W 1288-A

SMALL-SPACE OUTDOOR FOOD PRODUCTION

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Growing your own fruits and vegetables is possible even if you don't have access to soil or outdoor yard space. Whether you live in a house, townhouse or apartment, there are options for you to grow your own food crops. This first publication in the series focuses on selecting the sites and materials that will best support small space food production outdoors. For more information on indoor food growing sites and systems as well as the crops and cultivars that can do well in small spaces, refer to UT Extension W1288-B Small-Space Indoor Food Production and UT Extension Publication W1288-C Crops and Cultivars for Small-Space Food Production.

A. Small-space outdoor food production (site, light, containers, media, and management)

B. Small-space indoor food production (site, supplemental lighting, growing systems, management)

C. Small-space crops and cultivars (vegetable, herb, and small fruit crops and cultivars)

A leafy mix with bok choy, mustard, and mizuna grown as a baby leaf crop in a large decorative container.

SITE AND LIGHT FOR OUTDOOR SMALL-SPACE FOOD PRODUCTION

Porches, patios, and balconies can all work well for growing food crops if they have enough light, air movement, and distance from nearby walls that could retain excess heat. Sunlight is the first important consideration. The best way to gauge light availability is to count the number of hours of sunlight available throughout the day. Keep track of hours of sunlight in different seasons because nearby buildings could block more light in the winter months when the sun is lower in the sky or tree shading could be impacted by leaf cover. Additionally, the location of the sun in the sky can impact the depth of lighting into porches and balconies (Figure 1). Some root or leafy vegetable crops can be grown with four to six hours of light. However, fruiting vegetables (tomatoes, peppers, okra, vine crops) and small fruit crops will need six to 10 hours of sunlight for good growth and production. Also, note whether there is morning shade or afternoon shade. Sites that receive more midday and afternoon sunlight will gain more heat than those with more morning light.

The direction the site faces (aspect) also will make a difference in light and temperature. Sites facing south and west gain the most heat through the day, especially in the afternoon. Sites facing east and north tend to have more morning light and lower heat gain during the day. Darker surfaces will absorb and retain more heat while lighter or metallic surfaces will reflect more light. In some cases, metallic surfaces can reflect excess heat onto plants.

Moderate air movement is beneficial to keep leaves drier and reduce disease pressure, but balconies or other exposed areas could have high wind issues. Also assess whether rainfall reaches the site. It can be an asset but be cautious of heavy rainfall causing waterlogging or leaching of nutrients from containers. Additionally, avoid using rainwater that has been collected from roofs or other surfaces as it can pick up pathogens that can create a food safety risk.

Table 1. Key considerations about the growing environment in different sites

Site	Lighting	Temperature	Wind/Air Movement
Ground level patio	Consider shading patterns during the day (morning versus afternoon sun) and year (summer to winter).	Dark walls will absorb and retain more heat. Sunlight patterns through the year will impact temperature gain. Containers could be placed closer to walls in cooler seasons and farther away during summer heat.	Open patios encourage air movement. This lowers disease risk but also can speed drying of container media, resulting in more frequent watering needs.
Porch	Porch roofs can block considerable amounts of sunlight, so assess light through the day and year.	The potential benefit of porch roofs is that they can lower heat load in the summer.	Porch roofs or walls can reduce wind, which can be both an asset in slowing media drying but also a concern if leaves stay wet.
Upper floor balcony or rooftop	Balconies experience light changes similar to porches and patios, but rooftops will likely be full sun and experience only seasonal differences.	Receiving full sun for most of the year means that rooftop color can have a large impact on temperature gain with darker surfaces absorbing more heat and lighter surfaces reflecting heat.	Wind speed can be a risk on balconies, so be aware of conditions and consider windbreaks if needed.

Once you have determined the light levels, air movement, and temperature patterns through the growing season (Table 1), you can best select crops for your site. Not all sites fit all crops, but crops can be selected for sites and seasons that work well. For instance, an eastern facing site or one with a partial roof covering might work well to keep down heat levels for summer crops but would likely not provide enough light for many spring or fall crops. Conversely, a fully exposed south facing location might retain heat, cause rapid container drying and challenge your summer management but be a great spot for early spring or late fall cool season crops (Figure 1). You can also actively manage light by using a trellis for warm season high light requirement crops, such as cucumbers. That same trellis could then provide lower light sites for leafy or root crops. Once you understand the basics, there are many ways you can adapt and tailor the site to your crop preferences and site characteristics.

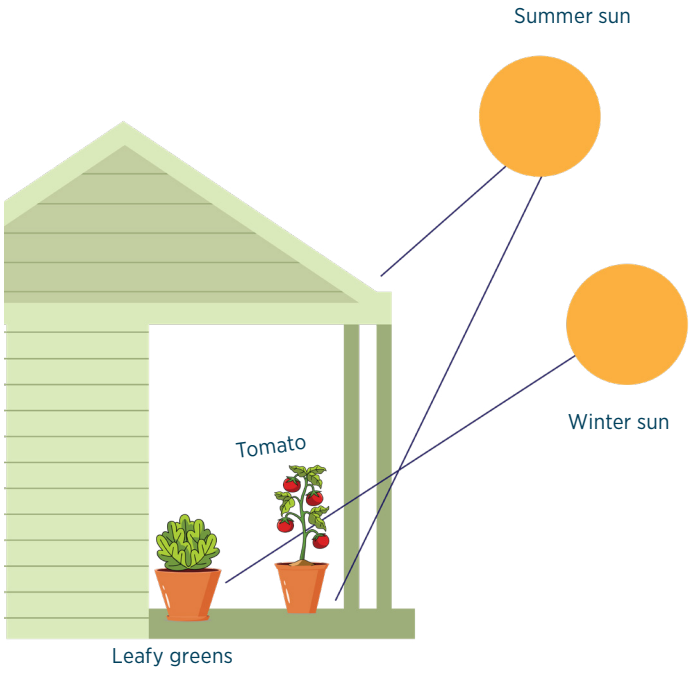

Figure 1. *The location on the porch or patio as well as the season will impact the amount of light that outdoor plants receive. Select sites and seasons that fit your small-space food crops.*

CONTAINERS

There are many great container options that are functional and visually appealing on the porch or patio. Key considerations are weight, cost, size, depth, and porosity of the material. Bottom drainage is essential for all containers to prevent waterlogging and this enables the roots to grow and utilize the entire container volume.

- **Terracotta** is easy to find and affordable but is a porous clay material that provides good aeration while drying out quickly. If you use terracotta, be sure to select a large size that has plenty of growing media.
- **Glazed clay** or **concrete containers** are often more expensive but usually dry out slower than terracotta.
- **Wooden containers** or **pots** are another option that can be quite large and do not dry out too quickly.
- **Plastic containers** generally dry out the slowest, which can be a benefit if there is adequate drainage. Plastic can have shorter lifespans and become brittle with age.
- **Reused items** can make great containers. Paint buckets, cinder blocks or repurposed wooden or metal barrels can all be used. If the size is adequate and drainage is present, these recycled options can be novel visual elements and very cost effective.

Container size is quite important. Smaller pots will require more frequent watering, and hot sunny locations can often require watering once or more a day. It is generally better to err on the side of too large than too small for containers to prevent rapid drying and plant loss under hot or dry conditions. Just make sure not to overwater small plants in large pots early or late in the season when the growing mix is drying out slower.

Table 2. Minimum suggested size of containers for common food crops (see W 1288-C for suggested cultivars)

Crop	Minimum container size*
Beets, Swiss chard, lettuce, mustard/turnip greens, onions, garlic, radishes, dwarf cherry tomatoes, basil, cilantro, parsley, oregano, sage, mint	1 gallon, 6”-9” depth
Cherry tomatoes, peppers, compact eggplant, bush beans, carrots, bush peas, turnips, kale, collards, small cabbage, strawberries	3 gallon, 12”-18” depth
Cucumbers, determinate tomatoes, compact summer squash, bush winter squash, full sized cabbage, broccoli/cauliflower, peppers, dwarf okra	5 gallon, 12”-18” depth
Indeterminate tomatoes, determinate potatoes, compact blueberries, compact raspberries	5 gallons or larger, 18”-24” depth

** Recommendations have been adapted from VT 426-336*

GROWING MEDIA

The term growing media is used rather than dirt or soil because actual soil does not work well for container growing for several reasons: soil is heavy, prone to compaction that restricts roots, and can contain plant pathogens. Many urban or small space gardeners do not have access to soil, which is why they are container gardening in the first place.

For these reasons, many container gardeners use a growing media or potting mix that is soilless. Soilless growing mixes are common in greenhouse and nursery production. They contain peat moss, coconut coir, composted pine bark, and natural materials such as sand, perlite, and vermiculite. These different components are combined to provide either water or nutrient holding capacity (peat moss and vermiculite) or rapid drainage (sand, pine bark, perlite). High quality compost (that does not contain weed seeds or pathogens) can be used to increase weight as well as water and nutrient holding capacity.

The best growing mix is one that holds water well but still has room between particles for air since plant roots need continual access to both water and air. It is also good to have a growing mix that is pathogen free, heavy enough to be stable, but not so heavy as to be difficult to handle. Different materials can be used in the growing mix to match the container and the crop. Growing medium may need to be adjusted for different crops and seasons. Select a mix that will fit your site and crop and don’t settle for bargain bags of ‘potting soil’ of unknown composition.

- For smaller growing containers, gardeners could use a greenhouse mix that has primarily peat moss and compost to hold water and perlite to support aeration and drainage.
- For larger containers, a mix that has similar volumes of peat moss, compost, and pine bark would be a good choice to provide weight, water and nutrient holding capacity and drainage. Pine bark is also a benefit because the larger particles do not break down as quickly as smaller peat particles. This longer productive lifespan is good for long season annual and perennial crops.

A greenhouse germination mix with peat and small perlite. This mix would hold water too well for most plants grown in a container. A greenhouse mix with larger perlite would be better suited to container growing.

A nursery type mix with a high percentage composted pine bark. While this would be a good material to be used in a mix, if used alone, it would dry out quickly.

When properly sized and well managed, containers can be a great tool for home food production. This array of containers is visually appealing but will likely require frequent management due to the dense planting of crops and small size of the containers.

WATER AND NUTRITION IN OUTDOOR CONTAINERS

Watering containers can be more challenging than a new gardener may think because underwatering and overwatering can limit production or even kill the plant. As a general rule, watering should be done until water drains out of the bottom of the container to ensure water reaches all the media. Bottom watering can be used if there is a tray or reservoir under the container (this can be essential if you are on a balcony with neighbors below). Just be sure that the bottom of the container is not sitting in water continually as that will waterlog the lower portion of your media. Timing of watering is important. It's best to water in the morning or evening when temperatures are mild. If mid-day watering is required, be sure to water the growing mixture and avoid getting the leaves wet. Water on leaves under direct sunlight can act as a magnifying glass and could burn your leaves.

Watering frequency depends on the location, season, crop, and plant size. The best way to monitor moisture content in the substrate is manually. Simply use your hand or finger to determine how moist the substrate is and how deep that moisture can be found.

With some experience, the rate of container drying becomes more predictable, and determining the timing of watering will become easier to anticipate. The goal is for the upper portion of the container to dry out between waterings but for the entire container to not be dry. If the growing mix dries and pulls away from the container edges, rewetting can be a challenge due to water running down the side without being absorbed. In these cases, containers can be submerged briefly to rewet thoroughly.

Irrigation systems can be quite helpful because drippers can be individually placed in containers or drip tube can be fit to unique containers sizes. Timers can be used with irrigation systems, but they aren't a replacement for careful attention and oftentimes these systems are not practical for casual home gardening.

Most of the materials used in container mixes have a low level of plant nutrients, even if compost is used, so attention to fertilization is crucial. Controlled release fertilizers can be added early in the season to slowly provide plant nutrients. Higher nutrient needing crops, such as tomatoes or leafy crops, can benefit from the use of soluble fertilizers once or twice a month. Distribute top dress fertilizers evenly over the surface area or utilize water soluble fertilizer options. Fertilizer materials are available using both conventional and organic materials. Be sure to follow directions provided with the product and select fruiting formulas (higher in potassium) or leafy formulas (higher in nitrogen) depending on the crop. You will want to visually monitor crops through time to ensure that leaf color, growth rate, and plant habit do not indicate an excess or deficiency of key nutrients.

By carefully assessing the growing site and then matching suitable containers, crops, growing media with attention to water and nutrition management, edible crops can be a fun and tasty addition to your urban or small space site.

ONLINE RESOURCES

UT Extension Publication W 1288-B Small-Space Indoor Food Production - **tiny.utk.edu/W1288B**

UT Extension Publication W 1288-C Crops and Cultivars for Small-Space Food Production - **tiny.utk.edu/W1288C**

Introduction to Small Space Food Production with Amy Dunlap Video - **https://youtu.be/MTV-NCCeKsw**

An Overview of Containers and Media for Small Spaces with Natalie Bumgarner Video - **https://www.youtube.com/watch?v=iloC6Dt_hKY**

PUBLICATIONS CITED:

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https://www.pubs.ext.vt.edu/426/426-336/426-336.html

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