PUBLICATION **8059**

Vegetable Garden Basics

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POINTS TO REMEMBER

- Choose the best available site for your garden, preferably in a location that is easily accessible from your home.
- Select a level, sunny area with well-drained soil.
- Have an adequate supply of water readily available.
- Prepare your soil carefully before you plant.
- Plan your garden so that you have vegetables all year round.
- Plant vegetables that your family likes in quantities you will use.
- Plant disease-resistant varieties that are adapted to your area.

PLANNING THE GARDEN

One of the best ways to plan a garden is to make a map of the proposed area using grid paper and drawing it to scale. Look up the space requirements for the vegetables you're interested in; consult your local UCCE Farm Advisor or Master Gardener and the publications listed in "For More Information" (at the end of this publication) for advice on this subject. Draw the vegetables in appropriate places on the map. Also include planting dates—this will help you remember when and where to plant different crops.

Vegetables need a steady supply of water during growth, so make certain there is an adequate and handy water source near the site. A level garden is necessary for uniform watering, but if the ground slopes, contour planting and drip irrigation allow water to be distributed evenly. Choose a site with rich, fertile soil that is free of weeds, rocks, and debris. Avoid shallow or compacted soils. If your soil is less than ideal, you may need to amend it or plant in raised beds (see "Modifying the Soil" and "Raised Beds," below).

SUNLIGHT

Full sunlight—a minimum of 6 to 8 hours per day—is necessary for some crops that produce "fruit," such as tomatoes and corn. Full sun is ideal for all vegetables, but root and leafy crops (carrots, turnips, beets, leaf lettuce, spinach, etc.) can tolerate some shade. Look for shadows that may be cast over the planted area; note how much of the garden would be in shade and for how long each day. Keep in mind that shadow patterns change with the seasons.

If possible, avoid planting under trees or on the north side of tall buildings. If tall and short plants are to be planted closely together, put the tall ones on the north side (for example, put corn on the north side of eggplant) so the tall plants don't cast shade on shorter plants next to them.

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PREPARING THE SEEDBED

Soil should be spaded or rototilled when it is moist but not wet. A good time to do this is in autumn before rain begins; it can be done again in spring if necessary. Work the soil about 6 to 10 inches (15 to 25 cm) deep, but avoid bringing subsoil to the surface. While working the soil, add preplant fertilizer (see "Fertilization," below). Rake the turned seedbed in several directions while it is still soft and full of moisture, so that any large clods or layered soils are broken up. The soil should have a uniform texture to a depth of 6 to 10 inches (15 to 25 cm).

Large dirt clods cause poor germination because seeds planted in or under them have little contact with the soil or may be buried too deeply. If the soil is too wet, it will be difficult to break up the large clods. In this case, allow it to dry a few days and try again. You may have to rake and dry the soil several times to achieve the desired soil condition, but be patient and take your time. If the soil has hard, dry clods, wet them and then start working them down. Level the soil after it has reached the desired texture.

MODIFYING THE SOIL

The ideal soil is a loam, one whose texture is not too light (sand) or too heavy (clay). No soil is perfect, but try to use the best soil that you can find. Very light or very heavy soils can be modified with organic amendments to increase their water-holding capacity or to improve drainage.

Light, sandy soils are generally very low in organic matter and water-holding capacity. Adding large amounts of organic matter, such as humus, compost, or well-rotted manure, to light soil increases its water-holding capacity and the percentage of organic content. Adding organic matter helps make heavy soils more friable (crumbly), improving water infiltration and root penetration. It also serves as filler to increase the number of large pore spaces in the soil.

To be effective, large amounts of organic matter are necessary—about one-third by volume of soil is often desirable, and less than 20 percent is often ineffective. Humus, compost, composted manure, or green materials like almond hulls or grape or apple pumice are most desirable because they help maintain good soil structure over time. Work a 2- to 4-inch (5- to 10-cm) layer of this material into the top 1 foot (30 cm) of soil and allow it to sit for a week or two before planting.

If high-carbon materials (peat moss, straw, shredded bark) are used, add extra nitrogen at the rate of 0.5 pound of actual nitrogen per 10 cubic feet (about 210 g per 0.25 m^3) of organic material (see "Fertilization," below). This extra nitrogen feeds the organisms that reduce (decay) the organic matter, whose activity would otherwise rob nitrogen from the plants.

RAISED BEDS

Raised beds are frequently desirable, even though a great deal of organic material may be used in their construction. Planting in raised beds allows excess moisture to drain out of the soil and also permits air to move around the plant roots, reducing the potential for rot.

Raised beds are commonly used in California and can make gardening easier for you. The simplest raised bed is soil mounded between two parallel furrows or irrigation ditches. The furrows also provide walking space between plant rows.

The simplest raised beds are made of mounded soil 20 to 60 inches (0.5 to 1.5 m) wide from the center of one ditch to the center of the other. The actual dimensions

will depend on the soil, irrigation methods, cultural practices, and what is to be planted. A common width is 30 inches (0.75 m): a single row of cabbage or beans, or two rows of carrots or beets, can be planted in a bed this wide. For spreading plants such as tomatoes and squash, a 48- to 60-inch (1.2- to 1.5-m) bed is more desirable. If the garden slopes, beds should run north and south so that both sides will get equal sunlight—this is particularly desirable for winter gardens.

Raised beds may be reinforced by a wooden frame, particularly if the soil is heavy or poorly drained. Raised beds with wooden sides offer many advantages other than improved drainage. The soil absorbs water better and warms up sooner in the spring. The wooden sides of the bed offer a good place to fasten markers or stakes for trellises. If gophers are a problem, wire can be placed under the bed before it is filled with soil.

To build a reinforced, or "boxed," raised bed, use 2-by-12 redwood planks for the sides and ends and fill with modified or amended soil. A boxed raised bed should probably not be more than 4 feet (1.2 m) wide for ease in planting and care, but it may be as narrow as 12 inches (30 cm) if space is limited.

The soil in a boxed raised bed may be composed of any good potting mix or modified soil, depending on the materials at hand. One-third to one-half of the mix can be your regular soil, and the remainder may be compost or other organic material. If good-quality loam topsoil is available, less organic matter is needed. The soil must be dry when mixed with the organic matter, and clumps of compost or clods of soil must be broken up and uniformly mixed before placing in the bed.

After the soil is mixed and placed in the bed, build a path around the bed for use in wet weather. A permanent sprinkler system or a faucet for irrigation hoses can be attached to the outside of the bed at a convenient location. Plants in a raised bed can be placed closer together for higher yields, but avoid overcrowding.

WATER

For optimal plant growth, the soil should remain evenly moist as plants mature; try to avoid alternating wet and dry soil conditions. Although deep irrigation is preferable because it promotes deeper root growth, you may need to provide frequent, light irrigations, especially for shallow-rooted crops such as lettuce or corn. As a general rule, water should be applied when the top 1 to 2 inches (2.5 to 5 cm) of the soil have dried out. Your watering schedule will vary according to your soil and weather conditions.

Using a layer of mulch around plants helps conserve soil moisture and reduces the frequency of irrigation, and it also discourages the growth of weeds. However, be sure that adequate water is able to move through the mulch layer into the root zone of the plants.

Furrow irrigation provides ample water to the root zone but results in considerable water loss through evaporation and may make the soil so soggy that you cannot work in the garden until the soil surface dries. Overhead watering with a hose, watering can, or sprinkler is usually considered the least efficient irrigation method. Much of the water is lost through evaporation, and some will fall on soil away from the roots and provide moisture to weeds. Additionally, water that falls on the foliage may contribute to leaf diseases. The best results are usually obtained by using drip tape or soaker hoses, which slowly supply water directly to the plant roots with minimal loss through evaporation and little water contact with the foliage.

FERTILIZATION

Nitrogen is naturally low in almost all California soils, and soil in many regions of the state is also low in phosphorus, so these nutrients should be added to the soil before planting. Most California soils have adequate amounts of other essential plant nutrients, but continued poor growth of vegetables, weeds, and other plants may indicate a deficiency of one or more nutrients. Soil tests, or consultation with a UCCE Farm Advisor or Master Gardener, can help you decide whether other nutrients are needed.

By law, the guaranteed content of a fertilizer must be printed on the bag or box. This content is expressed as the percentages of nitrogen (N), phosphorus (P), and potassium (K). For example, ammonium sulfate is labeled as 21-0-0: 21 percent by weight of nitrogen, and no phosphorus or potassium. To find out how much fertilizer would be needed to apply a certain amount of nutrient, divide the amount of nutrient needed by the percentage given on the bag. For example, to apply 0.5 pound of actual nitrogen using ammonium sulfate (21-0-0), divide 0.5 by 21% (or 0.21). The result is that about 2.4 pounds of ammonium sulfate would be needed.

A preplant (before planting) fertilizer application of a combination of nitrogen and phosphorus should be worked into the soil as the seedbed is being prepared. A basic commercial fertilizer of ammonium phosphate, (16-20-0), is one of the simplest to use for this purpose. Broadcast 2 pounds of this fertilizer per 100 square feet (1 kg per 10 sq m) of garden space and then work it into the planting bed. While additional potassium is not necessary for most California soils, a fertilizer containing this element can be used safely. If used, apply at the rate of 3 pounds of 10-10-5 or 12-12-12 per 100 square feet (1.4 kg per 10 sq m) of garden area.

Soil productivity can also be improved by generous application of manure. Approximately 1 pound of dry steer manure per square foot (4.3 kg per sq m) of garden area is usually sufficient. Chicken manure contains more-concentrated nutrients and, if used, should be applied more sparingly, 1 pound per 5 square feet (1.9 kg per sq m). Manure should be worked uniformly into the top 6 inches (15 cm) of soil several weeks to a month before planting.

Fertilizers may be as effective—in some cases more effective—if they are "banded" at planting time rather than being broadcast and worked into the soil. To band fertilizer, determine where seeds are to be planted and mark the row with a small groove or a string tied from one end of the row to the other. Dig a shallow trench 1 inch (2.5 cm) to one side and 3 inches (7.5 cm) below where the seed is to be placed, then distribute fertilizer evenly in the bottom of this trench and cover it with soil. If furrow irrigation is used, the band should be between the seed row and the irrigation furrow. If irrigation is by sprinkler, either side is acceptable. Use 1.5 pounds of 10-10-5 or 12-12-12 fertilizer per 100 feet (670 g per 30 m) of row.

Most vegetables will respond to "side-dressing" with a nitrogen-containing fertilizer such as ammonium sulfate at the rate of 2 pounds per 100 feet (885 g per 30 m) of row after the plants are 3 to 4 inches (7.5 to 10 cm) high. Side-dressing is done in the same way as banding, using a small furrow between the plants and the irrigation furrow, and covering the fertilizer with soil. If the plants are large, place the side-dressing furrow farther away from them. Irrigate to dissolve the fertilizer so the water will move it down into the root zone of the plants.

TOOLS AND EQUIPMENT

The following tools are useful in the vegetable garden:

- hand trowel for transplanting
- hoe for digging up weeds or making furrows
- rake for smoothing out soil after spading and for preparing seedbeds
- spade or spading fork for turning soil
- yardstick, twine, and stakes for spacing rows evenly and in straight lines

Clean your tools after using them (a putty knife or wire brush is useful for scraping off dirt) and put a thin coating of oil on them to protect them from rust or corrosion. Keep tools in a dry place; keep cutting tools sharp.

WHAT AND WHERE TO PLANT

Keep these points in mind when choosing which vegetables to plant.

- Choose vegetables you and your family like to eat.
- Select varieties that do well in your growing area.
- Some crops, like corn, have short harvest periods, so you can make several successive plantings or choose several varieties to stagger harvests. Planting 2 weeks apart in spring results in about 1 week's difference in harvest time in summer.
- If some of your crops have short growing seasons, you may want to plant another crop after harvesting the first. Consult a planting chart for appropriate planting dates (see, for example, chapter 14 of the *California Master Gardener Handbook*).
- Remember that vegetables grown from seed take longer to mature than those grown from transplants. If your grow your own transplants from seed, start them 4 to 6 weeks before the desired planting date.
- To discourage certain soilborne pests, avoid planting the same crop, or crops from the same plant family, in the same place 2 years in a row. If you have a serious problem with root-knot nematodes or root diseases, a more formal rotation schedule may be worthwhile. For example, a 4-year rotation schedule could include tomatoes, corn, legumes, and squash.
- When planting perennials, put them in one corner of the garden so that they won't be disturbed by the more frequent cultivation required by annual vegetables.
- Plant vegetables to best utilize available space. If you have little space, it might be advisable to use varieties that don't become as large as others, or to select varieties that can be grown vertically on trellises or wires.

PLANT ADAPTATIONS AND DISEASE RESISTANCE

Some plants are better adapted to one region than another. Plant recommendations are generally made for large areas of the state, while local climatic conditions may vary considerably. For example, coastal regions generally have mild weather, but some protected areas may have extremely warm summers. Become familiar with the growing periods for your particular area. Consult local UCCE Farm Advisors or Master Gardeners or a neighbor who knows the region if you are new to the neighborhood. In cold-weather areas, you may be able to extend your growing season by using hotcaps, tunnels, or other frost-protection strategies.

In many areas where vegetable farming preceded housing developments, certain diseases or pests may persist in the soil. Verticillium wilt and root-knot nematodes are good examples, although some tomato varieties are resistant to both. Try to ascertain whether these potential problems exist and take steps to eliminate them before planting your garden. Some soil pests can be significantly reduced by solarization, while others require different treatment. Explore the local information before working up your final garden plans.

FOR MORE INFORMATION

This publication is adapted from *Vegetable Gardening: Planning and Preparing the Vegetable Garden,* University of California Division of Agricultural Sciences Leaflet 2777, 1975.

You'll find more information on vegetable gardening in the following ANR sources:

California Master Gardener Handbook, Publication 3382, 2002.

Home Vegetable Gardening, Publication 21444, 1992.

Pests and Problems in Vegetable Gardens, Slide Set 83/111, 1983.

Pests of the Garden and Small Farm, Publication 3332, 1998.

Soil Solarization, Publication 21377, 1997.

The UC Guide to Solving Garden and Landscape Problems (CD-ROM), Publication 3400, 2000.

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An electronic version of this publication is available on the ANR Communication Services website at http://anrcatalog.ucdavis.edu.

Publication 8059

Funding for this publication was made possible through a grant from the Elvenia J. Slosson Fund.

pr-04/02-SB/VFG

This publication has been anonymously peer reviewed for technical accuracy by University of California scientists and other qualified professionals. This review process was managed by the ANR Associate Editor for Environmental Horticulture.