Chapter 11

Vegetables

Learning Objectives
1. Explain the benefits of growing vegetables
2. Describe the basic requirements for garden preparation for vegetables
3. Explain the reasons for garden planning and layout
4. Explain sustainable vegetable garden cultivation, care and maintenance techniques
5. Explain how to harvest and store seeds and vegetables
Vegetable gardening has become increasingly popular as people garden for health, economic and recreational purposes. This chapter will discuss the benefits of growing vegetables, will provide an overview of basic garden preparation and maintenance using sustainable, conventional methods, will provide an overview of alternative gardening methods, and will discuss the cultivation of specific crops for Tennessee.

Organic vegetable gardening has become an important area for Extension clientele. However, depending on the person or the group, “organic” may have a different meaning. Some people believe that spraying eco-friendly pesticides is organic; however, the National Organic Producers have strict rules about what chemicals are considered approved treatments in organic systems. Therefore, when consulting Extension clientele, Master Gardeners should clarify the client’s definition of organic and be able to understand both conventional and organic gardening practices. Although a Master Gardener may not always agree with an individual’s desire to use a certain product or practice, a gardener’s choice should always be respected and the Master Gardener should always provide an educational response that encourages the best and most sustainable options for the said choice.

As people discover the benefits, interest and desire to grow their own food, the need for education is more evident. New gardeners often get discouraged when they encounter a problem, thinking that they have done something wrong. It is important to reassure these people that gardening experiences are different with every garden and crop grown. Information and choices can be overwhelming for even the most seasoned gardeners. Master Gardeners can provide a wealth of information and support for all types of gardeners as well as remind them of the benefits of growing their own vegetables:

1. Improve family health
2. Save money on groceries
3. Reduce environmental impact
4. Provide a reason for outdoor exercise
5. Enjoy better-tasting food
6. Build self reliance and a sense of pride
7. Provide a sense of control of food safety
8. Provide avenues of psychological and physical therapy
9. Reduce food waste

This chapter should provide Master Gardener volunteers a foundation of information to begin a journey of vegetable gardening. No gardener will be able to fully experience the pleasures of vegetable gardening without...
experimenting with plants in their own spaces. As a gardener practices, they will master certain activities and practices and be able to share their experiences with new gardeners.

**Location**

Vegetable gardening is traditionally done in large patches in rows; however, many landscapes are not large enough to accommodate a large garden. Therefore, methods of successfully growing vegetable gardens in large or small containers, hanging baskets, window boxes or companion planted with ornamentals have been developed. No matter the location or container, there are four basic plant requirements that should be considered when choosing the placement of a vegetable garden: soil, light, space and water. The ideal garden soil is deep, fertile, well-drained and of medium texture. One exception is that containerized plants can usually use a soilless mix to improve drainage. Regarding light, full sunlight produces the most productive vegetable gardens. Six hours of daily sunlight is the minimum for good production. Because they reduce sunlight and compete with vegetables for water and nutrients, trees and hedges should be avoided. The actual space required for a vegetable garden depends on what crop, cultivar or type of plant is being grown. However, level sites are less subject to erosion than sloping sites, but a slight slope toward the south hastens warming and drying of the soil early in the spring. A slightly sloping site will also have better air drainage and less frost damage than a level site or an exposed hilltop. Finally, different vegetables require different amounts of water to thrive. Therefore, before planting, make sure you are able to provide the plant with adequate water.

Typically, planting a garden near the house makes it more accessible. Therefore, it is easier to care for, water, protect and harvest. However, if there are young children, pets or farm animals that also inhabit the home or the area around the home, it may be necessary to put a protective fence around the garden. Lastly, garden sites must correspond in size to the amount of garden produce desired and the space you have for the plants. Intensive cultivation techniques can only partially substitute for a small site.

**Farmers Markets**

Farmers markets are a great Tennessee tradition. Patrons can find almost fresh fruits and vegetables, flowers and crafts seasonably available. These markets give consumers a chance to meet the farmer and purchase products directly.

Produce found at Farmers Markets is renowned for being locally grown and very fresh. Farmers markets allow farmers to pick produce at the peak of flavor, preserve the nutritional content of fresh produce, and transport locally grown produce. Purchasing local products saves fossil fuels because the food travels fewer miles and supports local growers.

Several markets such as Memphis, Jackson, Nashville, Chattanooga and Knoxville are open year round. Many Master Gardener groups are instrumental in the activities at these markets. Master Gardener supporting local agriculture by managing information booths, offering gardening seminars and providing youth activities.

For more about Farmers Markets and value added agriculture in Tennessee visit: http://valueaddedag.tennessee.edu/resources/farmersmarkets.htm
Site Preparation
Site preparation is important, especially if you are starting a new garden in a space that was once grass or a lawn. To prepare the site, start with a soil test. This will give an idea of the soil pH and the fertility. Next, mark the area for your garden and kill and remove the previous plant material; plastic sheeting (see the Soil Solarizing section in Chapter 7, Weeds) or herbicides can be used to kill the existing plant material. Once the soil is free of the previous plant material, add organic matter or compost and dig into soil. This process often takes a season of planning. Keep in mind that if grasses and weeds are not properly removed, they will become a problem during the next growing season.

Layer Cake Gardening
Patricia Lanza coined the phrase “Lasagna Gardening,” others have referred to this method of soil improvement as “Layer Cake Gardening.” This method of gardening allows for the creation of a garden bed without digging. It is an excellent way to build soils for raised beds. To make a layer cake garden:

- Layer the soil with newspaper or cardboard and then wet it down with water
- Layer the newspaper or cardboard with organic materials such as grass clippings, compost and straw
- Layer the organic materials with organic mulch, this will hold everything down
- The organic material under the mulch will decay in about 3 months and the soil will be ready for planting vegetable transplants

Garden Plan
A garden plan saves time, space, work and money. It can also increase yields and the length of the harvest season. Best of all, a solid garden plan will allow the harvest of high quality vegetables every season. To formulate a garden plan, consider past gardens and ask yourself:

- Which varieties did you like?
- Do you want to extend the harvest seasons?
- Which varieties should be rotated to a new location?
- Do you want to increase or decrease the amount of harvest?
- Do you want several small staggered plantings?
- Was something new tried last year that was desirable?
- Is there something new that you want to try this year?
- Has your family increased or decreased in size?
- Do you want to preserve more or less food this year?

The next step is to make a scale drawing of your garden. This is undoubtedly the greatest planning aid one can have. To make a scale drawing, get some paper and a pencil. Graph paper makes the drawing easy to construct and to work with, however, any kind of paper will do. Once the garden is drawn on the paper, divide it into two sections. Plan to plant cool-season vegetables in one section and warm-season vegetables in the other. The cool-season
section will be harvested by midsummer and can be replanted for a fall garden. The warm- and cool-season sections should be alternated each year to reduce plant disease. A good time to make the scale drawing is during the winter before cool-season vegetables are seeded and when the weather is not conducive to gardening.

Once the garden is drawn, sketch and label the rows of each vegetable on your plan using the appropriate row spacings (see vegetable profiles at the end of this chapter). Arrange the vegetables so tall vegetables will not shade shorter ones. Write the variety to be planted, the planting or transplanting date and the amount of seed required on the planting plan. Be sure to plan for staggered plantings to extend the season. In addition, it is also a good idea to note on your plan or in a garden calendar the dates planting was actually done, special procedures used and how acceptable the varieties were. This information will be used in planning the next garden.

### Layout and Design

Regarding layout and design, time, materials and space are the only limits to gardeners. If space is available, the traditional large gardens with 100-foot rows can be planted. These large gardens are easy to till with machinery and amendments of fertilizers and lime are already calculated into 100 square foot increments. However, if space or time for maintenance is limited, gardeners a kitchen, raised bed or container garden may be a more functional design for a part-time gardener to enjoy the bounty from the garden.

### Kitchen Gardens

Kitchen gardens have become very popular because they incorporate a variety of plants into a beautiful design. A kitchen garden is different from a garden plot because it has year-round appeal and it incorporates herbs, ornamental perennial and woody plant material. Kitchen gardens are also known as “potagers.” Potager comes from the French term *jardin potager*. It refers to a low-maintenance ornamental vegetable garden design that dates back to the Renaissance Period. Typical potagers are designed for aesthetics and use. The designs

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### Table 1. List of Vegetables for Each planting Season in Tennessee

<table>
<thead>
<tr>
<th>Spring-Planted, Cool-Season Vegetables</th>
<th>Warm-Season Vegetables</th>
<th>Summer Planted, Cool-Season Vegetables (Fall)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beets</td>
<td>Beans: Bush, Pole, Lima</td>
<td>Broccoli</td>
</tr>
<tr>
<td>Broccoli</td>
<td>Cantaloupe</td>
<td>Cabbage</td>
</tr>
<tr>
<td>Cabbage</td>
<td>Sweet Corn</td>
<td>Cauliflower</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>Cucumber</td>
<td>Collards</td>
</tr>
<tr>
<td>Carrots</td>
<td>Eggplant</td>
<td>Cucumber (second planting)</td>
</tr>
<tr>
<td>Collards</td>
<td>Okra</td>
<td>Kale</td>
</tr>
<tr>
<td>Kale</td>
<td>Peas, Field (Southern)</td>
<td>Kohlrabi</td>
</tr>
<tr>
<td>Kohlrabi</td>
<td>Pepper,</td>
<td>Lettuce</td>
</tr>
<tr>
<td>Mustard</td>
<td>Pumpkins</td>
<td>Mustard</td>
</tr>
<tr>
<td>Onions</td>
<td>Malabar Spinach</td>
<td>Potatoes</td>
</tr>
<tr>
<td>Peas, English and Sugar</td>
<td>Squash, Summer and winter</td>
<td>Radish</td>
</tr>
<tr>
<td>Potatoes</td>
<td>Sweet Potato</td>
<td>Spinach</td>
</tr>
<tr>
<td>Radishes</td>
<td>Tomatoes</td>
<td>Squash, Summer (second planting)</td>
</tr>
<tr>
<td>Spinach</td>
<td>Watermelon</td>
<td>Tomatoes (second planting on determinate)</td>
</tr>
<tr>
<td>Swiss Chard</td>
<td></td>
<td>Turnips</td>
</tr>
<tr>
<td>Turnips</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
include edible flowers, herbs and vegetables. In a potager, plants are arranged according to their form and color. They can be as formal as a knot garden or as relaxed as a cottage garden.

**Raised Beds**

Raised bed gardening allows gardeners to increase production while decreasing garden area. Additionally, raised beds allow gardeners who have fine-textured, clayey soils, which do not dry early, to concentrate on improving the soil in the growing areas. This is because raised beds drain and warm-up earlier in the spring. This allows for planting of cool-season vegetables at the recommended planting dates. Water will penetrate raised gardens better during heavy rains and there is that there is less danger of erosion.

Once they are built, raised beds are easy to prepare for planting and to manage throughout the growing season. In particular, the soil is easier to manage and pests are easier to control, as compared to standard garden plots. Additionally, raised beds are well suited to a wide range of intensive gardening techniques such as row covers, trickle irrigation, intercropping, successive plantings, use of plant supports, use of compact varieties and mixing food and ornamental plantings. Their orderliness usually produces an extremely attractive and appealing appearance.

The initial construction of a raised bed will require time, labor, materials and money, perhaps making them more expensive than traditional garden plots. Also, gardeners need to be careful about choosing which vegetables to plant. Sprawling vegetables such as pumpkins and winter squash may not have room. Additionally, the close spacing used in raised beds can promote plant diseases by reducing air circulation and allowing plants to remain moist.

**Figure 5. Potager or Kitchen Garden**

**Figure 6. Raised Beds**

**Historical Perspective of Vegetable Gardening**

The traditional vegetable garden has changed over the years, as a gardener’s space and time constraints are different. Today’s vegetable gardens are typically comprised of rows and blocks that are small-scale versions of the old family farm plots. The home vegetable garden’s popularity peaked during World War II as many people began to grow food at home to relieve the supply pressure needed to feed the war effort. These gardens were referred to as ‘victory gardens.’ Today, people have turned to growing home vegetables due to poor economic periods, the desire to become more sustainable and the desire to provide healthier food choices for their families. Additionally, as more people become involved in hobby gardening, the more creative the gardens have become. Many people incorporate functional areas such as a compost heap, a vertical garden space and raised beds as design elements.
longer. Therefore, vertical space and training should be used to reduce these problems, see Figure 7. The most severe problem associated with raised beds, however, is drainage.

Rapid drainage is an advantage when a gardener is trying to plant early spring vegetables. It is a disadvantage during the summer when drought stress can quickly lead to decreased yield and quality and increased physiological disease such as blossom-end-rot. Sandy soils and very high beds are particularly susceptible to drying out. Therefore, to help raised beds retain moisture, use low beds and apply organic matter and mulches to the surface of the beds. Also, supplemental irrigation is considered essential when gardening on raised beds.

The simplest types of raised beds are called burms. To form a burm, fertilize, lime and apply organic matter to the entire garden area. Once the soil is prepared, rake or plow the freshly worked soil into ridges, away from aisles between the beds. This will form the burms. Burms should be 4 to 8 inches high, any convenient length and 4 to 5 feet wide. If there are to be multiple beds, 1 or 2 feet should separate them. This size is advisable because it allows the entire garden to be reached from either side. This makes for convenient planting, weeding and harvesting. Raised beds should never be walked on once they are formed. The absence of soil compaction in raised beds is one of their strongest advantages. Although burms are only temporary, soil crusting can be reduced and seedling emergence enhanced by annually working compost into the soil. Once the burms are formed, the top should be flattened with a rake. At this point, the burms are ready for planting. These beds break down over the gardening season and must be reformed each year. In this way, gardening with burms is not very different from traditional gardening.

As compared to burms, permanently raised beds make much better use of the advantages of raised beds. To make permanently raised beds, the desired area should be marked with stakes and twine. Then, this area should be fertilized, limed and covered with compost, shredded leaves or other organic material. This material should then be worked into the soil as deeply as possible using a spading fork or rototiller. Once this is done, the beds should be edged. Raised beds may be edged with old lumber, landscape timbers, railroad ties, concrete blocks or whatever is convenient. A combination of soil from the aisles, topsoil, compost, sand, shredded leaves and other material may be added to fill the raised beds to the desired height.

Raised beds will have maximum efficiency if plants are spaced equidistant from each other. Ideally, mature plants should just touch, forming a canopy over the soil. One way to accomplish this spacing is to set plants a little farther apart than the suggested spacings and then use the same distance between rows as within rows. Additionally, small vegetables that tend to mature all at once or that are used only in small amounts may be planted in short rows across the bed. Plantings that are 2 to 3 weeks apart will maintain uniform production over many weeks.

Vegetables such as tomatoes and cucumbers do well in raised beds if they are supported and allowed to grow up, rather than to sprawl or climb. Corn is not well adapted to raised beds because it needs to be well anchored and it requires considerable space for best yields. Large sprawling vegetables, such as watermelons and pumpkins, are also better suited to traditional gardening systems than raised beds.

To use raised beds efficiently, they should be well fertilized, watered and kept filled with growing plants. When a spring vegetable is harvested, a summer vegetable should be planted in its place. Summer vegetables should be followed with fall vegetables.
Containers

Containers are practical solutions for gardeners with limited space. Container gardens can be on a deck, patio, doorstep or windowsill. Container gardening is beneficial because the containers are accessible, convenient, space efficient and the soil and drainage issues can be easily controlled. When it comes to drainage, containers should be treated similar to raised beds. Additionally, drilling holes on the sides of the container or lifting the container off the ground with pot feet can increase drainage.

Container media should be well-drained. Soilless mixes are the best choice for containers because they are weed and disease free. Additionally, they are less likely to become heavily compacted and they hold water, air and nutrients efficiently while still being lightweight.

Plants in containers are sensitive to their environment, including temperature changes, water evaporation and freezing. Therefore, containers should be thick for insulation, dark to absorb more heat for winter gardens and light to reduce temperatures for summer gardens. During warm seasons, containers should be watered frequently; soilless mixes should never be allowed to dry out.

Soil Care

Soil is the foundation to a successful garden. Thus, managing the growing media is very important. To successfully manage the growing media, it is essential to know the soil type and texture and to ensure proper drainage and nutrient availability. See Chapter 3, Soils and Plant Nutrition, for detailed information on managing soils.

Soil management for vegetable gardens depends on the type of gardening: raised bed, vegetable rows or containers. Additionally, soil type depends on the vegetable you are planting. For example, root crops grow longer and straighter in medium to coarse-textured soils. However, all garden layouts require the soil to be worked at least 6 inches deep and smoothed before planting. Seed and transplants should be planted only in moist, finely aggregated soil. Soil that is worked into a powdery condition is likely to crust and soil that is overly wet will form clods that will become extremely hard as they dry. Clods are entirely unsuitable for a seedbed. It may require several seasons to get cloddy soil back in top condition. Seeds and transplants planted in cloddy soil usually dry out or germinate and grow poorly. If water can be squeezed from a handful of garden soil or if a squeezed lump of soil does not break apart when dropped, it is too wet. Garden soil may be worked with farm equipment, a rototiller or spaded with a shovel.

Early spring soils are often too wet to plant cool-season crops by the recommended planting date. Establishment of drainage ditches, tiles, addition of sand or incorporation of organic material may improve these soils. As stated earlier, raised beds or a high part of the garden may be used for the earliest planting. Another solution is to work part of the garden in the fall and to make ridges that are 6 to 8 inches high. These ridges warm up and dry out earlier in the spring than the rest of the garden. They can be planted without further working if fertilizer is incorporated in the fall.

Table 2. Choosing the Right Container

<table>
<thead>
<tr>
<th>Shallow Container (less than 12” deep)</th>
<th>Medium Container (12-18” deep)</th>
<th>Deep Containers (18”+ deep)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beets</td>
<td>Carrots</td>
<td>Beans</td>
</tr>
<tr>
<td>Leaf lettuce</td>
<td>Broccoli</td>
<td>Potatoes</td>
</tr>
<tr>
<td>Onions</td>
<td>Cabbage</td>
<td>Summer squash</td>
</tr>
<tr>
<td>Radishes</td>
<td>Cauliflower</td>
<td>Tomatoes</td>
</tr>
<tr>
<td>Spinach</td>
<td>Peas</td>
<td></td>
</tr>
<tr>
<td>Swiss chard</td>
<td>Peppers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cucumbers</td>
<td></td>
</tr>
</tbody>
</table>
Adjusting pH

It may be necessary to apply lime or sulfur to the soil so that the pH is about 5.5 to 6.0, depending on the vegetable being planted. A soil test is the only accurate method of determining how much fertilizer, lime or sulfur is needed. If too little fertilizer is applied, plants will be starved and yield and quality of vegetables will be reduced. If too much fertilizer is applied, plants may be injured or killed, and because plants will not be able to fully utilize it, both fertilizer and money will be wasted.

Lime is important because it improves rooting, allows better fertilizer uptake and reduces the incidence of certain physiological disorders such as blossom-end-rot of tomatoes. If too little lime is in the soil, the soil will be acidic and plants may be hindered from taking up nutrients, thus fertilization may be ineffective. Too much lime can also be harmful to plants (see Chapter on Soils and Plant Nutrition). Specific information concerning how to sample soil for a soil test and how to treat the sample after collection is available at all county Extension offices, in Chapter 3, Soils and Plant Nutrition and in the soil preparation section of this unit.

If the soil test determines that lime is needed, broadcast it evenly over the garden and work it into the top 6 inches. The lime will probably last 3 to 5 years under most conditions. Heavy concentrations of lime should not be applied around the base of plants or sprinkled over plants in an attempt to control insects. Soil pH will become balanced as more organic materials are added each growing season. As the soil becomes healthier, the need to add fertilizer, lime and sulfur will decrease.

Green Manure Cover Cropping

Green manure cover crops are usually planted in the late summer or early fall and plowed under either in the late fall or several weeks before spring planting. Green manure cover crops provide large amounts of organic matter, some nutrients and protection from erosion over the winter. They are useful to gardeners trying to improve their soils, especially those who are unable to compost enough material for their large gardens. They may also be used over the growing season in a rotation system designed to control plant pests or to improve soils.

There are two types of green manure cover crops: legumes and non-legumes. Legumes can add nutrients to the soil because they have root nodules that contain nitrogen-fixing bacteria. Legumes fix more nitrogen when grown with a non-legume crop than when grown by themselves. It is not unusual for a mixed legume planting to fix 100 pounds of nitrogen per acre. Legumes may also have very deep roots, which improves soil drainage and brings up nutrients from the subsoil to levels where shallow-rooted plants can use them. Peas, beans, clover, vetch and alfalfa are examples of legumes.

The non-legumes used as green manure cover crops are mostly grasses. They are grown because they are economical, easily established and can quickly produce large amounts of organic material. Examples include annual ryegrass, oats, wheat and millet.

A list of suitable green manure cover crops and some of their characteristics can be found in Table 3.

Cover crops may be left to decay on the soil surface or they may be chopped or mowed.

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**Table 3. Green Manure Crops**

<table>
<thead>
<tr>
<th>Cover Crop</th>
<th>Sowing Time</th>
<th>Time to Turn Under</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crimson clover (<em>Trifolium incarnatum</em>)</td>
<td>Fall or Spring</td>
<td>Fall or Spring</td>
</tr>
<tr>
<td>Hairy vetch (<em>Vicia villosa</em>)</td>
<td>Fall or Spring</td>
<td>Fall or Spring</td>
</tr>
<tr>
<td>Buckwheat (<em>Fagopyrum esculentum</em>)</td>
<td>Late Spring or Summer</td>
<td>Summer or Fall</td>
</tr>
<tr>
<td>Oats (<em>Avena sativa</em>)</td>
<td>Spring or Fall</td>
<td>Spring, Fall or Summer</td>
</tr>
<tr>
<td>Rape (<em>Brassica napus</em>)</td>
<td>Spring or Fall</td>
<td>Summer or Fall</td>
</tr>
<tr>
<td>Winter rye (<em>Secale cereale</em>)</td>
<td>Fall</td>
<td>Spring</td>
</tr>
</tbody>
</table>
with a rotary lawn mower. This needs to be done before their seeds mature. Allowing a cover crop to remain on the soil surface will provide about the same amount of nitrogen as turning it under, and it may help reduce erosion and retain moisture. However, it could provide a place for insects and disease pathogens to overwinter, see Crop Residues below. If cover crops are turned under, allow at least 6 weeks for them to decay before planting. This will reduce nitrogen tie-up problems.

**Crop Residues**
Crop residue is the portion of the plants remaining after harvest. This residue is a significant source of organic material. It can be left on the surface where it grew, used as mulch, composted or turned under. Leaving crop residue on the surface slows breakdown of the organic material so total soil organic material increases. However, insect, disease and weed problems are increased due to these pests overwintering in this debris. Turning crop residue under breaks it down faster, which may release nutrients. Additionally, some insects and diseases are less likely to survive if their host plant material is eliminated.

**Fertilizers**
Vegetables require complete fertilizers for proper growth and development. Fertilizers need to have nitrogen, phosphorus and potassium in them to be considered complete fertilizers. Manure is also a complete fertilizer and can be used to supplement chemical fertilizers. Manure varies considerably in nutrient value, depending on the type of animal, length of storage, amount of bedding material and moisture. Since most manure has less than 2 percent phosphate and less than 1 percent nitrogen and potash, several times more manure than chemical fertilizer must be applied if only manure is used.

Fertilizer should be applied to garden soils in the spring before planting. Manure is generally broadcast. Chemical fertilizers may be broadcast, applied in the row or banded near the row. If fertilizer is broadcast or applied in the row, it should be worked into the soil before planting. Bands should be placed about 2 inches to the side and 2 inches below the seed. Vegetable plants may be damaged by over-fertilization or fertilizer placed too close. Soil test reports give amounts of fertilizer to broadcast in pounds per 1,000 square feet and per acre. Therefore, Table 4 can be used to convert the soil test recommendations to amounts per 100-foot of row or square foot of garden area.

### Table 4. Approximate Pounds of Fertilizer to Apply to 100-Foot Rows to Equal Recommended Rates

<table>
<thead>
<tr>
<th>Per acre</th>
<th>Per 1,000 square feet</th>
<th>Fertilizer rates in pounds per 100 foot rows for various row widths*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>18 inches</td>
</tr>
<tr>
<td>435</td>
<td>10 lbs.</td>
<td>1.5</td>
</tr>
<tr>
<td>650</td>
<td>15 lbs.</td>
<td>2.3</td>
</tr>
<tr>
<td>870</td>
<td>20 lbs.</td>
<td>3.0</td>
</tr>
<tr>
<td>1,090</td>
<td>25 lbs.</td>
<td>3.8</td>
</tr>
<tr>
<td>1,305</td>
<td>30 lbs.</td>
<td>4.5</td>
</tr>
</tbody>
</table>

* One pint of dry fertilizer weighs about one pound.
Variety Selection

Vegetable variety selection is important because of the different characteristics of the varieties. Some varieties are grown as hybrids, while some offer resistance to certain diseases, some are heirlooms and some have a different form or growth habit. The variety to choose depends upon the location it is being grown and which characteristics are desired. For example, someone that is looking for pest resistance may prefer a hybrid variety while someone who is looking for optimal performance may select an heirloom variety.

Many vegetable varieties have been observed or tested in gardens across Tennessee at the UT Gardens in Knoxville and Jackson. Varieties are listed in each vegetable profile at the end of this chapter.

Disease Resistance

Many of the disease resistant varieties have resistance to three or more diseases. It is important to remember that resistance is not immunity. A resistant variety will probably not escape a pest, but may bear a fair crop despite the pest. Selecting vegetable varieties resistant to several pests is worthwhile if reducing the use of plant protective chemicals is desired. Disease-resistant varieties tend to be more productive with less chemical input.

Form or Growth Habit

The form of a vegetable plant refers to the appearance or the shape of the plant, a bush beans and pole beans for example. Growth habit refers to how the plant grows. For example, plants can have an indeterminate growth habit, meaning that they continue to grow as in a vine, or they may have a determinate growth habit, meaning that they grow until they reach a set point and then they stop as in a bush. Small gardens may benefit from compact varieties designed to grow in small or vertical spaces. These are widely available and frequently produce more in less space. Varieties that climb or that are adapted to plant supports such as stakes or cages are also well adapted to small gardens.

Crop Rotation

Closely related plants can be grouped into families. Families of plants tend to be susceptible to many of the same insect, disease and nematode problems. Grouping vegetable plants into families and moving each family to a different location within the garden each year can reduce many insect and disease problems. See Table 5 for suggested vegetable groups for rotation.

Figure 9.
Research the characteristics of a variety before you purchase seed. Purchase fresh seeds, germination can significantly decrease for some species if seed is older than one year.

Figure 10.
Different Varieties of Squash, Pumpkins and Gourds
Seed Sowing: Timing and Spacing

Vegetables should be seeded in trays so that they will be ready to set into the garden at the recommended planting dates. Table 6 gives an indication of appropriate seeding dates for some vegetables. Staggering the planting dates can length the growing and harvesting season. Most vegetables may be seeded with one or two seeds to an individual cell or in rows in a seed flat. If the seeds are placed in flats, they need to be transplanted into individual containers 5 to 10 days after they emerge.

Cantaloupe and other vine crops are grown in fibrous containers or in containers that allow the roots to grow through. They must be seeded directly into these containers and set into the garden without removal from the containers. They are seeded no more than 3 weeks before transplanting to reduce stunting caused by root pruning and transplanting shock. Pint or quart mesh berry baskets work well as containers for two or three plants of a vine crop. Seed should be planted at a depth equal to two to four times its diameter. Some seeds, such as lettuce, require light for germination. Seeds requiring light for germination should be planted very shallow and have a transparent cover on the container to retain moisture until the seeds begin to emerge. Seed packets often have planting instructions printed on them.

See Table 6. Approximate Growing Time, Germination Temperature, Growing Temperature and Hardening Conditions for Various Vegetables.

### Table 5. Examples of Crop Groupings to Reduce Diseases

<table>
<thead>
<tr>
<th>Group</th>
<th>Crop</th>
<th>Disease(s) Reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Cantaloupe, Cucumber, Pumpkin, Squash, Watermelon</td>
<td>Microdochium blight, Fusarium wilt, Gummy stem blight, Anthracnose, Scab, Belly rot angular leaf spot, Nematodes</td>
</tr>
<tr>
<td></td>
<td>Brussels sprouts, Cabbage, Cauliflower, Collards, Lettuce, Mustard, Radish, Rutabaga, Spinach, Swiss chard, Turnip</td>
<td>Black leg, Club rot, Black rot</td>
</tr>
<tr>
<td>B</td>
<td>Eggplant, Irish potato, Orkra, Pepper, Tomato</td>
<td>Bacterial canker, Early blight, Nematodes, Potato scab</td>
</tr>
<tr>
<td>C</td>
<td>Beet, Carrot, Garlic, Shallot, Sweet potato</td>
<td>Scurf, Black rot, Wilt, Nematodes</td>
</tr>
<tr>
<td>D</td>
<td>Sweet Corn</td>
<td>Smut</td>
</tr>
<tr>
<td>E</td>
<td>Bean, Cowpea, Peas</td>
<td>Fusarium root rot, Nematodes, Anthracnose</td>
</tr>
<tr>
<td>F</td>
<td>Bean, Cowpea, Peas</td>
<td>Fusarium root rot, Nematodes, Anthracnose</td>
</tr>
</tbody>
</table>
Transplanting

Some vegetables are commonly set into the garden as transplants. These include tomatoes, peppers, eggplant, head lettuce, cabbage, cauliflower, broccoli, Brussels sprouts, kohlrabi, cantaloupe, watermelon, summer squash, okra and cucumbers. There are several advantages to using transplants rather than direct seeding. Transplants allow the immediate replacement of early harvested vegetables and the rapid production of another crop. Yield losses from poor germination are eliminated and the chances of introducing insects or diseases into the garden are greatly reduced. Using home grown transplants allows for the control of things such as cultivar selection, plant size, container material and container size. Additionally, there is an assurance of transplant availability, and the plants usually provide better livability and growth when set in the garden.

Growing Conditions

Growing conditions refer to the environmental conditions surrounding the plant. They include factors such as water, fertilizer and temperature. Vegetables vary in their optimum temperature for germination and growth and in the time required to produce a quality transplant. This information is summarized in Table 6. Most homeowners find maintaining proper conditions for transplant production at home to be extremely difficult. Vegetable seeds generally germinate best at a higher temperature than their optimum growing temperature and grow best with day temperatures that are about 10 degrees above night temperatures.

The big problem in growing transplants at home is light intensity. Even a bright, south-facing window does not allow enough light to grow a good quality transplant. Homeowners must develop a special place, or make a special effort, to provide optimum conditions to produce quality vegetable transplants.

Water

Proper watering is critical to producing healthy transplants. Without moisture, seeds will fail to germinate and seedlings will quickly die. However, vigorous applications of water can destroy seedlings, cause root rot or cause damping off. Therefore, it is best to frequently water plants with a fine mist so that uniform moisture is maintained. If conditions are warm, dry or windy, it may be necessary to water two or three times a day. If conditions are moist or cloudy, watering may be required only once a day or not at all. Transplants should be watered frequently enough to keep the media slightly moist until the plants harden. Finally, hotbeds, cold frames and seedling flats can dry out very quickly when exposed to direct sunlight; therefore, it may be necessary to water plants in these items more frequently.

Types of Vegetable Breeding

Hybrids

Hybrid varieties are often more pest resistant than non-hybrid varieties. This is because hybrids are crosses of true breeding lines. They are frequently selected because they contain specific pest resistance from both parent lines. Also, when grown under favorable conditions, hybrids tend to live longer, have higher yields and bear fruit earlier than non-hybrid varieties.

Hybrids do have some disadvantages. Hybrid varieties must be grown from purchased seed, which is expensive due to the labor involved in making the crosses necessary to produce the seed. Also, plants grown from seed saved from hybrid varieties will vary in numerous characteristics rather than being identical to the parent plants. Despite these disadvantages, hybrid vegetables are generally a wise choice for gardeners. They not only have increased vigor, pest resistance and longevity, but they have shown to be equal in taste and nutrition to non-hybrid varieties. The fruit, in fact, frequently has increased storability, appearance and quality.

Heirloom

Heirloom varieties are family or pass-a-long varieties that have continued to perform well in local areas of Tennessee for many years. When using heirlooms, it is important to grow recommended varieties or varieties known to perform well whenever possible. Organic gardeners prefer non-hybrid or heirloom varieties.

Genetically Modified

Genetically modified vegetables have been changed or breed by having their genetic information (DNA) altered. Sometimes they are referred to as transgenic plants. Genetic plant breeding is usually done to cultivate a specific characteristic such as resistance to a pest, disease or chemical. Some breeding has been done to create new colors or species. There is more information on genetic modification in plants in the handbook Chapter 16, New Technologies in Plant Sciences.

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Fertilizer
Some artificial medias contain fertilizer. If these are used with the initial planting, then additional fertilization is usually not required. However, if a homemade media is being used or if the artificial media does not contain fertilizer, it will be necessary to add some. An easy way to do this is to water with a soluble fertilizer at half the recommended strength once a week.

Temperature: Retaining Heat
To increase the chances of producing quality transplants in a cold frame, cover the frame on cold nights with an insulating cover, such as a blanket or a bag of leaves, and set the frame on concrete on the south side of a building.

This will retain heat because the concrete will absorb heat during the day and give it off at night. Additionally, the building will shelter the frame from cold winds.
If an outdoor growing frame is unavailable, it is possible to produce transplants indoors if special efforts are made. There are, for example, various fluorescent lights designed especially for plant growth. By suspending one of these lights 4 to 6 inches above young plants and turning the thermostat down 10 degrees at night (see Table 6), adequate quality transplants of some vegetables can be produced. It is also possible to use a combination of soft, white fluorescent and incandescent lighting to produce transplants. About 10 percent of the total wattage should be incandescent.
Another method of producing transplants indoors involves building a light box to supplement light from a south-facing window. A light box has a bottom, a back and two ends only. It should be just over 4 feet long and about 18 inches high and 18 inches wide. The inside of the box should be lined with aluminum foil to reflect light, and a fluorescent light containing soft white tubes should be put across the top ends of the box. The fluorescent light then becomes the top of the box. Once complete, the box should be placed in front of a south-facing window to supplement the

Cold Frames
A hotbed without a heating source is a cold frame. Cold frames are more difficult to grow plants in than hotbeds, especially early in the growing season when it is cool. Cold frames may suffice if seeds are not planted too early or if seed are germinated inside and then the seedlings are moved into the cold frame.

Table 6. Approximate Growing Time, Germination Temperature, Growing Temperature and Hardening Conditions for Various Vegetables

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Approximate Growing Time (wks)</th>
<th>Germination Temp. (degrees F)</th>
<th>Growing Temp. (degrees F)</th>
<th>Hardening Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cool-Season</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broccoli</td>
<td>5 to 7</td>
<td>70</td>
<td>60 to 65</td>
<td>50 to 55 degrees F for 10 days</td>
</tr>
<tr>
<td>Cabbage</td>
<td>5 to 7</td>
<td>70</td>
<td>60 to 65</td>
<td>50 to 55 degrees F for 10 days</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>5 to 7</td>
<td>70</td>
<td>60 to 65</td>
<td>50 to 55 degrees F for 10 days</td>
</tr>
<tr>
<td>Head Lettuce</td>
<td>5 to 7</td>
<td>70</td>
<td>60 to 65</td>
<td>Reduce temperature and moisture</td>
</tr>
<tr>
<td>Warm-Season</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cucumber</td>
<td>2 to 3</td>
<td>75</td>
<td>65 to 75</td>
<td>Reduce moisture</td>
</tr>
<tr>
<td>Cantaloupe</td>
<td>2 to 3</td>
<td>75</td>
<td>65 to 75</td>
<td>Reduce moisture</td>
</tr>
<tr>
<td>Eggplant</td>
<td>6 to 8</td>
<td>75</td>
<td>70 to 75</td>
<td>Reduce temperature and moisture</td>
</tr>
<tr>
<td>Pepper</td>
<td>7 to 9</td>
<td>75</td>
<td>60 to 70</td>
<td>Reduce temperature and moisture</td>
</tr>
<tr>
<td>Squash</td>
<td>2 to 3</td>
<td>75</td>
<td>65 to 75</td>
<td>Reduce moisture</td>
</tr>
<tr>
<td>Tomato</td>
<td>5 to 7</td>
<td>75</td>
<td>60 to 70</td>
<td>Reduce temperature and moisture</td>
</tr>
<tr>
<td>Watermelon</td>
<td>2 to 3</td>
<td>80</td>
<td>65 to 75</td>
<td>Reduce moisture</td>
</tr>
</tbody>
</table>
natural light. A timer should be used and should come on at dawn and go off 16 hours later. Flats of plants should be placed on blocks in the light box to keep them near the light. The blocks should be removed as the plants grow.

Proper care of a cold frame or hotbed is critical if young plants are to survive. Both must be opened in the morning so heat can escape, or the plants inside will be destroyed. This is because they heat up very quickly when the sun shines on them. Also, to retain heat during cold weather, cold frames should be closed in the late afternoon or early evening.

**Hardening Transplants**

Hardening transplants increases their ability to withstand cold temperatures, drying winds and hot sunlight after they are set in the garden. Hardening may be accomplished by either lowering the growing temperature about 10 degrees for 10 days to 2 weeks, or by allowing plants to wilt slightly before watering (see Table 6). Opening growing structures earlier, wider or setting transplants outside in a protected area during the day may also harden them. Hardened plants can be recognized by a slight purple tinge in the leaf veins on the lower side of the leaf. If the entire underside of the leaf is purple, the plant is not only hardened but also stunted. Stunting plants should be avoided as they seldom perform well. Cantaloupe, watermelon, squash or cucumber plants should never be hardened by exposing them to cold temperatures because they will be permanently stunted. Some of the common problems and causes observed in growing transplants are listed in Table 7.

A hotbed that may be used to produce good quality transplants. A hotbed is essentially a box with a transparent top and a provision for adding heat. The sides may be concrete, cinder blocks, wood or even plastic. Tops are usually plastic or glass. Heat is usually provided by placing a heating cable connected to a thermostat in the bottom of the bed. The cable should be protected by wire mesh and about an inch of sand. Fermenting manure can also be used as a heat source. Growing media may be placed directly in the hotbed or in containers placed in the bed.

**Planting Your Garden**

Planting a garden should begin with the previously discussed steps. Site selection, soil preparation and proper seed selection have been discussed and are all particularly important. Other important considerations include timing, spacing and planting depth. Transplants or seed planting is discussed in more detail in the vegetable profiles at the end of this chapter. These tender plants need extra care at planting to insure their success.

**Protective Covers**

Plants should be covered not only to prevent damage during cold weather, but also to modify climates and extend growing seasons. Buckets, old blankets and one-gallon milk jugs are cheap, readily available and highly useful items for covering plants. If a milk jug is used, simply cut out the bottom, remove the cap and push the remainder of the jug 1 inch into the soil, directly over small plants. If necessary, jugs can be pinned to the ground with a long wire hairpin. Protective covers encourage plants to grow faster and produce earlier. Covers may be removed once the weather moderates. Additionally, the bottoms of the jugs can be used as small platforms to support cantaloupe, pumpkin and winter squash above the ground.

Groups of plants can be protected from winter weather by modifying the climate over an entire row, or even several rows. Spun-bonded or plastic floating row covers loosely placed over one or more rows of young plants

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**Table 7. Troubleshooting Transplant Production**

<table>
<thead>
<tr>
<th>Common Problems</th>
<th>Cause(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tall, straggly seedlings</td>
<td>Light intensity is too low</td>
</tr>
<tr>
<td></td>
<td>Nitrogen fertilization is too high</td>
</tr>
<tr>
<td></td>
<td>Night temperature is too high</td>
</tr>
<tr>
<td></td>
<td>Plants are spaced too close</td>
</tr>
<tr>
<td>Older leaves yellow</td>
<td>Nitrogen fertilization is needed</td>
</tr>
<tr>
<td>Seed does not come up</td>
<td>Seed is old or improperly stored</td>
</tr>
<tr>
<td></td>
<td>Media is too wet or too dry</td>
</tr>
<tr>
<td></td>
<td>Temperature is too low</td>
</tr>
<tr>
<td></td>
<td>Seed is planted too deep</td>
</tr>
<tr>
<td>Seedlings look pinched at soil line, fall over and die</td>
<td>Damping off</td>
</tr>
<tr>
<td></td>
<td>Too much water</td>
</tr>
<tr>
<td></td>
<td>Temperature is too high or too low</td>
</tr>
<tr>
<td></td>
<td>Poor ventilation</td>
</tr>
<tr>
<td></td>
<td>Media and/or containers are not sterile</td>
</tr>
<tr>
<td></td>
<td>Light intensity is too low</td>
</tr>
<tr>
<td>Purple leaves</td>
<td>Phosphorus is deficient</td>
</tr>
<tr>
<td></td>
<td>Temperature is too low</td>
</tr>
</tbody>
</table>
can be used for this purpose. Floating row covers lie directly on the plants and are lifted as the plants grow. Floating row covers raise the temperature considerably during the day and offer two or three degrees of frost protection at night. This results in more rapid plant growth and an earlier harvest.

If row covers are used, it is important to apply them loosely so they can be lifted as the plants grow. For plants requiring pollination, these covers should be removed when the plants flower so insects can reach the flowers. The protection of young plants from insects is an important secondary effect of spunbonded covers. These covers are especially useful on cabbage and broccoli plants where protection from insects is important. They are also useful on watermelon and cantaloupe plants because they respond well to increased heat. Because these covers need to be removed to control weeds, they should only be used on weed-free soils or on small areas.

Like floating row covers, slitted row covers can also encourage an early harvest and reduce insect infestation. However, they must be removed from plants requiring pollination when they flower. They must also be removed from crops that cannot withstand extreme summer temperatures. Thus, slitted row covers are very conducive to high-yielding small gardens, but they are difficult to use with some other cultural devices, such as plant supports.

In addition to the covers mentioned above, there are various kinds of small plastic tunnels used to protect plants. These tunnels consist of 5- to 6-foot wide clear or translucent plastic strips that are either solid or with slits or holes down the sides. The plastic is supported by 6-foot lengths of #10 wire bent into a hoop shape and inserted over the row at 6- to 10-foot intervals. To prevent removal by wind, the edge of the plastic must be well covered with soil.

Plastic row covers should be installed immediately after planting or transplanting. This is because much of their benefit comes from increased soil temperature, which requires time to achieve. They are often used with black plastic mulch, which assists in weed control. Although all of the above items will help the growth of transplants, if cost is not an issue, the best structure for growing transplants is a greenhouse.

Cultivation Care
Care for vegetables after planning includes weed management, pest management and supplying adequate food and nutrition to the crop. Different crops have different needs and tolerances for these necessities. Balancing the specific needs for each crop is vital to the health and sustainability of the garden. Please refer to the vegetable profiles at the end of this chapter for cultivation details on each vegetable.

Figure 11. Row Covers

A. Row Covers Protecting Young Transplants

B. Floating Row Covers Over Eggplant
Timing Irrigation

Many people believe that watering during the hot part of the day causes plants to “bum,” which means to die. There is very little, if any, evidence that this is true. Watering when it is hot or windy will increase evaporation and waste water; however, it is unlikely to directly harm the plants. It is also a common belief that watering late in the evening may increase disease occurrence if plants remain wet at night. Therefore, this should be avoided. Although, the above being stated, any kind of water application that wets foliage is likely to increase certain plant foliage diseases somewhat. It is best to irrigate with drip or trickle irrigation, review Chapter 4, Water Management for more information on irrigation.

Another common error in timing irrigation is to shallow watering every day or two. Although this works well when using drip or trickle systems where a small amount of water will soak deeply into the soil, it does not work well when using an overhead sprinkler system. When using this type of system, only 1 to 1½ inches of water should be applied at one time. This water should be allowed to soak in for several days to a week before irrigating again. This less frequent irrigation will be less likely to increase plant diseases and will not create a shallow layer of moist soil over drier, deeper layers. Also, plants will be less dependent on frequent watering for growth and even survival.

Staking and Trellises

Plant supports can be an important part of the garden. They make plants easier to tend and to harvest. They can also extend the harvest season. More importantly, supported vegetable plants have fewer disease and insect problems because of the improved air circulation and the decreased contact with wet, disease-infested soil.

English peas, sugar snap peas, cucumbers and pole beans are some of the vegetables that are commonly grown vertically. These vegetables may be trained on a fence, in a wire cage or on a trellis. Pole beans may be grouped around individual stakes or on several stakes. They may be pulled together at the top and tied for additional strength.

Tomatoes also respond well to vertical culture because many of the fruit may rot if they touch the ground. Tomatoes are usually supported by either 5- or 6-foot stakes or by a trellis. Stakes should be at least 1½ square inches and they should be driven at least 1 foot into the ground. Plants should be pruned to one or two stems and tied loosely to the support at 8- to 12-inch intervals.

A second method of supporting tomatoes is with wire cages constructed of concrete reinforcing wire. Cages should be 20 to 22 inches in diameter. This requires a 6-foot length of wire bent into a circle. Each cage should be firmly anchored so that it will not blow over. Cages may be anchored by tying them to stakes or by tying them to a wire that is attached to the posts at each end of a row of cages. A single tomato plant should be set in each cage and plants should be allowed to grow without pruning. The ends of the plants should be pushed back into the cages as they grow. Fruit should be harvested by reaching through the mesh.

Caged cucumbers can be grown like caged tomatoes, but a 10-foot length of concert re-
forcing wire should be used. This will make a 3-foot diameter cage that will not need anchoring. Cucumbers should be planted 6 to 10 inches apart around the outside of the cage and the growing vine tips should be pushed into the cage until they begin to climb. The small hollow in the center of the cage should be used to fertilize and water the cucumbers. Benefits of this system include more fruit, an extended harvest season, increased ease of harvesting and reduced disease pressure.

**Pest Management**

Many pest problems can be avoided if care is taken to prevent the introduction of diseases, nematodes, weed seed and insects into the vegetable garden. Each of these pests can be carried from place to place on equipment, human hands or transplants. Therefore, it is a good idea to keep hands and equipment clean, to use pest free transplants and to practice simple cultural controls. Equipment should be cleaned and sterilized between uses, especially if tools are being moved between farms, fields or even parts of the yard. When possible, transplants grown in pasteurized soil or artificial media should be used because they will be less likely to harbor pests. Additionally, if available, transplants that are certified free of insects and disease should be purchased. Cultural control measures are generally aimed at saving the entire crop rather than individual plants. Generally, these measures either help the plants avoid contact with pests, eradicate the pests or reduce the number of pests. Common methods of control include companion planting, intercropping, timing planting and irrigation, and using mulches, pesticides and natural protective substances. For more information, see Chapter 9, Integrated Pest Management Strategies for the Landscape and Garden.

**Tomato Mosaic Virus**

If tomatoes, peppers or Irish potatoes are going to be grown, tobacco use should be avoided. This is because tobacco contains the tobacco mosaic virus (TMV). TMV can be spread from hands that have touched tobacco to susceptible plants. TMV is very difficult to control. Symptoms of TMV include reduced fruit size and distorted and mottled leaves. Plants showing symptoms of TMV should be isolated and removed from the garden immediately.
Companion Planting

Companion planting involves planting specific plants together for their mutual benefit. There has been a tremendous amount written about companion planting, however, very few claims have actually been proven. That being said, it is obvious that shade-loving plants in the forest benefit from the taller plants that shade them. It also seems reasonable that deep-rooted plants absorb nutrients from deep soil layers, deposit them on or near the surface as they decay, and then shallow-rooted plants eventually use these nutrients. Additionally, some plants may benefit other plants by attracting or repelling insects, diseases or nematodes either by scent, color or secretions. However, there is little consensus as to what combinations are most beneficial. Although, it is known that black walnut trees produce a substance that inhibits the growth and causes the wilting of many plants. Therefore, planting vegetables, especially tomatoes, near black walnut trees should be avoided. Because there is little agreement on which plants are best suited for companion planting, specific recommendations will not be made here.

Intercropping

Raising two or more crops in the same area at the same time is referred to as either intercropping or interplanting. Intercropping can reduce a wide range of pest problems. Two common examples of intercropping are pole beans or pumpkins planted with corn and a cool-season vegetable, such as lettuce, planted between tomatoes. This pairing works because the cool-season vegetable will mature and can be harvested before the tomatoes need the space. Infestations of aphids may also spread more slowly when infesting interspersed host and non-host plants than when in large areas of only one vegetable. Below are several ways in which intercropping can benefit gardening practices.

Vertical spacing: Vegetables species have different vertical requirements and can be grown on trellises. Squash, beans, cucumbers, peas, melons and tomatoes are just a few examples.

Inserted vegetables: Narrow leafed plants such as onions, leeks, shallots and garlic can easily fit between many leafy vegetables. Consider the plant’s feeding requirements. For example, onions have small root systems and need access to water and food.

Sunlight: During the main growing period, usually May through August, the sun is at its brightest. Plants that can be intercropped with sun-loving plants include beans, beets, chard, leeks, lettuce, peas, radishes and turnips. These cooler weather crops can have an extended season by benefiting from the shade or taller, sun-loving plants.

Structure and foliage: Intercropping involves using plants with opposite structure and foliage. Plants that have large structures or leaves, such as corn and squash, provide shelter for stricter climbing vines, such as beans.

Timing: Consider the amount of time it takes a vegetable species to mature, and try to intercrop slow growing vegetables with fast growing vegetables. Small vegetables such as radish and lettuce may be interplanted between tomatoes and other large vegetables. They will mature and can be removed before the tomatoes need the space. Reversing this procedure, peppers can be interplanted between lettuce plants.

Using Repellents as Pest Deterrents

- Intercropping with companion plants can act as repellents or traps for certain insect pests.
- Solutions made from hot peppers, garlic or strongly-smelling herbs have been used to discourage insects. It is unclear whether these solutions are toxic to some insects, repel them or work at all.
- Reflective plastic mulch and aluminum foil mulch can be used to repel thrips and aphids on some vegetables. These mulches apparently confuse thrips and aphids, making it more difficult for them to locate vegetables plants. Reducing aphid and thrips infestations may also reduce the spread of viruses carried by these insects, see Chapter 18, Entomology.
- Numerous repellents have been used to keep moles from gardens. These include caster beans, gopher spurge and windmills. Unfortunately, none of these repellents produce consistent results. For more information on deterring moles and other household pests, see Chapter 24, Backyard Wildlife Management.

Nutrition: Companion planting involves the use of specific plants together for their mutual benefit. This has been a tremendous amount written about companion planting, however, very few claims have actually been proven. That being said, it is obvious that shade-loving plants in the forest benefit from the taller plants that shade them. It also seems reasonable that deep-rooted plants absorb nutrients from deep soil layers, deposit them on or near the surface as they decay, and then shallow-rooted plants eventually use these nutrients. Additionally, some plants may benefit other plants by attracting or repelling insects, diseases or nematodes either by scent, color or secretions. However, there is little consensus as to what combinations are most beneficial. Although, it is known that black walnut trees produce a substance that inhibits the growth and causes the wilting of many plants. Therefore, planting vegetables, especially tomatoes, near black walnut trees should be avoided. Because there is little agreement on which plants are best suited for companion planting, specific recommendations will not be made here.

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Timing Plantings

Timing of plantings is yet another way to reduce the severity of some pest problems. For example, cutworms, aphids and root maggots tend to be more severe early in the spring and tend to decline in severity as temperatures increase and rainfall decreases. In contrast, corn earworms, European corn borers and armyworms cause less damage to corn when it is planted too early. The later corn is planted, the more severe these insect pests become. Virus diseases and pickleworms also tend to increase with later plantings of the vine crops.

Conventional Controls

Pesticides may also be used to control vegetable garden pests. For more information on pesticides, see Chapter 10, Understanding Pesticides and speak with the local county Extension office.

Regarding herbicides, commercial vegetable growers use a wide range of herbicides to kill weeds or to prevent weed seed from germinat-

<table>
<thead>
<tr>
<th>Crop</th>
<th>Intercrop With</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asparagus</td>
<td>Tomato, parsley and basil</td>
</tr>
<tr>
<td>Bush Beans</td>
<td>Potato, cucumber and corn</td>
</tr>
<tr>
<td>Carrots</td>
<td>Radishes, lettuce, rosemary, onion family, sage and tomato</td>
</tr>
<tr>
<td>Cole Family (Cabbage)</td>
<td>Aromatic herbs, celery, beets, onion family, chamomile, spinach and chard</td>
</tr>
<tr>
<td>Corn</td>
<td>Potato, beans, pumpkins, cucumber and squash</td>
</tr>
<tr>
<td>Eggplant</td>
<td>Beans and marigold</td>
</tr>
<tr>
<td>Lettuce</td>
<td>Carrots, radish, strawberry and cucumber</td>
</tr>
<tr>
<td>Onion Family (Allium)</td>
<td>Beets, carrots, lettuce and cole family</td>
</tr>
<tr>
<td>Parsley</td>
<td>Tomato and asparagus</td>
</tr>
<tr>
<td>Pole Beans</td>
<td>Corn and radish</td>
</tr>
<tr>
<td>Potato</td>
<td>Beans, corn, cole family, marigolds and horseradish</td>
</tr>
<tr>
<td>Pumpkins</td>
<td>Beans, corn and marigold</td>
</tr>
<tr>
<td>Radish</td>
<td>Carrots, nasturtium, lettuce and cucumber</td>
</tr>
<tr>
<td>Spinach</td>
<td>Beans</td>
</tr>
<tr>
<td>Squash</td>
<td>Nasturtium, corn and marigold</td>
</tr>
<tr>
<td>Tomato</td>
<td>Onion family, nasturtium, marigold, asparagus, carrots, parsley and cucumber</td>
</tr>
<tr>
<td>Turnip</td>
<td>Aromatic herbs, celery, beets, onion family, chamomile, spinach and chard</td>
</tr>
</tbody>
</table>

Climatic Effect

Climate varies regionally and annually. A pest may be no problem in one climate but a severe problem in another. Aphids, for example, require high humidity to shed their skins and are not a severe problem in regions of low humidity. They are, however, a severe problem in Tennessee and much of the humid south. Even within a single state, climatic factors vary with environmental conditions such as altitude, nearness to bodies of water and the slope of the land. These differences also affect plant susceptibility to problems and limit the effectiveness of organic controls. There are also annual climatic differences that affect host and pest. An organic control measure that works well one year may not work well the following year.

Mulching

Mulching is an incredibly helpful practice in the vegetable garden. A 2 to 3 inch layer of organic mulch can conserve water, regulate soil temperature and suppress pest problems. Organic mulches breakdown and provide organic matter as the materials break down. This improves the soil texture, nutrient values and water holding capacity. Landscape fabrics, which are synthetic woven materials (not plastic), are often seen in vegetable gardens as well. However, they are not as beneficial to improving the soils as traditional mulches. However, they will help regulate soil temperature and
suppress pests. The caution with plastic or synthetic mulches is that they do not allow root systems to dry out as quickly as organic mulches. Therefore, they should be recycled when they are no longer useful, see Table 9.

To help control pests, mulch should be completely applied to the area under very young plants. However, if applied too early, the mulch may prevent the soil from warming up and delay maturity. Therefore, it may be necessary to put holes in plastic mulch to allow moisture to reach the plant roots.

Mulches are useful because they reduce the numbers of some insects, such as Colorado potato beetles, by preventing their emergence from the soil where they overwintered and by slowing their migration from weedy overwintering sites to plants in the garden.

Although mulches can deter some pests, they can also serve as hiding places for some insects and increase the incidence of some diseases by retaining too much water around plant roots. For example, black plastic may increase damping off and root rot of peas and beans or bacterial diseases of tomatoes. This is especially true when it is used around seedlings growing in poorly drained soil.

Harvest and Storage
Many vegetables grown in home gardens can be stored fresh, but they must be harvested at the proper maturity and kept at the correct temperature and humidity. In addition, proper ventilation and sanitation must be maintained during storage. Basically, if vegetables are to be properly stored, they must be kept in an environment where the ripening and maturing processes, respiration and water loss are kept at low levels.

Respiration During Storage
During respiration, sugars and other compounds are broken down within the cells. This releases energy, carbon dioxide, water and heat. The living cells of the stored product need the energy, but the carbon dioxide should be removed by adequate ventilation. Several factors regulate respiration. These factors include temperature, soluble sugar content, water content, maturity and oxygen level. In general, the higher the temperature, within normal ranges, the faster the rate of respiration. For example, at 70 degrees F, the respiration rate of sweet corn is 3.6 times as fast as it is at 41 degrees F. Thus, you can see the importance of refrigeration in prolonging the life of harvested vegetables. The presence of soluble sugars in cells also influences by slowing the rate of respiration. The rate of respiration also varies directly with water content. At a given temperature, succulent plants, such as head lettuce, respire more rapidly than non-suc-
culent plants, such as sweet or Irish potatoes. Maturity also effects plant respiration. Immature vegetables respire more rapidly than mature vegetables. Finally, the oxygen levels influence the respiration rate. During respiration, oxygen is absorbed and carbon dioxide is released. Consequently, an airtight area will allow a decrease in oxygen and an increase in carbon dioxide. As a result, the respiration rate gradually decreases. However, if an area is completely airtight and oxygen levels fall too low for the complete combustion of sugars, undesirable compounds are produced that lower vegetable edibility. Therefore, respiration should be held at low levels rather than be stopped completely. For this reason, vegetable and fruit items are often wrapped in perforated plastic containers in supermarkets.

**Water Loss During Storage**

Water loss in fresh vegetables will result in a wilted, dull appearance that reduces eye appeal and freshness. Therefore, preventing water loss improves shelf life, appearance and desirability. Water loss during storage can be decreased by storing the product at as low of a temperature and as high of a relative humidity that is allowed for that product.

**Refrigerating Vegetables**

Homeowners usually store vegetables in a refrigerator or a garage. A garage is a great place to store vegetables like onions, Irish potatoes and sweet potatoes. Other vegetables may require a lower temperature and will do better in the refrigerator. Additionally, the refrigerator can accommodate vegetables with different needs because the climate can vary within refrigerator storage compartments.

While many vegetables can be stored well in the refrigerator for a week or longer, certain storage precautions should be observed. For instance, many ripening fruits, such as apples, pears, plums, cantaloupes and peaches, should not be stored together with vegetables. This is because these fruits give off ethylene gas, which causes yellowing of green vegetables, russet spotting on lettuce, toughening of asparagus spears, sprouting of potatoes and bitterness in carrots.

**Saving Seeds**

When deciding to save seed, a gardener should watch the parent plant all season long and select the seed source with the best genetic characteristics. Certain characteristics are more relevant to success depending on the environment, location and vegetable type. Plant breeders create new varieties and selections by selecting plants with the following characteristics:

- Flavor
- Yield
- Vigor
- Color
- Size
- Storage life
- Disease resistance
- Insect resistance
- Early bearing

---

**Sharing the Harvest**

The US Department of Agriculture estimates that 1 in 8 households experience a threat of hunger. Of these 33 million people, 13 million children have substandard diets. Food Banks and programs such as the Garden Writer’s Plant a Row provide support and direction for volunteer groups to promote community gardening to provide fresh garden vegetables and herbs to those in need. Community Garden advocates value these programs because they make fresh food available in the community while greening the community. Community gardens improve people’s lives by:

- Lowering family food budgets
- Providing the community with fresh, nutritious and in-season food choices
- Encouraging social interaction and relationships necessary for community development
- Encouraging self-reliance
- Stimulating awareness of resource conservation and the environment
- Providing recreation and exercise therapy
- Inciting emotional peacefulness
- Promoting active learning and educational opportunities

Another form of community gardening is community supported agriculture (CSA). In a nutshell, the farmer provides food and the people support the farm sharing in the potential bounty and risk. CSAs reinforce the connection between the farmer and the people who eat the food. Typically, patrons purchase a share of the farm, which supports the farmer by providing resources for farm management and labor, seeds, and other materials. This process eliminates the middle steps of transportation to the supermarket and provides fresh, seasonable produce at reasonable prices.
Late blooming
Germination success
Absence of undesirable characteristics—Thorns, spines, suckers, etc.
Seed number: Fewer for juicy fruits, more for seed production
Fruit quality: Texture, tenderness, juiciness, etc.
Form: Compact, vining, prostrate, etc.
Environmental tolerance
Fragrance
Suitability for use: If the vegetables are going to be dried, sauced, juiced or pickled, etc

The way a plant is pollinated will determine the genetic stability and potential of the seed. Self-pollinated species, from perfect flowers, are the easiest to grow without worry of crossing or additional genetic information. Seeds from self-pollinated plants can be saved without fear of weakening characteristics. These plants are passed down from generation to generation and preserve an important aspect of family and cultural history. Several self-pollinated plants that afford easy seed saving include:

- Beans
- Snap beans
- Soybeans
- Endives
- Oats
- Tomatoes
- Lettuces

If the fruit comes from a hybrid plant, reversion back to the species can occur, as with most hybrid tomatoes. Additionally, progeny plants can be sterile, as with hybrid corn. If fruit comes from cross-pollinated plants, then the seeds will carry new genetic characteristics.

Timing Seed Collection
Only mature seeds should be collected. This is because immature seeds will not have enough energy stored and will not germinate well. Generally, there are three basic types of fruit ripening and seed maturity:

- Seeds from fleshy fruits: Fruits should be fully ripe before seeds are harvested. Once ripe, the seeds should be removed from the fruit and allowed to air dry. Examples include tomatoes, eggplants and peppers.
- Seeds from crops: Plants in which the seed is the edible part tend to hold seeds until maturity. These seeds can stay on the plant until they are dry. At this point, they can be harvested. This allows plenty of time for harvest. Examples include corn, sunflowers, beans and wheat.
- Ripened seeds that scatter from plants at maturity: Seeds from these plants should be watched closely and they should be collected as soon as the flowers are mature. Examples include lettuces, onions, okras and mustards.

Removing and Drying Seeds
To remove undesired pulp, leaves or flowers, seeds can be floated in water. All of the debris and poor quality seeds will float and the viable seeds should fall to the bottom. Pea, bean and soybean seeds should be carefully removed.
because a damaged seed may not germinate properly.

Seeds should be dried to have 8 to 15% moisture. A seed with too much moisture will not germinate well and could cause other seeds to heat up in storage. Generally, it only takes seeds a few days to dry. However, the bigger the seed, the longer it will take to dry. A good location to dry seeds is on newspapers, paper towels, on top of the refrigerator, on screens in the sun and wherever air circulation is good.

Storing Seeds

Seeds respire at a very slow rate, even when in storage. Therefore, it is important to reduce air, moisture and temperature to keep this respiration slow so that seeds do not begin early germination. To keep respiration at a minimum, seeds should be placed in a tight container such as a jar or plastic container. The correct container will keep air, moisture and insects from affecting the seeds. Silica gel can be added to remove any extra moisture. Silica gel can be re-dried when heated in an oven. Seed containers should be kept in the refrigerator or the freezer and containers should be label with the seed type and collection date.

Keeping Seeds

If properly cared for, seeds can be kept for more than 1 year. Before planting, a germination test should be done to determine the percent viability of the seed. This test can be useful in deciding if seeds merit planting and what seeding rate should be used. If the germination percent low (less than 50%), then use a closer seeding rate if seedling plants require culling. See Tip Box, Germination Test, for instructions on how to do a germination test.

Summary

Vegetable gardening can be healthy, fun and rewarding. It can also be recreational and economical. After reading and considering the information in this chapter, Master Gardener’s will have a basic a foundation of knowledge to educate and support local communities in practicing sustainable gardening. Master Gardeners should be able to explain the benefits of growing vegetables, understand the basic garden preparations for vegetables grown in different locations, describe basic garden maintenance, understand alternative gardening methods, and understand how to harvest and store seeds and vegetables. Mastery of this content will involve exploring and experiencing vegetable gardening in the garden. Enjoy the bounty of this discovery.

Germination Test

To do a germination test:

1. Randomly select 10 to 100 seeds of the lot to be checked
2. Spread the seed out over a damp paper towel
3. Roll up the towel and place it in a sealed plastic bag
4. Date and label the seeds with information on species, number of seeds and date seeded
5. Place in a warm location such as the top of the refrigerator
6. Check to make sure the towel stays damp but is not puddling in the bag
7. When seeds have sprouted, count the number of seeds that germinated and divide it by the total number of seeds
8. Multiply this number by 100 to get the percent viability
Terms To Know

Burms
Cold frame
Companion planting
Container gardening
Crop residue
Floating row cover
Germination test
Green manure cover cropping
Growth habit
Hardening
Heirloom
Hotbed
Hybrid
Intercropping
Kitchen garden
Layer cake gardening
Light box
Organic
Raised beds
Reversion
Row spacing
Self-pollinating plant
Victory garden

Test Your Knowledge

1. Name the four basic plant requirements that should be considered when choosing the placement of a vegetable garden.

2. Name three benefits of a raised bed garden.

3. When space is limited, how can vine crops be grown?

4. Which vegetables are commonly put into the garden as transplants?

5. Name three factors that effect vegetable ripening and discuss how a gardener can control those factors.

Resources


The University of Tennessee Extension Websites
utextension.tennessee.edu
vegetables.tennesseee.edu
organics.tennesseee.edu
soilplantandpest.utk.edu

American Community Garden Association communitygarden.org

Cooperative Extension eXtension.org

Food Bank Locator feedingamerica.org

The National Organic Program (USDA) ams.usda.gov/AMSv1.0/nop

Plant A Row Program by the Garden Writers Association gardenwriters.org

Seed Savers Exchange seedsavers.org

Tennessee Organic Growers Association tnorganics.org
# Asparagus

## Sowing

<table>
<thead>
<tr>
<th>Description</th>
<th>Asparagus is a perennial vegetable that takes time and care to establish. Once the plant is mature enough to produce, asparagus provides a perpetual harvest. Asparagus is native to Europe and Asia. It has fern-like leaves and a brilliant yellow fall color.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Asparagus does well in deep, fertile and well-drained soils. Avoid very light, sandy soil and porous subsoils.</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>Apply 10 pounds per 100-foot row of a complete fertilizer, such as 10-10-10 or 8-8-8, or composted manure in the first year. Apply ½ of the fertilizer or use compost before planting and the other half in June.</td>
</tr>
<tr>
<td>Date to sow outdoors</td>
<td>March 15</td>
</tr>
</tbody>
</table>

## Growing

<table>
<thead>
<tr>
<th>Description</th>
<th>pH range: 6.0 - 6.7, best at 6.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing temperature</td>
<td>60 - 70°F</td>
</tr>
<tr>
<td>Spacing</td>
<td>18 - 24 inches</td>
</tr>
<tr>
<td>Watering</td>
<td>Heavy</td>
</tr>
<tr>
<td>Light</td>
<td>6 – 8 hours</td>
</tr>
<tr>
<td>Nutrient requirements</td>
<td>High N, Moderate P and K</td>
</tr>
<tr>
<td>Rotation</td>
<td>Perennial, no rotation</td>
</tr>
<tr>
<td>Seed longevity</td>
<td>3 years</td>
</tr>
</tbody>
</table>

## Cultivation Care

| Description | Gentle cultivation should keep weeds out of the asparagus patch. Asparagus spears should not be harvested in the first year; the ferns should be allowed to grow and store energy for the second year. After the ferns and the stalks die and turn brown, they should be cut back to soil level. Asparagus can be blanched by covering the crowns with a lightproof box. This will slow the production of chlorophyll and cause the spears to be white. |

## Companions

| Description | Dill, coriander, cosmos, aster, garlic and onion |

## Varieties

| Description | Jersey Giant and Jersey Knight, both are male and disease resistant; Martha Washington and Mary Washington, both are open pollinated; and Purple Passion |

## Harvest

| Description | Spears should be harvested every third day. Harvesting should increase as temperatures increase. To harvest asparagus, cut the spears just under the soil with a sharp knife. A harvested spear should be about 8- to 10-inches long. Asparagus tastes the best right after harvest. It can be cooked, canned or eaten raw. |

## Health Benefits

| Description | Potassium, folic acid, niacin, and vitamins C, A, B1 and B2. |

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**Figure 18.**

Asparagus Crowns should be spread out and planted 4.5 inches in heavy soils.
Beans, Bush

Description
Bush beans are categorized into three areas: snap, shell or dry. Younger beans are called snap beans, older beans are called shell beans and fully mature beans are called dry beans. Some varieties taste better at certain stages. Bush beans grow on 1-to 2-inch tall compact bushes.

Soil
Bush beans will not need extra fertilizer if soil quality is good. Organic matter should be added to the soil prior to planting if the soil test indicates deficiencies. Rhizobia bacteria in the soil fix nitrogen and are beneficial for bush beans. Rhizobia are found naturally and should not need to be added to healthy soils.

Fertilizer
Beans are light feeders, incorporate compost into soil at planting if soil is poor.

Placing
Bush beans should be planted at 2-inch spacing and thinned to 4 inches.

Cultivation
Cultivate weeds shallowly, about 1 inch, to not injure the roots. Water weekly if weather is dry. Blooms will drop if soil is too dry. Provide good air circulation to avoid diseases and pests. Inspect plants for bean beetles, mosaic virus and bacterial blights.

Companions
Savory, French tarragon, basil, dill, beet, cabbage, carrot, cauliflower, chard, corn, cucumber, eggplant, leek, marigold, pea, potato, radish, strawberry and sunflower

Varieties
Bush beans: Bush Kentucky Wonder, Contender, Goldencrop Wax, Harvester, Resistant Cherokee Wax and Tendercrop
Bush lima bean: Baby Fordhook, Dixie Butterpea, Fordhook 242 and Henderson’s Bush

Harvest
Snap beans should be harvested when they are thin and tender, which means that their width is no more then the width of a pencil. Shell beans should be harvested before they dry on the bush; they will be about ¼ inch thick. Dried beans should be harvested after they have dried on the bush, and lima beans should be harvested when the pods are full and the beans are green. Bush beans have 52 to 60 days to harvest and lima beans have 65 to 75 days to harvest. The length of harvest is 2 to 4 weeks.

Health Benefits
Beans provide fiber, potassium, folic acid, iron, zinc, magnesium, niacin and vitamins C, B1, B2 and B6.

Sowing
Seed depth: 1 inch
Germination soil temperature: 75 - 85° F
Days to germinate: 7 - 10
Date to sow indoors: Not recommended
Date to sow outdoors: (Bush beans) When soil temperature reaches 60 ° F, April – June 20; (Lima beans) May - June

Growing
pH range: 6.0 - 7.0
Growing temperature: 60 - 65° F
Spacing: 4 inches
Watering: Low - Moderate
Light: 6 - 8 hours
Nutrient requirements: Moderate N, P and K
Rotation: Avoid other legumes and before and after plants in the onion family
Seed longevity: 3 years
# Beans, Pole

<table>
<thead>
<tr>
<th><strong>Sowing</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Seed depth:</strong> 1 inch</td>
<td></td>
</tr>
<tr>
<td><strong>Germination soil temperature:</strong> 70° F</td>
<td></td>
</tr>
<tr>
<td><strong>Days to germinate:</strong> 6 - 10</td>
<td></td>
</tr>
<tr>
<td><strong>Date to sow indoors:</strong> Not recommended</td>
<td></td>
</tr>
<tr>
<td><strong>Date to sow outdoors:</strong> April 10 - June 20</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Growing</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pH range:</strong> 6.0 – 7.0</td>
<td></td>
</tr>
<tr>
<td><strong>Growing temperature:</strong> 60 - 65° F</td>
<td></td>
</tr>
<tr>
<td><strong>Spacing:</strong> 4-inch plant/36-inch row</td>
<td></td>
</tr>
<tr>
<td><strong>Watering:</strong> Moderate</td>
<td></td>
</tr>
<tr>
<td><strong>Light:</strong> 6 – 8 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Nutrient requirements:</strong> Moderate N, P and K</td>
<td></td>
</tr>
<tr>
<td><strong>Rotation:</strong> Follow corn and avoid planting after peas or beans</td>
<td></td>
</tr>
<tr>
<td><strong>Seed longevity:</strong> 3 years</td>
<td></td>
</tr>
</tbody>
</table>

| **Description** | Many of the beans available today were passed down through families. Most were grown in the United States by Native Americans. There are several different types of beans grown in Tennessee. Some of these types are pole beans and lima beans (these can include vining type snap and wax beans). |
| **Soil** | Soil for pole beans should be well-drained. Beans are leguminous, but soil should be inoculated with nitrogen. Soil usually contains bacteria in sufficient quantities. |
| **Fertilizer** | Fertilizer is not necessary. Incorporate mature compost into soil. If there is evidence of nutritional deficiencies or slow-growth pole beans may need a side dressing of 2 to 3 pounds of 8-8-8 per 100 square foot. |
| **Planting** | Sow 2 weeks before latest frost date (April) and continue to plant until the first of August. Pole beans should be planted 4 inches apart in 4-foot rows on trellises or some other type of support. |
| **Cultivation Care** | Cultivate weeds shallowly, about 1 inch, to not injure the roots. Water weekly if weather is dry. Blooms will drop if soil is too dry. Support pole beans with overhead trellises, wire, twine or tee-pee poles. Inspect plants for bean beetles, mosaic virus and bacterial blights. |
| **Companions** | Savory, French tarragon, basil, dill, salvia, snapdragon, cucumbers, corn, tomato family, marigold, potato, pea, radish, sunflower, beet, cabbage, carrot, basil and dill |
| **Varieties** | Bush: Provider, Blue Lake, Top Crop, Derby, Roma II, Half runners, Tendergreen Improved  
Bush Lima: Fordhook 242, Henderson Bush, Dixie Butterpea  
Pole: Blue Lake, Kentucky Blue and Kentucky Wonder, McCaslan  
Pole Lima: King of the Garden, Priz-taker and Sieva  
Wax: Cherokee Wax, Golden Wax and Goldencrop |
| **Harvest** | Depending on the variety and use, harvest beans when they are about the size of a pencil. Beans that are overly mature will be tough and stringy. Limas are harvested in the green stage when pods are swollen and full. There are 60 – 65 days to harvest for pole beans and 80 – 90 days to harvest for lima beans. Length of harvest for pole beans is 5 – 6 weeks and 4 weeks for lima beans. |
| **Health Benefits** | Vitamin C, iron, folic acid, potassium and dietary fiber. |
Beets

**Sowing**

<table>
<thead>
<tr>
<th>Description</th>
<th>Beets are members of the goosefoot family. Both the leaves and the roots are edible.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Soil should be well-drained and friable. Beets will tolerate clay. High organic soils have a better texture; they tend not to be as hard and crusty.</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>In the absence of a soil test, apply composted manures and compost teas or broadcast one cup of 10-10-10 per 10-foot row and mix into the top 4 inches of soil. Use a composted manure or green manure to add nutrients and texture to the soil.</td>
</tr>
<tr>
<td>Planting</td>
<td>Plant seed ½-inch deep in moist soil. Plant in rows about 2 to 2½ feet apart. Spring sow in March, Fall sow in August.</td>
</tr>
<tr>
<td>Cultivation</td>
<td>Keep the plant bed weed free. Use a rake or hoe to prevent soil crusting, but do not cultivate more then 1 inch to prevent root damage. Water plants weekly when there is no rain. Thin plants when they become crowded in rows. Extend the crop harvest by shading with a trellis or vining the summer crop.</td>
</tr>
<tr>
<td>Companions</td>
<td>Bush beans, cabbage family, corn, leek, lettuce, lima bean, onion and radish. Catnip or mint will reduce beetle damage; avoid mustard and pole beans.</td>
</tr>
<tr>
<td>Varieties</td>
<td>Bottoms: Chioggia, Detroit Dark Red, Early Wonder, Gladiator, Ruby Queen, Formanova and Golden Beet (cylinder shaped for raised beds, may be difficult in shallow or compacted soils). Greens: Avenger (greens), Bull’s Blood (ornamental red tops)</td>
</tr>
<tr>
<td>Harvest</td>
<td>Young beet tops are excellent as fresh salad greens. Harvest beets when roots are the size of a golf ball. Cut off tops for storage. Keep in plastic bags and refrigerate.</td>
</tr>
<tr>
<td>Health Benefits</td>
<td>Beet root juice has been shown to lower blood pressure, benefit liver functions and reduce cholesterol. Potassium, phosphorous, magnesium, calcium, iron, zinc, manganese, selenium, folic acid, niacin, and vitamins A, C, B1, B2 and K.</td>
</tr>
</tbody>
</table>

**Growing**

<table>
<thead>
<tr>
<th>pH range</th>
<th>6.0 - 6.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growing temperature</td>
<td>60 - 65° F</td>
</tr>
<tr>
<td>Spacing</td>
<td>Greens 2 inches, Beets 3 inches</td>
</tr>
<tr>
<td>Watering</td>
<td>Moderate and even</td>
</tr>
<tr>
<td>Light</td>
<td>6 - 8 hours of full sun</td>
</tr>
<tr>
<td>Nutrient requirements</td>
<td>Moderate N, P and K</td>
</tr>
<tr>
<td>Rotation</td>
<td>Avoid following spinach and shard</td>
</tr>
<tr>
<td>Seed longevity</td>
<td>4 years</td>
</tr>
</tbody>
</table>

Beta vulgaris
Broccoli

**Sowing**
Seed depth: ¼ inch
Germination soil temperature: 68 - 85° F
Days to germinate: 4 - 7
Date to sow indoors: 4 - 6 weeks before last frost
Date to sow outdoors: March 1 and July 15

**Growing**
pH range: 6.0 - 6.5
Growing temperature: 60 - 65° F
Spacing: 15-inch staggered rows
Watering: Moderate
Light: 6 – 8 hours
Nutrient requirements: Moderate N and High P and K
Rotation: Avoid cole crops
Seed longevity: 5 years

**Description**
Broccoli is a cool-season cole crop that is grown for its compact flower head. Broccoli is highly nutritious and contains cancer-fighting antioxidants called sulforaphane. It can be eaten cooked or raw.

**Soil**
Broccoli tolerates a wide variety of soil types, but prefers well-drained soils.

**Fertilizer**
Fertilize broccoli with 8 pounds of 13-13-13 per 100 feet of row or apply composted manures. Sidedress at 2 to 3 week intervals with 1½ cups of ammonium nitrate per 100 foot of row or compost teas.

**Planting**
If planting transplants, they should be set in early April or late July. Seeding should be done in late July. Plants should be fertilized with a side dressing of composted manure or a balanced fertilizer.

**Cultivation Care**
Broccoli plants should be fertilized with either composted manure or a balanced fertilizer once the plants show true leaves. Gentle cultivation, especially around the roots, should keep weeds out of the broccoli patch. Mulching will suppress weeds and keep the soil moisture even.

**Companions**
Beet, bush bean, carrot, cucumber, dill, kale, lettuce, nasturtium, calendula, onion, sage, spinach and tomato plants

**Varieties**
Bravo, Green Comet, Green Duke, Packman, Premium Crop, Purple Sprouting and Waltham 29

**Harvest**
Center heads should be cut when buds are tight. Secondary heads will develop in leaf axils. These can be harvested after the center head is removed. If heads are overly mature, they will become open and loose. Flowers will also begin to open. Broccoli tastes best eaten fresh, garden broccoli will taste much sweeter (more appealing to children) than stored broccoli.

**Health Benefits**
Excellent source of fiber, potassium, phosphorus, calcium, iron, and magnesium, folic acid, riboflavin, niacin vitamins C, A, E and B6.

---

**Figure 19.**
Broccoli is a great Fall and early Spring crop in Tennessee
Brussels Sprouts

**Description**
Brussels sprouts are a cool-season cole crop that increases in sweetness with colder temperatures. They are hardy in the garden and produce cabbage-like sprouts at the base of leaves along the stem. They are named after a city in Belgium and the name is always capitalized.

**Soil**
Brussels sprouts tolerate a wide variety of soil types, but prefer well-drained and mulched soils.

**Fertilizer**
Fertilize Brussels sprouts with 8 pounds of 13-13-13 per 100 feet of row apply composted manures. Sidedress at 2 to 3 week intervals with 1½ cups of ammonium nitrate per 100 foot of row or compost teas.

**Planting**
If planting transplants, they should be set in February or late August. Seeding should be done in late July. Plants should be fertilized with a side dressing of composted manure or a balanced fertilizer.

**Cultivation Care**
Brussels sprouts should be planted at 12 to 18-inch spacings in 3-inch rows; tighter spacing will produce smaller heads. During sprout formation, plants will need more water, and mulches should be used to keep the soil moist and to help reduce weeds. Gentle cultivation, especially around the shallow roots, should also help to keep weeds out of the cabbage patch. Cooler weather will produce better quality.

**Companions**
Beet, bush bean, carrot, cucumber, dill, kale, lettuce, nasturtium, onion, calendula, sage, spinach and tomato plants

**Varieties**
Jade, Long Island Improved, Prince Marvel, Royal Marvel and Valiant

**Harvest**
Brussels sprouts should be harvested when they are about 1 inch in diameter, and they should be cut from the stalk near the older leaves first. The stalk will keep producing sprouts as the plant grows. Yellowing, older leaves should be removed as the plant grows.

**Health Benefits**
Brussels sprouts are an excellent source of fiber and contain potassium and iron, phosphorous, magnesium, folic acid, thiamin, and vitamins C, A and B6.

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**Sowing**

- **Seed depth:** ¼ inch
- **Germination soil temperature:** 75 - 85° F
- **Days to germinate:** 5 - 9
- **Date to sow indoors:** 4 - 6 weeks before last frost
- **Date to sow outdoors:** February 20 - April 1 and July 1 - July 30

---

**Growing**

- **pH range:** 6.0 - 6.8
- **Growing temperature:** 60 - 65° F
- **Spacing:** 16 – 18-inch staggered rows
- **Watering:** Moderate
- **Light:** 6 – 8 hours
- **Nutrient requirements:** Moderate N, P and K
- **Rotation:** Avoid cole crops
- **Seed longevity:** 4 years
Cabbage

**Sowing**
- Seed depth: ¼ inch
- Germination soil temperature: 75 - 85° F
- Days to germinate: 5 - 8
- Date to sow indoors: 4 - 6 weeks before last frost
- Date to sow outdoors: February 20 - April 1 and July 1 - July 30

**Growing**
- pH range: 6.0 - 6.5
- Growing temperature: 60 - 65° F
- Spacing: 12 - 18 inches
- Watering: Heavy
- Light: 6 – 8 hours
- Nutrient requirements: High N, P and K
- Rotation: Avoid cole crops
- Seed longevity: 4 years

**Description**
Cabbage is a member of the mustard family and is a cool-season cole crop. It forms a firm, leafy head that can be stored most of the winter, but it can be grown in the spring or fall. However, if left until the temperatures rise, spring cabbage will taste bitter.

**Soil**
Cabbage tolerates a wide variety of soil types, but prefers well-drained soils.

**Fertilizer**
Fertilize cabbage with 8 pounds of 13-13-13 per 100 feet of row. Sidedress at 2 to 3 week intervals with 1½ cups of ammonium nitrate per 100 feet of row.

**Planting**
If planting transplants, they should be set in February or late August. Seeding should be done in late July. Plants should be fertilized with a side dressing of composted manure or a balanced fertilizer.

**Cultivation Care**
Cabbage plants should be planted at 12 to 18 inch spacings in 3-inch rows; tighter spacings will produce smaller heads. Later, during head formation, plants will need more water, and mulches should be used to keep the soil moist and to help reduce weeds. Gentle cultivation, especially around the shallow roots, should also help to keep weeds out of the cabbage patch.

**Companions**
Beet, bush bean, carrot, cucumber, dill, kale, lettuce, nasturtium, calendula, onion, sage, spinach and tomato plants

**Varieties**
- Green varieties: Charmont, Danish Roundhead, Early Jersey Wakefield, King Cole, Round Dutch and Stonehead
- Red varieties: Ruby Ball and Ruby Perfection

**Harvest**
Cabbage should be harvested when it is ripe, which is when the head becomes firm. Firmness can be determined by pressing a thumb into the center of the head and measuring resistance. If cabbage is harvested past maturity, the taste and quality will be poor and it will feel tough. Cabbage can be eaten raw or cooked.

**Health Benefits**
Cabbage provides an excellent source of fiber, folic acid, calcium, iron, potassium, niacin, and vitamins C and A.

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**Figure 20.**
Cabbage forms a large head when provided plenty of water and nutrition.
**Carrots**

**Sowing**

- **Seed depth**: ¼ - ½ inch
- **Germination soil temperature**: 75° F
- **Days to germinate**: 6-8
- **Date to sow indoors**: Not recommended
- **Date to sow outdoors**: March 1- April 1

**Growing**

- **pH range**: 5.5-6.5
- **Growing temperature**: 60-70° F
- **Spacing**: 2-3 inches apart and 10-14 inches per row
- **Watering**: moderate, increase if temperature rises
- **Light**: Full sun, tolerates some shade.
- **Nutrient requirements**: Moderate N, P and K
- **Rotation**: Avoid rotating with dill, fennel or parsley
- **Seed longevity**: 3 years

**Description**

Carrots are root vegetables that range in color shape, flavor and yield. Carrots are an easy vegetable to grow and a fun vegetable to harvest for the entire family.

**Soil**

The soil a carrot grows in dramatically affects its size, shape and taste. Work compost into the soil to loosen the soil for deep-rooted vegetables. The soil should be well worked to “fine” textured seed bed. Carrots will grow longer and deeper in raised beds or containers.

**Fertilizer**

Compost or a balanced fertilizer like 10-10-10 can be added at a rate of 1½ pounds per 100 square foot of garden.

**Planting**

When planting in rows or raised beds sow carrot seeds about 3 per inch in 10 to 14 inch rows. If planting in rows use ¼ oz. of seed per 100 ft row. Carrots can be planted in deep container also. Cover seeds with ¼ of soil and lightly water in settle seeds in the soil. Seeds are tiny and fine, a board or stick can be used to keep rows straight. It might be helpful to mark you row after sowing. When seedlings emerge, thin to 1 plant every 2 to 3 inches.

**Cultivation**

Care

Light hoeing and cultivation of weeds will reduce water and nutrient competition. Prevent green tops from developing from sunlight exposure by lightly covering tops with soil. In hot, dry weather carrots will become woody or fibrous. Monitor carrots for maggot damage, if present rotate crop the next year.

**Companions**

Onion, tomatoes, lettuce, rosemary, beans and sage

**Varieties**

In soils that are difficult to work or shallow, plant shorter varieties like: Danvers, Little Finger, Short n’ Sweet and Thumbelina. In deeper soils or in raised beds choose Chantenay and Nantes.

**Harvest**

Tug on the top of a carrot and if it lifts from the soil begin harvest. If the carrot top breaks loosen the soil with a fork. Harvest carrots when they are at least ½ inch in diameter, carrots will continue to grow if they are left in the ground. A fall crop can be left in the ground as they are harvested or a killing frost. Carrots can be harvested for 4-6 weeks. Store in a cool place like a garage– do not allow them to freeze.

**Health Benefits**

Carotenes, fiber, biotin, potassium, thiamine and vitamins K, B6 and C.

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**Figure 21.**

A. Carrots will grow long in deep soils, raised beds can allow for deeper roots.

B. Carrots can be started early in the Spring is covered.
Cauliflower

Sowing

Seed depth: ¼ inch
Germination soil temperature: 80° F
Days to germinate: 6
Date to sow indoors: 4 - 6 weeks before last frost
Date to sow outdoors: March 1 – April 1 and July 15 – August 15

Growing

pH range: 6.0 - 6.5
Growing temperature: 60 - 70° F
Spacing: 15 inch, staggered rows
Watering: Moderate
Light: 6 – 8 hours
Nutrient requirements: High N, P and K
Rotation: Avoid cole crops, plant after beans
Seed longevity: 4 years

Description
Cauliflower is a cool-season cole crop. It is the most difficult in the cole crop family to grow. Cauliflower is sensitive to frost damage and heat stress and bolts easily. It can be eaten cooked or raw.

Soil
Cauliflower tolerates a wide variety of soil types, but prefers well-drained soils.

Fertilizer
Fertilize cabbage with 8 pounds of 13-13-13 per 100 feet of row apply composted manures. Sidedress at 2 to 3 week intervals with 1½ cups of ammonium nitrate per 100 feet of row or compost teas.

Planting
If planting transplants, they should be set in early April or late July. Seeding should be done in late July. Plants should be fertilized with a side dressing of composted manure or a balanced fertilizer.

Cultivation Care
Set transplants in April or late July. Cauliflower requires the best conditions and is considered a difficult crop to grow.

Companions
Beet, bush bean, carrot, cucumber, dill, kale, lettuce, nasturtium, calendula, onion, sage, spinach and tomato plants

Varieties
Andes, Early White, Imperial, Snow Ball, Snow Crown, Snow King and Violet Queen Hybrid

Harvest
Cut center heads when they are tight. Secondary heads will develop in leaf axils. These can be harvested after the center head is removed. Overly mature flowers become open and loose. Cauliflower has 55 to 65 days to harvest and has a length of harvest of 2 weeks.

Health Benefits
High in dietary fiber, potassium, phosphorous, magnesium, calcium, selenium, folic acid and vitamins C, K and B6.

Brassica cauliflora var. botrytis

Figure 22.
Cauliflower can be a difficult crop, use a row cover to protect heads form frost damage.
### Collards

**Brassica oleracea var. acephala**

#### Sowing

| Description | Collards are cool-season, winter hardy plants. The leaves are blue/green. They are cabbage-like plants that do not head. |
| Soil | Soil should be well-drained and high in organic matter. Composted manure or a cover crop should be turned over and incorporated into soil before planting. |
| Fertilizer | Broadcast a complete fertilizer, such as 10-10-10 or 13-13-13, at a rate of 1½ pounds per 100 square foot before planting. Apply composted manures or compost teas. If plants begin to lose their green color, sidedress with nitrogen. |
| Planting | Cultivate soil and direct sow from July 1 to September, or plant transplants in August. If seeding, space rows 30 inches apart and thin (cull) seeds to 12 to 16 feet. |

#### Growing

| pH range: 6.0 - 6.5 |
| Growing temperature: 60 - 65°F |
| Spacing: 12 – 18 inches |
| Watering: Moderate |
| Light: Full sun |
| Nutrient requirements: High N, P and K |
| Rotation: Avoid the cabbage family |
| Seed longevity: 4 years |

#### Description

Collards are cool-season, winter hardy plants. The leaves are blue/green. They are cabbage-like plants that do not head.

**Soil**

Soil should be well-drained and high in organic matter. Composted manure or a cover crop should be turned over and incorporated into soil before planting.

**Fertilizer**

Broadcast a complete fertilizer, such as 10-10-10 or 13-13-13, at a rate of 1½ pounds per 100 square foot before planting. Apply composted manures or compost teas. If plants begin to lose their green color, sidedress with nitrogen.

**Planting**

Cultivate soil and direct sow from July 1 to September, or plant transplants in August. If seeding, space rows 30 inches apart and thin (cull) seeds to 12 to 16 feet.

**Care**

Plants need adequate water, especially during the hot weather. Water weekly if there is no rain. Keep rows weed free.

**Companions**

Carrots, coriander, fennel, dill and sage

**Varieties**

Blue Max, Champion Long, Georgia, HiCrop, Top Bunch and Vates

**Harvest**

Collard leaves can be harvested when small and would need thinning when 4 inches tall. Some plants may re-sprout after others have harvested. Harvest lower leaves first. Collards taste sweeter after a light frost. There are 65 to 75 days until harvest. It is important to not over cook the collards; they will emit a sulfur smell. Let cook greens sit for 5 minutes to benefit from the health promoting qualities.

**Health Benefits**

Collards are extremely nutritious. They contain high amounts of folic acid, manganese, calcium, fiber and vitamins K, A and C.
Corn, Sweet

**Sowing**

- **Seed depth:** 1 inch
- **Germination soil temperature:** 80° F
- **Days to germinate:** 4
- **Date to sow indoors:** Not recommended
- **Date to sow outdoors:** One week after frost

**Growing**

- **pH range:** 6.0-7.0
- **Growing temperature:** 65-75° F
- **Spacing:** 8 inches
- **Watering:** Moderate
- **Light:** Full sun
- **Nutrient requirements:** High N, P and K
- **Rotation:** Plant after a nitrogen-fixing crop like a legume
- **Seed longevity:** 1-2 years

**Description**

Nothing tastes better than homegrown sweet corn. Corn needs full sun and plenty of room. Most varieties produce one ear per plant and need several rows (at least 4) for optimal pollination of full ears.

**Soil**

Corn will benefit is soil contains organic mater.

**Fertilizer**

Corn benefits form extra fertilizer such as a 10-10-10 at a rate of 1½ pounds per 100 square foot. Sidedress with 10-10-10 again when plants are about 1½ foot tall.

**Planting**

Sow 1/2 inch deep as the ground temperature warms. Cover with soil and water. Planting two different varieties of corn will result in cross-pollination or spectacled ears.

**Cultivation**

- **Care**
  - Control weeds by hoeing gently. Corn will eventual shade out weeds as it grows tall. Keep plants watered as they tassel (pollen) and make silk (pollen tubes). Keep plants form wilting as silks turn brown and corn kernels develop. If you have wind problems you can run string lines across two poles to support the stalks.
  - Watch for pests including corn ear worm, smut and rust.

**Companions**

- Sunflowers, legumes, cucurbits, potato, parsley, beets, carrots and dill

**Varieties**

- Golden Cross Bantam, Honey and Cream, Jubilee, Peaches and Cream, Pearl White, Silver Queen and Sundance

**Harvest**

Harvest before ears are mature for optimal sweetness and texture. Ripe ears silk are brown at the tips and green closer to the ear. Feel the ear to check if the kernels have developed. Sweet corn is best harvested and cooked fresh. After ears are picked the sugar in the corn quickly turns to starch.

**Health Benefits**

Provides a source of folic acid, magnesium, phosphorous, and vitamins B1, B5, C and E

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**Zea mays var. rugosa**

Sweet corns is harvested when silks are brown at the tips and green nearest the ear.
Cucumber

**Sowing**

- **Seed depth:** ½ - 1 inch
- **Germination soil temperature:** 80 - 95° F
- **Days to germinate:** 3 - 4
- **Date to sow indoors:** 3 weeks before last frost
- **Date to sow outdoors:** After last frost

**Growing**

- **pH range:** 6.0 - 7.0
- **Growing temperature:** 70 - 80° F
- **Spacing:** 18 inches trellised, or 36-inch mounds
- **Watering:** Moderate, regular
- **Light:** Full sun
- **Nutrient requirements:** Moderate N, High P and K
- **Rotation:** Avoid following gourd family
- **Seed longevity:** 5 years

**Description**

Cucumbers are warm-season plants that are closely related to squash, pumpkin and melons. Vine cucumber crops will cross with water, pumpkins and some squash. Accidental crossing does not influence the quality of the current season’s fruit and is only a factor if saving seed.

**Soil**

- Soil should be well-drained and high in organic matter. Crop rotation should be done every year to avoid soil-borne diseases.

**Fertilizer**

- Broadcast 6 pounds of 5-10-10 per 100-foot row. Mulch with compost or sidedress with composted manure.

**Planting**

- Planting dates should be May 1 and July 1. Vine crops should be planted in hills with 5 seeds at a depth of 1 to 3 inches. When plants develop four leaves, thin to one to two plants. Vining cucumbers can be trained to trellis on a 4-foot fence or a cattle grate.

**Cultivation Care**

- Keep planting bed weed free while plants are growing. Also, keep soil loose and mulch it with compost. Water as necessary, but avoid wetting the foliage. Plants are monoeic, meaning male and female flowers are produced separately on the same plant. Thus, insects must be present for pollination. Poor fruiting formation may be from a lack of pollination. Therefore, avoid spraying insecticides.

**Companions**

- Nasturtiums, radish and marigolds

**Varieties**

- Pickle: Bush Pickle and Calypso
- Bush Slicing: Bush Crop, Fanfare and Salad Bush
- Slicing (vine): Burpless, Marketmore, SliceMaster and Straight 8

**Harvest**

- Bitterness in cucumbers is due to genetic and environmental factors, including temperature, water and variety. To avoid bitterness, choose hybrid varieties and avoid growing cucumbers in cool or shaded locations. Also, provide consistent and uniform moisture. Cucumbers should be harvested every other day. Plants will stop or slow production if they are not harvested regularly.

**Health Benefits**

- Cucumbers are abundant in water and silica. Nutritionaly, cucumbers provide fiber, magnesium, potassium, folic acid, and vitamins A and C. The ascorbic caffeic acid in the flesh will prevent water retention.

**Figure 24.**

Cucumbers can vine up fences for smaller space gardens.
Solanum melongena var. esculentum

Eggplant

**Sowing**

- **Seed depth:** ¼ inch
- **Germination soil temperature:** 85° F
- **Days to germinate:** 7
- **Date to sow indoors:** 4 - 6 weeks before last frost
- **Date to sow outdoors:** Not recommended

**Growing**

- **pH range:** 5.5 - 7.0
- **Growing temperature:** 80 - 90° F
- **Spacing:** 18 inches
- **Watering:** Heavy
- **Light:** Full sun
- **Nutrient requirements:** Moderate N, High P and K
- **Rotation:** Do not follow tomato; follow bean or pea
- **Seed longevity:** 4 years

**Description**

Peppers and chilies are members of the nightshade family. They are warm-season, tropical plants. Fruits are white or purple with smooth skin. They are named for their oval, or egg, shape.

**Soil**

Soil should be well-drained and organically enriched. It is recommended that compost be added at incorporation and as mulch. Soil for eggplant needs to be rotated every year.

**Fertilizer**

These plants benefit from composted manure or from 3 pounds of 6-12-12 or 5-10-10 fertilizer per 100 square foot that is incorporated into the soil before planting. Over fertilization can cause excessive foliage growth, which will reduce fruit production.

**Planting**

Plants should be placed 2 feet apart in 3 foot rows. They do best if they are seeded indoors or if they are purchased as transplants. Planting should be done on May 1 or June 20.

**Cultivation Care**

Eggplant benefits from mulch. Depending on the fruit size, a cage or a stake may help support the plant. Plants need to be monitored for beetle damage. Use row covers to exclude insect pests. Plants do not need to be pollinated by insects.

**Companions**

Basil, dill, marigolds, cosmos, Bush bean, pea, pepper and eggplant

**Varieties**

Black Beauty, Burpee Hybrid, Easter Egg, Little Finger and Ichiban

**Harvest**

Fruit is ripe when the finger has resistance as it slides down the fruit. If the fruit is soft, then it is overripe.

**Health Benefits**

Eggplant provides fiber, magnesium, copper, manganese, folic acid, niacin, and vitamins B1 and B6.

**Figure 25.**

Eggplants can easily be grown in containers or the ground.
Endive and Escarole

**Sowing**

**Seed depth:** ¼ inch

**Germination soil temperature:** 60 - 65° F

**Days to germinate:** 5 - 7

**Date to sow indoors:** 8 weeks before frost

**Date to sow outdoors:** Stagger planting every 2 weeks from Spring until Fall: March – April and 2 months before the first frost (September)

**Description**

Endive and escarole are actually different forms of chicory. Endive has curly, crinkled leaves and a slightly bitter taste. Escarole has a milder flavor and flatter, thicker leaves. Both are great plants for the winter garden.

**Soil**

Endive and escarole do well if planted in a fertile soil and watered as needed.

**Fertilizer**

The faster lettuce grows, the sweeter the taste. To encourage growth, use compost or add a balanced fertilizer and water. However, keep in mind that too much nutrition can cause a bitter taste.

**Planting**

Directly sow tiny seeds in rows (use a stick or board as guide) or grow in containers. Cover lightly with ¼ inch of soil and water with a breaker to keep seeds from splashing.

**Cultivation Care**

To keep plants growing, water evenly when the top soil dries and withhold water as the ground begins to freeze.

**Companions**

Radish, strawberries, beets, broccoli, bush and pole beans, carrots, cucumber and onion

**Varieties**

Endive: Belgian, Radicchio and Puntarelle

Escarole: Full Heart Batavium and Twinkle

**Harvest**

Harvest outer leaves as needed; leaves should be eaten fresh. The roots can be harvested and forced into a root cellar.

**Health Benefits**

Endives and escaroles are rich in vitamins such as folic acid and vitamins A and K. They are higher in fiber than lettuce.

**Growing**

**pH range:** 5.5 - 7.0

**Growing temperature:** 45 - 65° F

**Spacing:** Leaf lettuce: 8 – 10 inches

**Watering:** Moderate

**Light:** Full sun, some shade

**Nutrient requirements:** Moderate N, P and K

**Rotation:** Avoid other lettuces

**Seed longevity:** 4 - 6 years
Garlic

Description
Garlic is sometimes considered an herb, but it is easily grown in the vegetable garden. Garlic cloves are easily grown and stored for use all year round. Garlic is actually a hardy perennial but harvested annually as a vegetable. The bulb is separated into cloves for planting in the cool season. Garlic has many health benefits and is believed to have medicinal uses such as curing the flu, acne, and antibiotic properties.

Soil
Garlic needs a fertile and friable (loose) soil, which has been enriched with compost. Garlic bulbs have short root systems and needs to have water nearby but will not tolerate flooded conditions.

Fertilizer
Compost can be added to the soil to make nutrients available however, if conventional fertilizers are needed apply a balanced fertilizer of 10-10-10 at 3 pounds per 100 square foot.

Planting
Plant garlic cloves in fall for a spring harvest. Place individual cloves, pointy end up, about 2 inches deep and 1 foot apart. In raised beds, the row could be 4 inches apart.

Cultivation Care
Keep garlic moist but not too wet. Gently cultivate weeds taking care not to disturb the bulbs. Watch for thrips and rot.

Companions
Carrots, nightshade vegetables and cole crops

Varieties
Bogatyr, Georgian Crystal, German Extra Hardy and New York White
Elephant garlic is actually a variety of leek, although it has the flavor of garlic.

Harvest
Later summer when the older outside leaves turn yellow and brown or the tops fall over. Loosen the soil with a fork before pulling. Pull and shake off the soil, allow drying without direct sunlight to cure the bulb. Tops can be left on and braided together and hung for storage.

Health Benefits
Manganese, selenium, calcium, copper, phosphorous, iron, potassium, and vitamins B6 and C. Contains sulfur-containing compounds that have properties that reduce HDL-cholesterol.
Horseradish

Armoracia rusticana

**Sowing**

**Root cutting depth:** 4 inches

**Plant outdoors:** Spring

**Description**

Horseradish is a perennial vegetable in the mustard family. The root is harvested and used in cooking. Horseradish can be used fresh or prepared and canned for storage.

**Soil**

Horseradish benefits from well-drained, fertile soils.

**Fertilizer**

Fertilize with compost and/or composted manure annually.

**Planting**

Dig a 6-inch furrow and plant roots cuttings 4 inches deep along the side with compost. Shoots should appear in about a week.

**Cultivation Care**

The first year of planting, the plant should be allowed to grow. In the second year, a portion of the roots can be harvested. Add composted manure to the plants once a year.

**Companions**

Potato

**Varieties**

Bohemian and Maliner Kren

**Harvest**

Harvest fresh horseradish all year long by cutting pieces of root and replacing soil or compost.

**Health Benefits**

Horseradish contains potassium, calcium, magnesium and phosphorous. It also has antibacterial properties to aid in food preservation.

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**Growing**

**pH range:** 5.5-7.0

**Growing temperature:** 50-70° F

**Spacing:** 12-18 inches

**Watering:** Low

**Light:** Shade to full sun

**Nutrient requirements:** Low N, P and K
**Kale**

**Brassica oleracea**

**Sowing**

- **Seed depth:** ¼ - ½ inch
- **Germination soil temperature:** 45 - 85° F
- **Days to germinate:** 5 - 7
- **Date to sow indoors:** 6 weeks before frost
- **Date to sow outdoors:** February

<table>
<thead>
<tr>
<th><strong>Description</strong></th>
<th>Kale is a cole crop with frilly, collard-like leaves. It has a sweet flavor and a crispy texture. Kale is a cool-season, winter hardy plant.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soil</strong></td>
<td>Soil should be well-drained and high in organic matter. Composted manure or a cover crop should be turned over before planting.</td>
</tr>
<tr>
<td><strong>Fertilizer</strong></td>
<td>Broadcast a complete fertilizer, such as 10-10-10 or 13-13-13, at a rate of 1½ pounds per 100 square foot before planting or use composted. If plants begin to lose their green color, sidedress with nitrogen or compost.</td>
</tr>
<tr>
<td><strong>Planting</strong></td>
<td>Cultivate soil and direct sow from July 1 to September, or plant transplants in August. If seeding, space rows 30 inches apart and thin (cull) seeds to 12 to 16 feet.</td>
</tr>
<tr>
<td><strong>Care</strong></td>
<td>Plants need adequate water, especially during the hot weather. Water weekly if there is no rain. Keep rows weed free.</td>
</tr>
<tr>
<td><strong>Companions</strong></td>
<td>Carrots, coriander, fennel, dill and sage</td>
</tr>
<tr>
<td><strong>Varieties</strong></td>
<td>Dwarf Scotch and Vates</td>
</tr>
<tr>
<td><strong>Harvest</strong></td>
<td>Kale tastes best after several frosts. Harvest older leaves (outside leaves) first until March. Flavor will decrease as weather warms.</td>
</tr>
<tr>
<td><strong>Health Benefits</strong></td>
<td>Kale provides iron, calcium, potassium and Vitamins A and C.</td>
</tr>
</tbody>
</table>

**Growing**

- **pH range:** 6.0 - 7.0
- **Growing temperature:** 60 - 65° F
- **Spacing:** 16 – 18 inches, staggered
- **Watering:** Moderate
- **Light:** Full sun
- **Nutrient requirements:** Moderate N, P and K
- **Rotation:** Avoid the cabbage family
- **Seed longevity:** 4 years
**Kohlrabi**

**Brassica oleracea var. gongylodes**

### Sowing

**Seed depth:** ¼ - ½ inch  
**Germination soil temperature:** 50 - 70° F  
**Days to germinate:** 5 - 7  
**Date to sow indoors:** Not recommended  
**Date to sow outdoors:** February or March, July 15 – September 1

### Growing

**pH range:** 6.0 - 7.0  
**Growing temperature:** 50 - 65° F  
**Spacing:** 6 - 8 inches staggered  
**Watering:** Moderate  
**Light:** 6 – 8 hours  
**Nutrient requirements:** Moderate N, P and K  
**Rotation:** Avoid cole crops  
**Seed longevity:** 3 years

### Description

Kohlrabi is a member of the cole family. It is grown in cooler seasons. The edible part is a bulbous, turnip-shaped globe that sits above the soil surface. It can be eaten raw, cooked or pickled.

### Soil

Kohlrabi tolerates a wide variety of soil types, but prefers well-drained soils.

### Fertilizer

Heavy feeders, apply composted manures and compost teas or 1 to 2 pounds of 20-20-20 per 100 ft rows, sidedress 3 weeks later with ammonium sulphate at a rate of ½ cup per 10 ft row.

### Planting

If planting transplants, they should be set in early April or late July. Seeding should be done in late July. Plants should be fertilized with a side dressing of composted manure or a balanced fertilizer.

### Cultivation Care

Set transplants in April or late July. Kohlrabi matures quickly.

### Companions

Beet, bush bean, carrot, cucumber, dill, kale, lettuce, nasturtium, calendula, onion, sage, spinach and tomato plants

### Varieties

Azure Star, Grand Duke, Early White Vienna and Purple Vienna

### Harvest

Begin harvest when the base of the plant forms a ball about the size of a tennis ball. As the head gets bigger, it becomes more fibrous and is still edible, but tastes best before it reaches full maturity. It takes 40 to 50 days to harvest and the length of harvest is 4 weeks.

### Health Benefits

Kohlrabi contains potassium, protein, fiber, niacin, riboflavin, thiamine, and vitamins A and C.
## Lettuce

### Sowing

<table>
<thead>
<tr>
<th>Description</th>
<th>There are hundreds of varieties of lettuce. This lends to a variety of colors, forms, tastes, textures and seasons for growing. Lettuce is a leafy green vegetable that can be harvested as a young microgreen or as a fully mature leaf. Lettuce is a fast-growing and rewarding vegetable to grow. Mesclun mixes are a common way to purchase a variety of lettuce seed.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed depth</td>
<td>¼ - ½ inch</td>
</tr>
<tr>
<td>Germination soil temperature</td>
<td>40 - 60° F</td>
</tr>
<tr>
<td>Days to germinate</td>
<td>7 - 14</td>
</tr>
<tr>
<td>Date to sow indoors</td>
<td>4 weeks before transplanting</td>
</tr>
<tr>
<td>Date to sow outdoors</td>
<td>When soil can be worked, throughout the cool season</td>
</tr>
</tbody>
</table>

### Growing

<table>
<thead>
<tr>
<th>Description</th>
<th>Lettuce may need some shade as summer heats up. Warm weather will cause lettuce to mature quickly by bolting and forming flower heads. Bolting plants have a bitter taste.</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH range</td>
<td>6.5 - 7.0</td>
</tr>
<tr>
<td>Growing temperature</td>
<td>55 - 65° F</td>
</tr>
<tr>
<td>Spacing Leaf lettuce</td>
<td>½ inch, continuous; Head lettuce: 8 – 12 inches; Bibb lettuce: 6 – 8 inches</td>
</tr>
<tr>
<td>Watering</td>
<td>Light to moderate</td>
</tr>
<tr>
<td>Light</td>
<td>Full sun, some shade</td>
</tr>
<tr>
<td>Nutrient requirements</td>
<td>High N, P and K</td>
</tr>
<tr>
<td>Rotation</td>
<td>Avoid other leaf lettuces, endive, escarole, cabbage and artichoke</td>
</tr>
<tr>
<td>Seed longevity</td>
<td>1 year</td>
</tr>
</tbody>
</table>

### Soil

<table>
<thead>
<tr>
<th>Description</th>
<th>Moisture-rich soil mixed with compost will provide adequate moisture and heat protection.</th>
</tr>
</thead>
</table>

### Fertilizer

<table>
<thead>
<tr>
<th>Description</th>
<th>The faster lettuce grows, the sweeter the taste. To encourage growth, use compost or add a balanced fertilizer and water. However, keep in mind that too much nutrition can cause a bitter taste.</th>
</tr>
</thead>
</table>

### Planting

<table>
<thead>
<tr>
<th>Description</th>
<th>Directly sow tiny seeds in rows (use a stick or board as guide) or grow in containers. Cover lightly with ¼ inch of soil and water with a breaker to keep seeds from splashing.</th>
</tr>
</thead>
</table>

### Cultivation Care

<table>
<thead>
<tr>
<th>Description</th>
<th>Lettuce may need some shade as summer heats up. Warm weather will cause lettuce to mature quickly by bolting and forming flower heads. Bolting plants have a bitter taste.</th>
</tr>
</thead>
</table>

### Companions

<table>
<thead>
<tr>
<th>Description</th>
<th>Radish, strawberries, beets, broccoli, bush and pole beans, carrots, cucumber, onion</th>
</tr>
</thead>
</table>

### Varieties

<table>
<thead>
<tr>
<th>Description</th>
<th>Bibb: Buttercrunch, Summer Bibb and Tom Thumb Heading: Great Lakes, Itchaca, Speckled, Summertime and Tennis Ball Green Leaf: Black-seeded Simpson, Grand Rapids and Oak Leaf Red Leaf: Red Sails, Red Salad Bowl and Ruby Romaine: Green Towers, Parris Island Cos and Sangria</th>
</tr>
</thead>
</table>

### Harvest

<table>
<thead>
<tr>
<th>Description</th>
<th>Microgreens should be harvested when they are 2 to 3 inches. Most lettuces mature in 50 to 60 days, heading lettuce matures in 90 days. Harvest outer leaves when they are large enough to eat. A stem will form in the middle. Harvest cut leaf lettuce by cutting the leaves, but leaving a stem; the new leaves will continue to grow. Harvest heads by cutting the entire plant, but wait until the plant is mature but tender.</th>
</tr>
</thead>
</table>

### Health Benefits

<table>
<thead>
<tr>
<th>Description</th>
<th>Lettuce has nutritional benefits that include chlorophyll, folic acid, and vitamins K, A, B1, B2 and C.</th>
</tr>
</thead>
</table>
Melons

**Sowing**

- **Seed depth:** ½ inch
- **Germination soil temperature:** 80 - 90° F
- **Days to germinate:** 3 - 5
- **Date to sow indoors:** 3 weeks before last frost
- **Date to sow outdoors:** After last frost

**Growing**

- **pH range:** 6.5 - 7.0
- **Growing temperature:** 70 - 85° F
- **Spacing:** 16 inches
- **Watering:** Even and moderate, but low during fruit ripening
- **Light:** Full sun
- **Nutrient requirements:** Low N, High P and K
- **Rotation:** Avoid summer/winter squash, melons, pumpkin and watermelon
- **Seed longevity:** 4 years

---

**Description**

Melons are warm-season, vining fruits that are members of the cucumber family. Melons include: muskmelon, cantaloupe, honeydew, and crenshaws and are closely related to watermelon, cucumber and squash. These plants occupy a lot of space, but can be grown on trellises.

**Soil**

Soil should be well-drained and high in organic matter. Crop rotation should be done every year to avoid soil-borne diseases.

**Fertilizer**

Broadcast 6 pounds of 5-10-10 per 100-foot row. Mulch with compost or sidedress with composted manure.

**Planting**

Planting dates should be May 1 and July 1. Vine crops should be planted in hills with 5 seeds at a depth of 1 to 3 inches. When plants develop four leaves, thin to one to two plants. Vining melons can be trellised on a 4-foot fence or a cattle grate.

**Cultivation Care**

Keep the planting bed weed free while plants are growing. Also, keep soil loose and mulch it with compost. Water as necessary, but avoid wetting the foliage. Plants are monocious, meaning male and female flowers are produced on the same plant. Thus, insects must be present for pollination. Poor fruiting formation may be from a lack of pollination. Therefore, avoid spraying insecticides.

**Companions**

Sow thistle, summer savory

**Varieties**

Cantaloupe: Ambrosia, Earlsweet and Honeybush

**Harvest**

Melons are ready for harvest when the green between the netting turns tan and the fruit smells sweet.

**Health Benefits**

Melons are a low calorie fruit that contains potassium and vitamin C.

*Cucumis melo*
Mustard Greens

**Description**
Cool season (fall and spring) leafy vegetable that is a relative of cabbage and collards. Mustard greens are often used as microgreens with lettuce and endive. Mustard seeds also make good sprouts.

**Soil**
Mustard benefits from fertile, well-drained soils.

**Fertilizer**
Apply 10 pounds per 100-foot row of a complete fertilizer, such as 10-10-10 or 8-8-8, or composted manure in the first year. Apply ½ of the fertilizer or use compost before planting and the other half in June.

**Planting**
Plant seeds in rows 12 to 15 inches apart then to 6-inch spacings per plant. Succession planting every two weeks until March and provide a longer harvest for tender leaves.

**Cultivation Care**
Provide water for productive plants, pull weeds or hoe between plants. Disease can include fungus and black rot so crop rotation is encouraged.

**Companions**
Mustard can be used as a trap crop for cole crops, turnips

**Varieties**
Florida Broadleaf, Green wave, Osaka Purple, Red Mustard, Savannah and Tendergreen

**Harvest**
Harvest leaves when they are large enough for salads or cooking. The entire plant can be harvested by pulling the entire plant out of the ground when mature. If roots are left, new shoots will grow to extend harvest.

**Health Benefits**
Low in calories, but contains a large amount of antioxidants. Provides a good source of folic acid, calcium, carotenes, manganese, copper, phosphorous, magnesium, protein, potassium, iron, fiber and vitamins B6, B1, B2, C and E.

---

**Sowing**

- **Seed depth:** ¼ inch
- **Germination soil temperature:** 65-70° F
- **Days to germinate:** 4-6
- **Date to sow indoors:** Not recommended
- **Date to sow outdoors:** February

**Growing**

- **pH range:** 5.5-7.0
- **Growing temperature:** 50-70° F
- **Spacing:** 6-15 inches
- **Watering:** Moderate
- **Light:** Full sun
- **Nutrient requirements:** High N, Moderate P and K
- **Rotation:** Do not follow or precede cole crops
- **Seed longevity:** 4 years
Okra

Sowing
Seed depth: ¾ inch
Germination soil temperature: 80-95°F
Days to germinate: 5-14
Date to sow indoors: Not recommended
Date to sow outdoors: May

Growing
pH range: 6.0-7.0
Growing temperature: 70-90°F
Spacing: 12 inches
Watering: Low
Light: Full Sun
Nutrient requirements: Moderate N, P and K
Rotation: Avoid nightshades
Seed longevity: 2 years

Description
Okra is a beautiful plant with many ornamental qualities such as texture, shape and color. It is a relative of the hollyhock family and thrives in the heat of the south. There are spinless and spiny varieties, which can complicate harvest and enjoyment.

Soil
Okra benefits from a fertile, well-drained soil. Incorporate organic matter to increase texture and moisture holding capacity.

Fertilizer
Use compost or a 10-10-10 at 1½ pounds per 100 square foot garden. Fertilize each month after plant begins to grow.

Planting
Allow plants enough space to benefit from the sun. Seed and place a shovel full of compost over the seeds and water.

Cultivation Care
Water only during dry periods.

Companions
Lettuce, peppers and eggplant, basil, cucumber, melons, southern peas

Varieties
Burgundy, Cajun Delight, Clemson, Cowhorn (Spinless), Dwarf Green (Spinless) and Emerald Green

Harvest
Harvest pod when they are about 3-inch long and still tender, about 50 days after planting. Wear gloves to protect hands from spins (or hairs). Remove over-ripe pods to keep the plant producing. Okra will not store well so cook fresh and no more than 2 to 3 days after harvest.

Health Benefits
Low in calories and a good source of fiber. Provides nutrients such as calcium, folic acid, and vitamin B6 and C.

Figure 27.
Okra performs best in the heat of the summer.
## Onions

### Description
Onions are tough, productive crops in Tennessee. There are two main types of onions: bunch type, which are green onions, and storage type, which are bulb onions (drying type). The green onions, or scallions, are actually immature onions of the same species. Onions can be grown from seed or purchased in sets. Onion sets are available in the early winter or late summer.

### Soil
Onions benefit from soil that has been worked and has compost incorporated.

### Fertilizer
Onions do not require large amounts of fertilizer. Some can benefit from compost in the soil or a well-balanced fertilizer like a 10-10-10 at a rate of 1 1/2 pounds per 100 square foot of garden.

### Planting
Onion seeds are best started outdoors because there is less disturbance of the root system. Seedlings can be trimmed to keep tops from falling over. Onions do take a long time to mature. Most gardeners prefer to purchase the onion sets. Some onions form bulbs when the days are long, some form bulbs when days are short. Plant onions closer together to force them to mature quickly (for procrastinators), wider spacing will slow down maturity (for eager gardeners).

### Cultivation Care
Onions have small root systems and can benefit from light cultivation to prevent weeds, but take care not to injure the onion bulb. Since the roots are shallow, care should be taken not to allow water to stand on bulbs, onions do not need a lot of water.

### Companions
Carrots, cole crops and nightshades

### Varieties
**Green:** Deep Purple, Evergreen Hardy White, Guardsman and Nebachan (all of the drying varieties can be harvested at immaturity for green onions)
**Long Day Drying:** Ebenezer, Red Baron and Southport White Globe
**Short Day Drying:** Chrsystal White Wax, Red Creole, Red Wethersfield and Texas 1015

### Harvest
Drying onions are ready to harvest when the tops fall over. Green onions are ready when bulb is 3/8 inch in diameter. Gently pull drying onions from the ground and brush off soil, allow to dry in a well-ventilated pace (out of the sunlight) to let them finish curing. Green onions should be stored in the refrigerator. Drying onions can be dried on a rack or hung in pantyhose, putting a knot between each onion and hung in a garage.

### Health Benefits
Chromium, biotin, fiber, folic acid, and vitamins K, B1, B6 and C.

### Sowing
- **Seed depth:** 1/2 inch for transplants, 1 inch for sets and 1/4-1/2 inch for seeds
- **Germination soil temperature:** 65-85°F
- **Days to germinate:** 4-5
- **Date to sow indoors:** 2 months before last frost
- **Date to sow outdoors:** February to March

### Growing
- **pH range:** 6.0-7.0
- **Growing temperature:** 55-75°F
- **Spacing:** Bunch type: 400-600 sets per 100 ft row; Storage type: 3-4 inches
- **Watering:** Moderate, even
- **Light:** Full sun, will tolerate shade
- **Nutrient requirements:** Moderate N, P and K
- **Rotation:** Avoid parsley, onion family and legumes
- **Seed longevity:** 1 year

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Allium cepa

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Tennessee Master Gardener Handbook 352
Peas

*(Vining)* English Peas *Pisum sativum*, Sugar Peas *P. sativum var. macrocarpon*  
Southern or snap peas *Vigna unguiculate*

### Sowing

- **Seed depth:** 1 inch  
- **Germination soil temperature:** 40-75°F  
- **Days to germinate:** 14  
- **Date to sow indoors:** Not recommended  
- **Date to sow outdoors:** February 1-March 20, Southern peas: May or June

### Growing

- **pH range:** 6.0-7.0  
- **Growing temperature:** 60-65°F  
- **Spacing:** 1 - 2 feet  
- **Watering:** Moderate until blooming, then low  
- **Light:** Full sun for bet yield  
- **Nutrient requirements:** Low N, P and K  
- **Rotation:** Follow cole crops, avoid nightshades, sunflowers and alliums  
- **Seed longevity:** 3 years

### Description

English (snap) and sugar peas are a sweet delicacy straight form the garden. Both types are cool season crops. Southern or field peas are warm season crops, which include our black-eyed, purple hulls and silver skins. The can be eaten fresh, frozen or dried.

### Soil

For an early spring planting, prepare soil in the fall by tilling cultivating in compost.

### Fertilizer

No fertilizer needed unless the soil test indicates a deficiency. Sow seed 1 inch and space about 12 to 24 inches, depending on type (vining vs. bush). In raised beds spacing can be closer, up to 4 inches. Prepare supports for vining types.

### Planting

Sow seed 1 inch and space about 12 to 24 inches, depending on type (vining vs. bush). In raised beds spacing can be closer, up to 4 inches. Prepare supports for vining types.

### Cultivation Care

Bush types are self-supporting. Provide a structure for the vining types peas to climb. Vining peas can be trellised on fencing, poles or trellises. Water plants only during dry periods. Peas do not have many pest problems.

### Companions

Eggplant, corn, spinach, lettuce, dill, carrots, cole crops, beets, radish, and cucumber

### Varieties

- English (Snap): Alaska, Little Marvel and Mr. Big  
- Sugar: Early Snap, Snowbird, Sugar Daddy and Sugar Snap  
- Southern: Calico Crowder, California Blackeye, Mississippi Purple and Purple Hull

### Harvest

Southern peas produce 3 to 4 harvests for 3 to 5 weeks. For fresh peas, pick when pods shell easily or begin to change color. Southern peas should be frozen while fresh. English peas should be harvested when the pods have filled but have not started to turn yellow. Sugar peas should be harvested after pods form (immaturely) or before yellowing. They can be cooked or eaten raw in salad or as a snack food. Both can loose their flavor easily in storage so it is bet to eat them while fresh.

### Health Benefits

Good source of protein, B vitamins, magnesium, phosphorous, manganese, iron and potassium. Green peas are good sources of vitamins C and K and carotenes.

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Figure 28.

Peas are a sweet cool season crop that can be harvested an eaten fresh form the garden.
Peppers and Chilies

**Sowing**

| Description | Peppers and chilies are members of the solanaceae family, which also includes tomatoes. They are warm-season, annual plants. Peppers are bell-shaped, round, pointed and slender and chilies are long and thin. The fruits of chilies and peppers can be green, yellow, red, orange or purple. The flavor of peppers and chilies ranges from sweet to hot. The heat from a pepper comes from capsinic, a chemical used in soothing inflammation. The heat is measured by scoville units. A bell pepper is 0 scoville units and a Habanero is 350,000 to 550,000 units. |
| Soil | Soil should be well-drained and organically enriched. |
| Fertilizer | These plants benefit from composted manure or from 3 pounds of 6-12-12 or 5-10-10 fertilizer per 100 square foot that is incorporated into the soil before planting. Over fertilization can cause excessive foliage growth, which will reduce fruit production. |
| Planting | Plants should be at 24 inch spacing. |
| Cultivation Care | Water enough to keep the soil evenly moist. Uneven watering will reduce fruit size and number. |
| Companions | Carrot, eggplant, onion, pea and tomato |
| Varieties | Hot Peppers/Chilies: Anaheim, Cayenne, Habanero, Jalapeno, Pretty in Purple, Serrano, Hungarian Wax and Thai. Sweet Peppers: Ace, Apple, California Wonder, Gypsy, Bell Boy, Golden Summer, Big Bertha, Hungarian Sweet Banana, Italian, Purple Beauty and Sunray |
| Harvest | All peppers can be harvested when green, but they are not mature until they turn color, such as red, yellow, orange, etc. Allowing the fruit to mature on the plant may slow production. Hot peppers and chilies tend to get hotter if they turn red. Plants will produce fruits all season if fruit is harvested. |
| Health Benefits | Peppers add flavor to cuisine and provide beta carotene, thiamine, folic acid, and vitamins B6, C and K. Peppers also contain phytochemicals containing antioxidants. |

**Growing**

| pH range: 5.5 - 7.0 |
| Growing temperature: 70 - 85° F |
| Spacing: 12 inches |
| Watering: Even and moderate |
| Light: Full sun |
| Nutrient requirements: Moderate N, High P and K |
| Rotation: Do not follow potato, eggplant or tomato |
| Seed longevity: 2 years |

**Figure 29.**

A. Sweet Bell peppers

B. Pepper have ornamental appeal and can be used as an edible landscaping plant.
Potato

**Sowing**

Tuber depth: 3-4 inches

Date to sow outdoors: 3 weeks before last frost (approximately 45° F)

**Growing**

pH range: 5.0-6.5

Growing temperature: 60-65° F

Spacing: 12 inches and 24 inches between rows

Watering: Moderate

Light: Full sun

Nutrient requirements: High N, P and K

Rotation: Avoid following other plants from the nightshade family

**Description**

Potatoes are nightshade family members that are best known as Irish potatoes. They contain eyes or buds, which will sprout new plants. Therefore, potatoes are started from pieces, not seeds. Garden potatoes are available in a variety of different flavors colors that are not commercially available. The potato is actually a shortened stem called a tuber.

**Soil**

Prepare soil by tilling to a 12 to 20 inch depth in the early spring. Organic matter can be incorporated at cultivation to improve texture, drainage and fertility.

**Fertilizer**

Add organic matter to the tilled soil or apply a complete fertilizer (10-10-10) 1½ pounds per 100 square foot of garden.

**Planting**

It is not recommend to save potatoes and replant because the can carry disease. Use certified seed potatoes form a reputable supplier. Each piece should have at least one (two-three is best) good sprout. Plant 3 to 4 inches deep. Cover the seed potatoes gently taking care not to break the sprouts.

**Cultivation Care**

Hill around sprouts when they are 6-inches tall. Cultivate weeds between rows. Straw and compost can be used as mulch in potato plots. Pests and diseases can include: scab, leafhoppers, potato beetle and flea beetles. Row covers can be used to exclude the pests.

**Companions**

Horseradish

**Varieties**

All Blue, Green Mountain (White), Irish Cobbler (White), Red Pontiac and Yukon Gold (Yellow)

**Harvest**

New potatoes can be harvested a couple months after planting. Pull plants and feel for small potatoes, replant the plant to allow potatoes to keep growing. Main crop is ready when the foliage begins to dieback. When the soil is dry use a garden fork to gently loosen soil to dig tubers. Leave the soil on the potatoes until the soil dries and brush the excess soil from. Do not wash tubers. Allow the potatoes to cure about 2 weeks in a root cellar. Do not store potatoes with apples or other ethylene producing fruits.

**Health Benefits**

Provide a good source of potassium, niacin, fiber, pantothenic acid, and vitamins B6 and C.

**Figure 30.**

Carefully expose potatoes to the air and allow to dry before harvesting and storing.

*Solanum tuberosum*
Pumpkin

**Sowing**

**Seed depth:** ½ - 1 inch

**Germination soil temperature:** 70 - 90° F

**Days to germinate:** 6 - 10

**Date to sow indoors:** 3 - 4 weeks before frost

**Date to sow outdoors:** When soil temperature reaches 70° F; can use row covers of tunnels to start plants early.

**Description**
Pumpkins are members of the cucumber family. They are a warm-season vine crop and a type of winter squash. Pumpkins are picked when they are fully mature. Some are grown to make pies, some are raised for seed and others are raised as gourds for carving.

**Soil**
Soil should be well-drained and high in organic matter. Crop rotation should be done every year to avoid soil-borne diseases.

**Fertilizer**
Broadcast 6 pounds of 5-10-10 per 100-foot row. Mulch with compost or sidedress with composted manure. Avoid over fertilization, it will reduce fruit growth.

**Planting**
Incorporate extra compost into the soil prior to planting. Use covers to raise the soil temperature. Plant 8 to 10 feet apart and put 6 to 8 feet between rows. Can plant May 20, but sow seeds before July 1 to have Jack-O-Lanterns for Halloween.

**Cultivation Care**
Pumpkins have huge vines that need plenty of room to spread. They do not tolerate transplant injury well. Plants need a lot of water, about 1 inch of water per week. Direct sow.

**Companions**
Nasturtiums, radish and marigolds

**Varieties**
Jack-O-Lantern: Atlantic Giant, Big Max, Bushkin, Happy Jack, Mystic and Spirit, Wizard
Miniature: Jack Be Little and Munchkin
For Pie: Baby Bear, New England Pie and Sugar Treat

**Harvest**
Harvest when fruit has developed good color and when the rind is too hard to be dented easily with the fingernail. Do not carry fruits by the stem. If the stem is broken, the pumpkin will not “cure” well. Cover if there is an early frost and store at 55° F.

**Health Benefits**
Vitamins C and A, iron, potassium and magnesium.

**Growing**

**pH range:** 5.5 - 6.5

**Growing temperature:** 65 - 75° F

**Spacing:** 12 - 18 inches

**Watering:** Even and heavy

**Light:** Full sun

**Nutrient requirements:** High N, Moderate P and K

**Rotation:** Do not follow squash, watermelon or cucumber

**Seed longevity:** 4 years
Radish

Sowing

Seed depth: ½ inch

Germination soil temperature: 45 - 90° F

Days to germinate: 4 - 12

Date to sow indoors: Not recommended

Date to sow outdoors: Early Spring - February 15, April 15

Growing

pH range: 6.2 - 6.5

Growing temperature: 60 - 65° F

Spacing: 1 - 2 inches, thin to 4 - 6 inches

Watering: Moderate and even

Light: Full sun, tolerant of some shade

Nutrient requirements: Low N, P and K

Rotation: Follow legumes

Seed longevity: 4 years

Description

Radishes are a cole crop with edible roots. Radishes can be used as a pest repellant for squash crops.

Soil

Soil should be well-drained and friable. Radishes will tolerate clay. High organic soils have a better texture; they tend not to be as hard and crusty.

Fertilizer

In the absence of a soil test, broadcast one cup of 10-10-10 per 10-foot row and mix into the top 4 inches of soil. Use a composted manure or green manure to add nutrients and texture to the soil.

Planting

Plant seed ½-inch deep into moist soil. Plant in rows about 2 to 2½ feet apart. Spring sow in March, Fall sow in August. Thin spring radishes to 1 inch, and thin winter radishes to 3 inches. Plant radishes in 3-foot blocks.

Cultivation Care

Place 1 to 2 inches of mulch into the planting bed after true leaves appear. This will keep the soil from crusting. Gently hoe weeds, or hand-pull them to protect the roots. Plants that lack water will grow slowly and taste hot and mealy.

Companions

Cucumbers, squash and nasturtiums

Varieties

Spring: Champion, Cherry Belle, Easter Egg and Icicle
Fall: Black Spanish and Tama

Harvest

Water prior to harvest to make pulling easier.

Health Benefits

Radishes provide protein, calcium and vitamin C.

Figure 31.

Radish are an excellent intercropping plant for warm season crops.
Spinach

Spinach oleracea

Sowing

Seed depth: ½ inches
Germination soil temperature: 50-75°F
Days to germinate: 7-14
Date to sow indoors: Not recommended
Date to sow outdoors: February or late July-August

Growing

pH range: 6.0-7.0
Growing temperature: 60-65°F
Spacing: 3-4 inches
Watering: Light and even
Light: Full sun to part shade
Nutrient requirements: Moderate N, P and K
Rotation: Should not follow legumes
Seed longevity: 1 year

Description
Spinach is a spring vegetable that can be served raw or cooked. It is nutrient and vitamin rich and tolerates spring frosts well. There are smooth leaf and savoyed leaf varieties.

Soil
Spinach can tolerate a wide range of soils. It will benefit from soil tilling and loosening.

Fertilizer
Too much nitrogen can make leaves taste bitter. Fertilize with compost or a light rate of 10-10-10 (1½ pounds per 100 square foot.)

Planting
Till soils to loosen it and incorporate organic matter. Plant seeds directly in the garden. Germination can be accelerated if they are soaked the night before. Thin the plants to 4 to 6 inches. For a continuous supply of spinach plant new seed every 7 days.

Cultivation Care
Spinach needs little water however they are shallow rooted. Cultivate carefully to remove weeds but not injure the roots. Insect pest include aphids, thrips and leaf miners. Row cover can exclude pests from spinach if they become a problem.

Companions
Benefits succeeding all plants. Helped by peas and beans.

Varieties
Smooth: Catalina, Giant Noble and Olympia
Savoy: America, Bloomsdale, Long Standing, Melody and Winter Bloomsdale

Harvest
Cut every other outer leaves as soon as they are large enough to harvest. This allows room for others to grow. Plants are mature when stalks form and begin to bolt.

Health Benefits
Provides a good source of carotenes, folic acid, magnesium, iron, manganese and vitamins C, K and B vitamins.

Figure 32.

This young spinach plant can be harvested for tender salad greens.
Spinach, Malabar

**Sowing**

- **Seed depth:** ¼ inch
- **Germination soil temperature:** 65° F
- **Days to germinate:** 7-8, with soaking
- **Date to sow indoors:** 7 weeks before last frost date
- **Date to sow outdoors:** April 15

<table>
<thead>
<tr>
<th>Description</th>
<th>Heat-loving spinach-like plant that grows on an ornamental red vine. Malabar will reseed itself or return after a mild winter. It has red leaf veins and stems and is a free-branching climber.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Soil</strong></td>
<td>Malabar spinach requires a well-drained, fertile soil. If soil is poor, incorporate compost or organic matter in early spring.</td>
</tr>
<tr>
<td><strong>Fertilizer</strong></td>
<td>Benefits from organic matter or compost. A 10-10-10 slow release fertilizer can be added if the soil test indicates deficiencies.</td>
</tr>
<tr>
<td><strong>Planting</strong></td>
<td>Soak seed in water before planting. Plant in rows 18 inches apart under trellis and water in.</td>
</tr>
<tr>
<td><strong>Cultivation Care</strong></td>
<td>Vining plant reaches 8 to 10 feet tall and will need trellising. As seed germinates and true leaves appear, apply a liquid fertilizer of compost tea. Add a thin layer of mulch to suppress and discourage weeds. Fortunately, Malabar spinach does not have many pests.</td>
</tr>
<tr>
<td><strong>Companions</strong></td>
<td>Benefits from cover crops</td>
</tr>
<tr>
<td><strong>Varieties</strong></td>
<td>Red Malabar Spinach</td>
</tr>
<tr>
<td><strong>Harvest</strong></td>
<td>Harvest leaves and stems as soon as the main vine is established. Harvest before the vine flowers for the best flavor. Harvest seeds for next year’s crop and fallen seeds will reseed. Leaves can be eaten raw in salads or boiled, steamed, stir fired or added to soups or dishes.</td>
</tr>
<tr>
<td><strong>Health Benefits</strong></td>
<td>Leaves are rich in calcium, iron and vitamins A and C.</td>
</tr>
</tbody>
</table>

**Growing**

- **pH range:** 4.5-7.0
- **Growing temperature:** 60-90° F
- **Spacing:** 18 inches apart
- **Watering:** Moderate
- **Light:** Full sun
- **Nutrient requirements:** Moderate N, P and K
- **Rotation:** Self-seeds, no known rotation issues
- **Seed longevity:** 1 year

**Figure 33.**

Malabar spinach has a beautiful rich green leaf and bright red stem and petiole.
**Squash, Summer**

**Description**
Summer squash are warm-season, vining or bush plants. They are very easy to grow and produce well. If only one mound of each variety is planted, there will still be plenty of squash to share.

**Soil**
Soil should be well-drained and high in organic matter. Crop rotation should be done every year to avoid soil-borne diseases.

**Fertilizer**
Broadcast 6 pounds of 5-10-10 per 100-foot row. Mulch with compost or sidedress with composted manure.

**Planting**
Planting dates should be May 1 and July, with plants spaced 4 feet apart. Plant three seeds per mound and when true leaves appear, thin to one plant.

**Cultivation Care**
Keep planting bed weed free while plants are growing. Also, keep soil loose and mulch it with compost. Water as necessary, but avoid wetting the foliage. Plants are monocious, meaning male and female flowers are produced on the same plant. Thus, insects must be present for pollination. Poor fruiting formation may be from a lack of pollination. Therefore, avoid spraying insecticides.

**Companions**
Nasturtiums, radish, marigolds, oregano and tarragon

**Varieties**
Patty Pan: Peter Pan and Scallopini
Yellow: Crookneck, Early Yellow Summer, Dixie, Goldbar, Sunburst, Sundance, White Bush and Scallop
Zucchini: Aristocrate, Black Zucchini, Chefini and Gold Rush

**Harvest**
Provide consistent and uniform moisture. Plants will stop or slow production if they are not harvested regularly. Harvest often and more blossoms will appear. Harvesting is typically done before the fruit is fully mature.

**Health Benefits**
Squash provide dietary fiber, magnesium, phosphorus, niacin, and vitamins C, A and K.

---

**Figure 34.**

Patty pan varieties of summer squash.
## Squash, Winter

### Sowing

<table>
<thead>
<tr>
<th>Description</th>
<th>Winter squash are warm-season, vining plants whose fruit is harvested when fully mature. The fruit is hard and sturdy for winter storage. Types of winter squash include butternut, acorn, spaghetti, Hubbard and buttercup.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed depth:</td>
<td>½ - 1 inch</td>
</tr>
<tr>
<td>Germination soil temperature:</td>
<td>70 - 90° F</td>
</tr>
<tr>
<td>Days to germinate:</td>
<td>6 - 10</td>
</tr>
<tr>
<td>Date to sow indoors:</td>
<td>3 - 4 weeks before last frost</td>
</tr>
<tr>
<td>Date to sow outdoors:</td>
<td>When soil temperature reaches 70° F, use row covers</td>
</tr>
</tbody>
</table>

### Soil

<table>
<thead>
<tr>
<th>Soil</th>
<th>Soil should be well-drained and high in organic matter. Crop rotation should be done every year to avoid soil-borne diseases. Incorporate extra compost into the soil prior to planting</th>
</tr>
</thead>
</table>

### Fertilizer

<table>
<thead>
<tr>
<th>Fertilizer</th>
<th>Broadcast 6 pounds of 5-10-10 per 100-foot row. Mulch with compost or sidedress with composted manure.</th>
</tr>
</thead>
</table>

### Planting

<table>
<thead>
<tr>
<th>Planting</th>
<th>Planting dates are May 1 and July 1 and plants should be spaced 6 feet apart. Plant seeds in mounds and use soil covers to warm the soil for the earliest start, seeds will not germinate in a cool soil. Sow 3 seeds per mound and thin to one plant when a true leaf appears.</th>
</tr>
</thead>
</table>

### Cultivation Care

<table>
<thead>
<tr>
<th>Cultivation Care</th>
<th>Keep planting bed weed free while plants are growing. Also, keep soil loose and mulch it with compost. Water as necessary, but avoid wetting the foliage. Plants are monocious, meaning male and female flowers are produced on the same plant. Thus, insects must be present for pollination. Poor fruiting formation may be from a lack of pollination. Therefore, avoid spraying insecticides.</th>
</tr>
</thead>
</table>

### Companions

<table>
<thead>
<tr>
<th>Companions</th>
<th>Nasturtiums, radish and marigolds</th>
</tr>
</thead>
</table>

### Varieties

<table>
<thead>
<tr>
<th>Varieties</th>
<th>Acorn: Cream of the Crop, Table Ace, Table King and Table Queen Buttercup: Buttercup and Emerald Bush Butternut: Butterbush, Early Waltham and Supreme Hubbard: Baby Hubbard, Green Hubbard and Warted Hubbard Spaghetti: High Beta Gold, Stripelti and Vegetable Spaghetti</th>
</tr>
</thead>
</table>

### Harvest

<table>
<thead>
<tr>
<th>Harvest</th>
<th>Harvest when the rind is hard to dent with the fingernail.</th>
</tr>
</thead>
</table>

### Health Benefits

<table>
<thead>
<tr>
<th>Health Benefits</th>
<th>Winter squash have significant amounts of dietary fiber, potassium, carotenes, folic acid, and vitamins B1 and C.</th>
</tr>
</thead>
</table>
Sweet Potato

Ipomoea batatas

**Sowing**
Transplant outdoors: 2 weeks after last frost (April 15)

**Description**
Sweet potatoes are a southern favorite that thrives in our heat. They are members of the morning glory family and yellow and purple-leaved ornamental varieties ('Blackie' and 'Margarita') have become very popular in container and bedding plants. Sweet potatoes are vining plants that need extra space to grow.

**Soil**
Sweet potatoes need a loose soil that is well-drained and textured.

**Fertilizer**
Avoid high nitrogen with sweet potatoes. Incorporate compost before planting.

**Planting**
Sweet potatoes are grown from rooted cutting called slips. You can buy slips in the spring or make propagate them. Bury the rooted portion of the slip in soil 1 foot apart in 3-foot rows or mounds (like melons). Leave at least 2 to 3 leaves showing.

**Cultivation Care**
Sweet potatoes are low maintenance and do not respond well to wet or over fertilized gardens. Sweet potatoes can be susceptible to insects and rot if over wet. Avoid planting near other plants that could shade the leaves and slow potato development.

**Companions**
Dill, thyme, oregano, beets, beans and potatoes

**Varieties**
Beauregard, Centennial, Jewel, Vandaman and Yellow Jersey

**Harvest**
It may take up to 4 months from planting to reap a harvest. Dig sweet potatoes when soil is dry and the air is warm. The skin can be easily damaged so handle and dig gently. Move potatoes to the shape and let them dry with soil on them. Keep in a humid warm storage place and wash well before you plan to cook them.

**Health Benefits**
Excellent sources of carotenes, and a good source of manganese, copper, biotin, pantothenic acid, fiber and vitamin B2.

**Growing**
Pp range: 5.5-6.5
Growing temperature: 65-90° F
Spacing: 14-18 inches
Watering: Low
Light: Full Sun
Nutrient requirements: Low N, P and K
Rotation: Avoid other root crops (carrots, onions etc.)

**Figure 35.**
Allow sweet potatoes to air dry before storing. Do not wash with water.

Ipomoea batatas

Allow sweet potatoes to air dry before storing. Do not wash with water.
# Tomatoes

<table>
<thead>
<tr>
<th>Sowing</th>
<th>Description</th>
<th>Soil</th>
<th>Fertilizer</th>
<th>Planting</th>
<th>Cultivation Care</th>
<th>Companions</th>
<th>Varieties</th>
<th>Harvest</th>
<th>Health Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed depth: ½ inch</td>
<td>Tomatoes are members of the nightshade family. They are the most popular homegrown vegetable. They have two distinct growth habits: determinate (bush) and indeterminate (vine). Determinate plants typically ripen at the same time while indeterminate plants grow fruit as the vine grows, until frost. Indeterminate plants set fruit in clusters and are excellent arbor, stake or trellis plants. Some tomatoes are grown for sauces, juice or slicing. Some are grown for color, size and shape. The selections are endless. Choose varieties that have disease resistance and practice crop rotation to avoid soil-borne diseases.</td>
<td>Soil should be well-drained and organically enriched. It is recommended that compost be added at incorporation and as mulch. Soil for tomatoes needs to be rotated every year to avoid soil borne diseases.</td>
<td>Tomatoes benefit from composted manure or from 3 pounds of 6-12-12 or 5-10-10 fertilizer per 100 square foot that is incorporated into the soil before planting. Over fertilization can cause excessive foliage growth, which will reduce fruit production.</td>
<td>Planting transplants should be done May 1 and July 1. Tomatoes need heat to grow. If temperatures are cool and there is too much water, the fruits will be slow to ripen and will lose taste. Plant seeds directly or plant transplants when they have four sets of leaves. Harden off tomato plants at least 2 weeks before plants go into the garden. If under a cold frame, move plants outdoors slowly and increase light daily.</td>
<td>Tomatoes benefits from mulch. Depending on the fruit size, a cage or a stake may help support the plant. Pinch out suckers by pulling out the sprouting bud from the inside node. This keeps the plant from becoming wild looking and supports heavy branches when fruiting. Plants need to be monitored for beetle damage. Use row covers to exclude insect pests. Plants do not need to be pollinated by insects.</td>
<td>Basil, dill, fennel, tansy, cosmos, Bush bean, pea, pepper and eggplant</td>
<td>There are many varieties of tomatoes that are appropriate for Tennessee. Choose a tomato with the desired use, color or flavor. All of the varieties listed are disease resistant. Container/Hanging Basket: Huskey Red, Patio Hybrid and Tiny Tim Ground or pot: Beefmaster, Better Boy, Big Boy, Celebrity, Early Girl, Enchantment, Lemon Boy, Mountain Gold Roma, Supersteak, Supersweet, Sweet Cluster, Sweet Million, and Sweet 100</td>
<td>Fruit is ripe when the fruit is firm and the color changes from green to pink to red, or from yellow to gold.</td>
<td>Tomatoes are rich in beta-carotene, lycopene, biotin, niacin, folic acid, pantothenic acid, and vitamins C, K and B6.</td>
</tr>
<tr>
<td>Germination soil temperature: 80° F</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Days to germinate: 6 - 8</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date to sow indoors: 6 - 7 weeks before last frost</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date to sow outdoors: After last frost</td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

## Growing

- **pH range:** 5.8 - 7.0
- **Growing temperature:** 70° F
- **Spacing:** 15 inches supported bush, 17 inches unsupported and determinate, 36 inches unsupported and indeterminate
- **Watering:** Heavy to moderate
- **Light:** Full sun
- **Nutrient requirements:** Moderate N, High P and K
- **Rotation:** Avoid potato, pepper, eggplant and tomatoes
- **Seed longevity:** 4 years

*Lycopersicon lycopersicum*
Watermelon

**Sowing**

- **Seed depth:** ½ inch
- **Germination soil temperature:** 80 - 90° F
- **Days to germinate:** 3 - 10
- **Date to sow indoors:** 3 weeks before last frost
- **Date to sow outdoors:** When soil temperature reaches 70° F

**Growing**

- **pH range:** 6.0 - 7.0
- **Growing temperature:** 70 - 85° F
- **Spacing:** 18 - inch mounds
- **Watering:** Moderate to low at planting or transplanting, low at ripening
- **Light:** Full sun
- **Nutrient requirements:** Moderate N, P and K
- **Rotation:** Avoid cucumber, melon, squash and pumpkin
- **Seed longevity:** 4 - 5 years

<table>
<thead>
<tr>
<th>Description</th>
<th>Watermelon requires significantly more room then their cucumber cousins. Fruits can range from 6 to 18 inches in diameter. Fruits have white, yellow and red flesh, skin could have variations of light green to dark green with spots, stripes or solid markings.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td>Soil should be well-drained and high in organic matter. Crop rotation should be done every year to avoid soil - borne diseases.</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>Broadcast 6 pounds of 5-10-10 per 100-foot row. Mulch with compost or sidedress with composted manure.</td>
</tr>
<tr>
<td>Planting</td>
<td>Planting should be done between May 15 and May 20. Do not plant watermelons too early because they will not survive a frost. Watermelons should be spaced 5 feet apart in 6 - to 8-foot rows. In a small garden, the vines can shade out weeds if other vegetable plants are established.</td>
</tr>
<tr>
<td>Cultivation Care</td>
<td>Keep planting bed weed free while plants are growing. Also, keep soil loose and mulch it with compost. Water as necessary, but avoid wetting the foliage. Plants are monocious, meaning male and female flowers are produced separately on the same plant. Thus, insects must be present for pollination. Poor fruiting formation may be from a lack of pollination. Therefore, avoid spraying insecticides. Watermelon plants cannot be trellised due to the large fruit.</td>
</tr>
<tr>
<td>Companions</td>
<td>Nasturtiums, radish and marigolds</td>
</tr>
<tr>
<td>Varieties</td>
<td>Jubilee, Crimson Sweet, Charleston Gray, Allsweet, Sweet Favorite</td>
</tr>
<tr>
<td>Harvest</td>
<td>Watermelons are ripe when the tendril, which is where the vine is attached, is dead. Thumping is not always accurate.</td>
</tr>
<tr>
<td>Health Benefits</td>
<td>Watermelon contain high amounts of water as well as magnesium, fiber, potassium, biotin, and vitamins C, B1 and B6.</td>
</tr>
</tbody>
</table>