients for 2-4 months.
- NOTE: never add lime, wood ashes, or gypsum to any commercial growing media or compost. Lime is already added to commercial soil-less mixes. Compost, either commercial or backyard, has a pH of 6.8-7.5 (a soil pH of 6.2-7.2 is a good range for most vegetable plants.) And always follow fertilizer label directions.



How to plant and care for your container garden

What can I grow?

- Just about any vegetable or herb! Some of the more popular container crops are salad greens, peppers, eggplant, tomatoes, beans, chard, beets, radish, squash and cucumbers.
- More challenging crops include melons, corn, potatoes, and sweet potatoes. The key is to experiment.
- Look for “bush” or “dwarf” varieties of the crops you want to grow. There are quite a few tomato and cucumber varieties bred for small-space gardening.

How big a pot do I need?

- Match container size to plant size, both the top growth and root system. Don’t squeeze large plants into small containers. Restrict root growth too much, and plants don’t grow well. It’s useful to consider both the depth and total volume of your containers.

Recommended media depth:

- o 4-6 inches: salad greens, Asian greens, mustards, garlic, radish, basil, cilantro, thyme, mint, and marjoram. (Salad greens and some herbs have shallow, fibrous root systems and are well-suited to shallow containers with a large surface area).
- o 8-12 inches: beans, beets, chard, carrots, chard, cabbage, pepper, eggplant, tomato, squash, rosemary, parsley, lavender, and fennel.

Required pot volume:

- o 1-3 gallons: herbs, green onions, radishes, onion, chard, pepper, dwarf tomato or cucumber, basil.
- o 4-5 gallons: full-size tomato, cucumber, eggplant, beans, peas, cabbage, and broccoli.



Planting time

- Don't fill the bottom of the container with pebbles, gravel, or rocks unless you need the added weight to prevent tipping. Cover drainage holes with mesh, gravel, paper towel, or a coffee filter, to prevent soil from washing away.
- Prior to planting, use a trowel or your hands to thoroughly work water into the growing medium. This is especially important for soil-less mixes containing peat moss.
- Don't cram media into container. Fill to within an inch or so of top of container. Follow seed packet directions for planting, spacing, and care.
- For attractive and versatile containers, mix herbs and annual flowers in with the vegetable plants.
- Herbs such as lavender, thyme, oregano, marjoram, and chives require a loose growing medium, and dry conditions. Plant them together in porous clay pots and add some sand to the mix.
- Keep containers together to increase humidity and water retention

Keep those plants growing!

- Three-season planting (a.k.a. "succession planting"): When spring lettuce or radish is spent, pull up and compost the plants. Then re-plant the container in late May with pepper plants, beans or cucumber seed. In early fall you can plant kale, lettuce or broccoli raab to finish out the season. Don't forget to fertilize after each crop!
- Give them support. Cucumbers, pole beans, peppers, tomatoes, and eggplant will all benefit from some type of vertical support.
- Move plants around if containers are portable to maximize sunlight (for heat-loving crops) and shade (for summer-grown salad greens).

Trouble in Paradise: Diagnosing Plant Problems

Container-grown plants are subject to the same insect and disease problems as garden-grown plants, but container gardeners tend to have fewer problems. The biggest causes of plant problems are lack of water and nutrients, and overcrowding. Plants can also suffer root rot from too much water, especially if the growing mix does not drain well. Go to plantdiagnostics.umd.edu for additional help in diagnosing vegetable problems.

"Self-Watering" Containers: The New Wave

"Self-watering" containers represent a relatively new gardening concept. Instead of drainage holes in the bottom, these containers have an overflow hole on one side. The growing medium sits on a perforated platform directly above a water reservoir. Plant roots grow through the medium and into the water. In most cases, water is wicked up from the reservoir into the medium. These containers can be seen as a hybrid between hydroponic gardening (plant roots growing in nutrient-enriched water) and conventional container gardening. Self-watering containers help conserve water and nutrients and make it possible to ignore your containers for a few days.



The simplest application is to place a saucer under a pot. The excess water is wicked up into the media or pulled up by roots that reach the saucer. A number of commercial models are available (see "Container Gardening Resources" on page 8) or you can make your own.



Convert a 5-Gallon Bucket into a Mini-Garden



The ubiquitous five-gallon plastic bucket is considered by some to be the most useful tool on earth, particularly in poor countries. Thousands are buried in landfills or burned each day in the U.S. Thrifty gardeners rescue them from local businesses and use them to harvest, store, and protect crops, carry water and tools, spread compost, and make compost tea. University of Maryland researchers have designed a new use: a mini-garden for vegetables and herbs that recycles water and nutrients and uses only compost as the growing medium.



Materials List:

5- gallon plastic bucket and lid (food grade). Bakeries, delis, and restaurants will often give them away.
7.5-inch section of 4-inch diameter perforated drain tile
6-inch section of ½ inch (inside diameter) plastic tubing
1 ½ inch wood or decking screw
electrical tape
empty 1-gallon milk jug

Tool List:

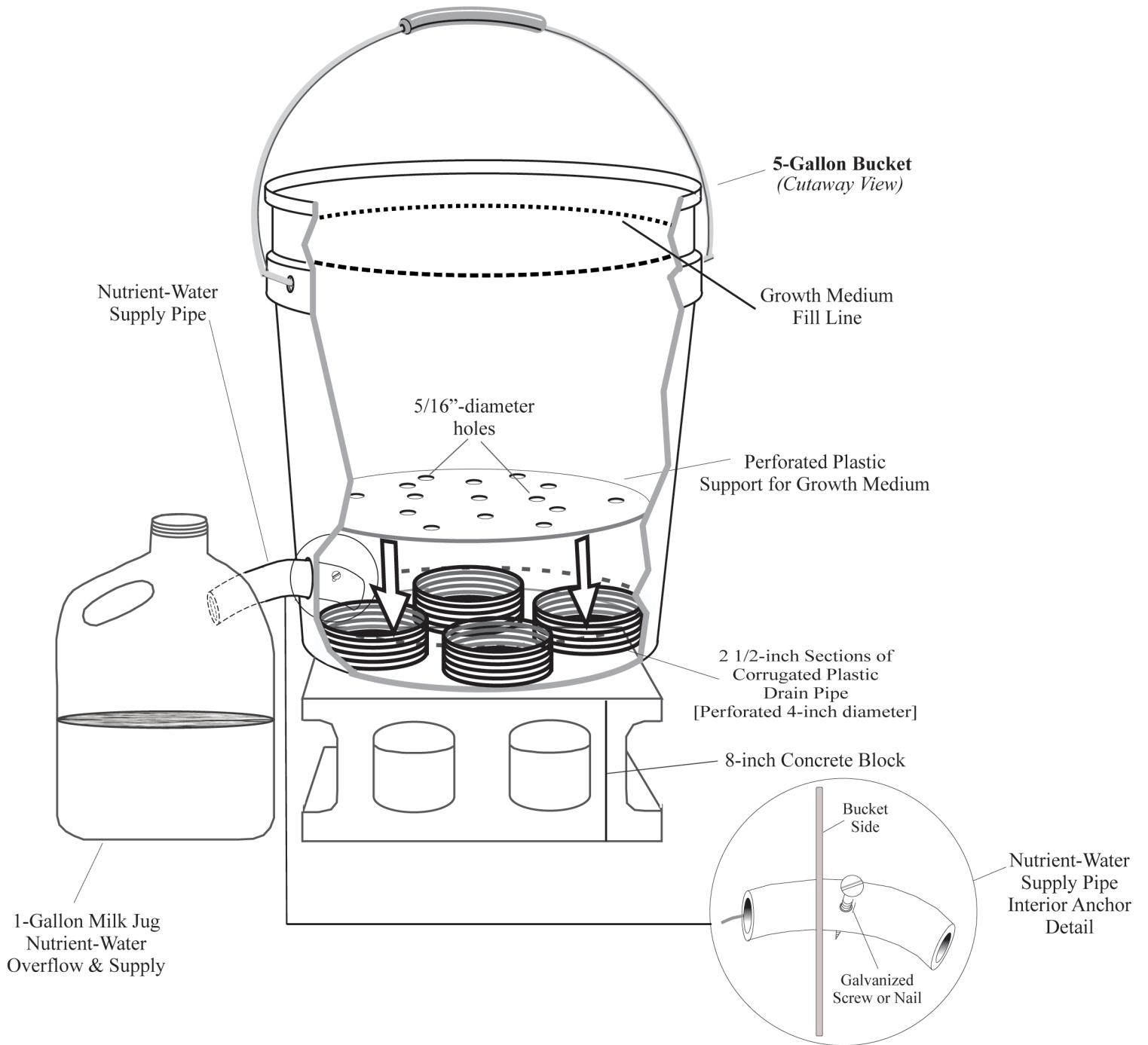
Saber saw, drill, 5/16 inch and 3/4 inch drill bits, utility knife, hacksaw



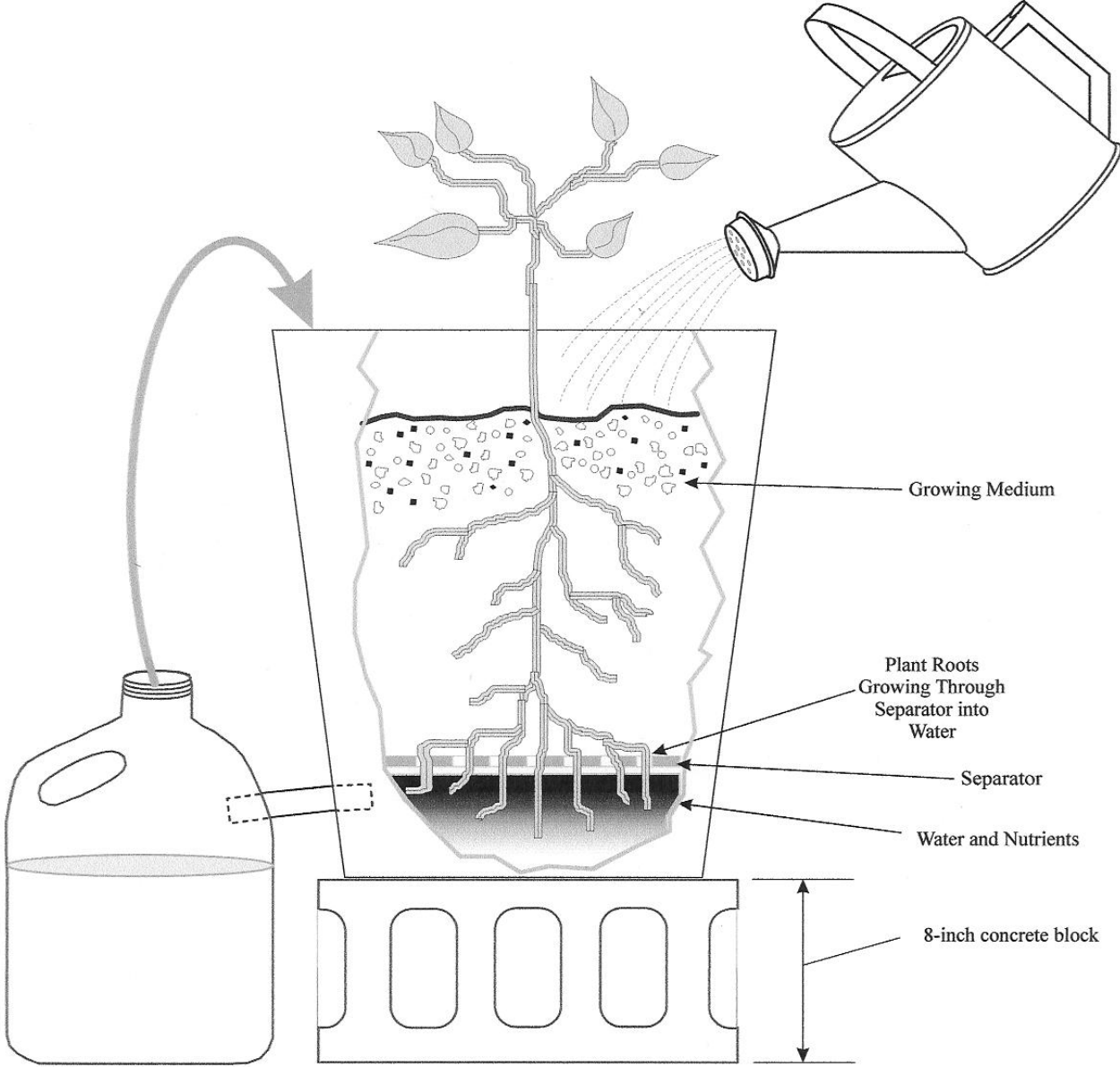
Construction Steps (see illustration on page 8):

- 1) Using a saber saw or band saw cut the lid so that it fits inside the bucket. (The lid will separate the medium from the water reservoir).
- 2) Drill 15 holes, 5/16" in diameter, in lid. (Plant roots will grow through the medium and pass through these holes into the reservoir.)
- 3) With a hacksaw, cut 3 pieces of 4-inch diameter black perforated drain tile 2 ½ inches long. (These are placed in the bottom of the bucket to support the lid-separator).
- 4) Drill one ¾ inch hole with a drill bit 2 inches above the bottom of the 5-gallon bucket.
- 5) Cut a 6-inch piece of ½ inch (inside diameter) clear plastic tubing; wrap one end with electrical tape, to create a snug fit, and insert it into the hole. The tubing will sit directly below the separator.
- 6) Drive screw through the tubing (inside the bucket), 1 inch from the end.
- 7) Cut an "X" with a knife or razor into the shoulder of a 1-gallon milk jug. Insert the end of the tubing into the milk jug and raise the bucket 8 inches by setting it up on a cinder block or bricks.
- 8) Decorate and beautify your bucket with decoupage or spray paint (Krylon Fusion™ for Painting Plastic)

Self-watering mini-garden (cutaway view)



Workings of a self-watering container (cut away view)



How to Use the “Self-Watering” Bucket Garden

Now that you’ve constructed your mini-garden it’s time to get growing! You’ll be impressed by how easy it is to recycle water and nutrients. Fill your bucket with about 4 gallons of moistened medium, plant your seeds or plants, and add 2-3 gallons of water. The reservoir will fill with water and the excess will travel through the tubing into the milk jug. If it doesn’t rain, your bucket will need to be watered regularly—every day in July and August if it’s in full sun each day. It will take 1-2 quarts of water each day to fill the reservoir. Before adding new water, simply pour back the water that collects in the milk jug. Using this technique no water or nutrients are wasted.

This is a portable mini-garden but not lightweight. The five-gallon bucket with moistened growing medium and a full-grown pepper or tomato plant weighs about 25 lbs. when the water reservoir is filled.

Container Gardening Resources:

Related MCE Fact Sheets

HG #16- Planting Dates for Vegetable Crops in Maryland

HG #70- Recommended Vegetable Cultivars for Maryland Home Gardens

HG #42- Soil Amendments and Fertilizers

Books

The Edible Container Garden- Michael Guerra; 2000; Fireside; 159 pp.

The Bountiful Container- Rose Marie Nichols McGee and Maggie Stuckey; 2002; Workman Publishing Co., Inc.; 432 pp.

Container Gardening for Dummies- Bill Marken; 1998; IDG Books; 334 pp.

The Contained Garden- Kenneth Beckett, David Carr, and David Stevens; 1992; Penguin Books; 168 pp.

Movable Harvests- Chuck Crandall & Barbara Crandall; 1995; Chapters Publishing; 128 pp.

Incredible Vegetables from Self-Watering Containers; 2006; Edwin C. Smith; Storey Pub.; 254 pp.

Websites

Container Gardens: The City Dwellers Guide to Fresh and Healthy Home Grown Food

(interesting plans for wading pool gardens)- <http://www.arts4all.com/elca/>

The Growing Connection- www.thegrowingconnection.org – a world youth gardening program run by the Food and Agricultural Organization of the UN that uses the EarthBox.

Supplies

Home Harvest Garden Supply Inc.- www.homeharvest.com

Windowbox.com- <http://www.windowbox.com/>

Gardener’s Supply Co.- www.gardeners.com

EarthBox™- <http://www.earthbox.com/>

Seeds for container gardening- <http://www.containerseeds.com/>

DripWorks- <http://www.dripworksusa.com/>

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Have a home or garden question?
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<http://www.hgic.umd.edu>