

Figure 1

Temporary raised beds can be created by digging soil in a 3- to 4-foot wide bed. Digging loosens the soil and keeps it higher than surrounding ground if there is no foot or equipment traffic.

Raised-Bed Gardening

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Raised-bed gardening is a popular technique for growing plants in Missouri. Beds are both useful and attractive in the landscape. Vegetables, fruits, flowers, trees and shrubs may be grown in raised beds.

Advantages of raised-bed gardening

- **Better drainage**
 Growing plants in raised beds is a logical choice for gardeners with heavy, poorly drained soils. Raised beds permit plant roots to develop in soil held above water-logged or compacted zones. This provides a more optimum soil environment for root growth. As beds are built up, compost or other forms of organic matter may be incorporated, further improving soil structure, drainage and nutrient-holding capacity.
- **Higher yields**
 Better root growth from improved soils leads to higher yields for food crops and lusher growth of ornamental plantings. Also, intensive planting in raised beds means more plants can be grown in a smaller area than with conventional row-cropping techniques. No space is wasted between rows.
- **Expanded growing season.**
 Better drainage speeds soil warming and allows earlier spring planting. In wet seasons, soil dries out faster, permitting planting to proceed between rains.
- **Maintenance**
 Because plants are growing above the level of walkways, less stooping is required for weeding, watering and other chores. Intensively planted raised beds provide dense foliage cover, shading out much weed growth.
- **Using difficult sites**
 Raised beds make gardening possible on sites where growing plants would otherwise be impossible. Rooftop gardens and raised beds on top of solid rock are examples. Terraced raised beds turn hillsides into productive growing areas while reducing soil erosion potential.

Types of raised beds

Temporary raised beds work well for many backyard vegetable gardeners. As the soil is tilled, it is loosened. If tillage equipment and foot traffic are kept off tilled beds, the loosened soil remains slightly raised above surrounding pathways. Adding compost or other organic matter to the bed raises it even farther (Figure 1).

The main advantage of temporary raised beds is their simplicity. No expense is involved in constructing framework to contain the soil. Temporary beds are less labor intensive to make than permanent beds. However, temporary beds flatten over the course of a growing season and require reconstruction the following year. Because there is no wall to contain the soil, it may erode from the top of the bed into walkways or down hillsides.

Permanent raised beds are more satisfactory for most situations. In the landscape, planting berms may be constructed by hauling in topsoil to create noise and traffic barriers as well as providing visual interest. When planted and mulched, berms need no edging to keep the soil in place. Walled raised beds may be used in the landscape or for vegetable gardens. Although there will be initial expense and labor in constructing walls for raised beds, the finished product should last for many years. Besides controlling erosion better than temporary beds, walled beds permit deep soil amendment. You may choose the wall construction materials to coordinate with other features in the landscape.

Figure 2

A grouping of barrels makes a convenient herb garden on the patio. Make certain that drainage is provided.



Construction materials

The choice of framework to use for walls depends on the availability and expense of the construction material, as well as the desired appearance of the final product in the landscape. Treated landscape timbers and used railroad ties are popular materials. Naturally rot-resistant lumber, such as redwood or cedar, may also be used. Other possibilities include concrete blocks, bricks and stones, or synthetic lumber made of recycled plastic. A group of half barrels can make a convenient raised bed for use on a patio (Figure 2). For a consistent look, match materials to those used elsewhere in the landscape.

Generally, wood-based products are less expensive than stone or masonry materials. However, resourceful gardeners may be able to find used bricks, concrete blocks or other materials at little or no cost.

Certain national gardening publications have raised concerns about the safety of using treated lumber in food gardens. Pressure-treated lumber uses CCA (chromated copper arsenate) or ACA (ammoniacal copper arsenate) as a preservative. However, studies done by Texas A&M Agricultural Extension Service showed insignificant movement of these compounds into surrounding soil. Pressure-treated lumber has no proven effect on plant growth or food safety. However, on Feb. 12, 2002, the U.S. Environmental Protection Agency (EPA) announced a voluntary decision by the lumber industry to move consumer use of treated lumber products away from a variety of pressure-treated wood that contains arsenic by Dec. 31, 2003, in favor of new, alternative wood preservatives. Alkaline copper quaternary (ACQ) is a relatively new wood treatment that is available in some areas of the country. This product is higher in copper than CCA but is free of arsenic.

Creosote, which is used to treat railroad ties, may cause injury or death to plants that come into direct contact with it. After a few years the effect diminishes. Old, discarded ties do not injure plants (Figure 3). However, injury may occur if ties are still oozing black, sticky creosote or smell intensely. If you are uncertain about the safety of treated lumber, place a heavy plastic liner between the treated lumber and soil used for growing plants to prevent direct contact of plant roots with the treated lumber. Be careful not to tear the plastic when tilling the bed.



Figure 3

Old railroad ties make a satisfactory raised bed if they are not oozing creosote, which could injure plants.

Raised-bed design

Raised beds take many forms, depending on the gardener's goals. Taming a hillside with terraces may require different bed dimensions than those used for flat-land vegetable gardens. On hillsides, follow the contour of the land and adjust the depth of beds according to the slope of the hill.

Typically, raised beds are laid out in a rectangular pattern. Level the area first to make a flat base for starting the building project.

A convenient width to use for beds is 4 feet. At this width, the center of the bed is easily accessible from either side. Lumber for constructing beds is readily available in 4-foot length multiples, minimizing the amount of sawing necessary and the amount of waste produced in building the bed. If the bed is accessible only from one side, limit the width to 3 feet. Most gardeners find it uncomfortable to reach farther than 3 feet to tend the bed.

The length of a raised bed is not critical. It is only limited by the dimensions of the yard. However, break up long distances into shorter beds. To prevent soil compaction, foot traffic and garden equipment such as wheelbarrows should not be permitted to go through the raised beds. For example, instead of building one long bed, breaking a 50-foot length into two 24-foot long beds with a 2-foot walkway between them will save gardeners many steps.

The depth of your raised beds is to a great extent up to your discretion. Most plants need at least a 6- to 12-inch rooting zone, but deeper would be better. With deep tillage, some of the rooting depth may come from soil at or below the existing grade. Beds built higher than 18 to 24 inches require retaining walls with foundations and supports, which are topics beyond the scope of this publication.

Stakes to hold raised-bed walls in place should be twice the height of the raised bed. Bury half the stake in firm ground. Leave half of the stake projecting above the ground as a support.

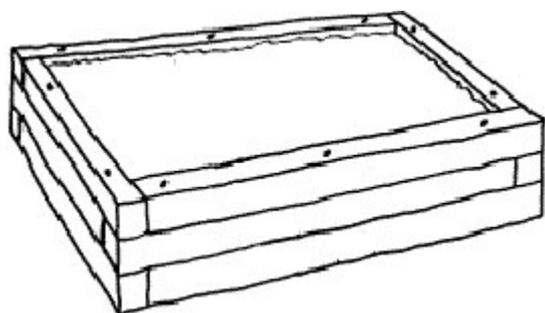


Figure 4

Landscape timbers make an attractive raised bed. Drill holes through the timbers to drive re-bar into the ground as far as the bed extends above ground. Hold landscape timbers and railroad ties in place with construction re-bar (see Figure 4). Drill holes all the way through each layer every 4 feet, staying 6 to 8 inches in from the ends of timbers. Drive a length of construction re-bar through the holes and into the ground below. Tie individual layers together by driving spikes from one layer into the next.

Use decay-resistant wooden stakes to hold dimensional lumber such as 2 x 8s in place. If placed on the inside of the board, the stakes will not be visible once the bed is filled with soil.

For a unique-looking raised bed, cut landscape timbers or posts to uniform 1- to 3-foot lengths. Set the posts vertically in the ground, half buried and half above ground.

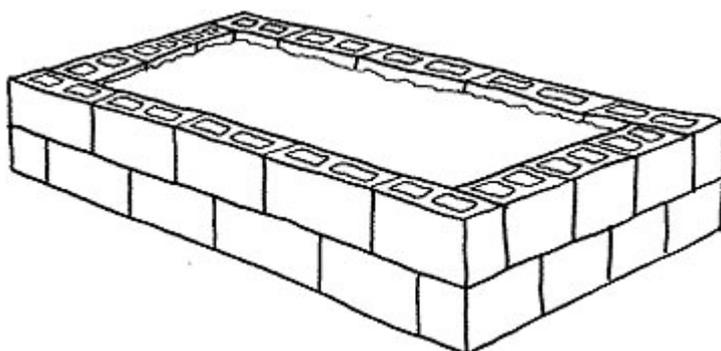


Figure 5

Stacked concrete blocks make a simple raised bed. For greater stability, offset the layers of blocks.

For raised beds less than 2 feet tall, stones or cement blocks may be stacked on top of one another without mortar or footings (see Figure 5). Carefully place irregularly shaped stones to enhance the stability of the wall. Offset seams and gaps from one layer to the next to help tie the wall together. You may use mortar for greater strength.

Make pathways between raised beds wide enough for easy access to beds. For foot traffic only, 1-foot wide paths are adequate. However, keep in mind that plants at the border of raised beds will hang over the edge, cutting into the available walk space. To allow room for a wheelbarrow or garden cart, plan on 2- to 3-foot wide walkways. To conserve space, one

option is to make most paths narrow, occasionally adding a wider path for access with garden equipment.

Several additional design features increase the convenience of raised beds. Seating can be made on the edges of wooden raised beds by capping the walls with a 2 x 6 or 2 x 8 inch board. If you regularly use a roto-tiller for tilling the beds, ramps into the raised beds save heavy lifting. Hollow pipes attached to the inside wall and spaced regularly along raised beds double as support posts for spring and fall season-extending cold frames or summer trellises for vine crops.

To make a raised bed wheelchair accessible, construct walls about 2 feet high and limit the width of the bed to about 3 feet (Figure 6).

Figure 6

Raised beds can be made wheelchair accessible by making the walls about 2 feet tall and limiting the width of the bed to about 3 feet.



Soil mix

Good quality existing topsoil may be used in raised beds. However, add additional organic matter to soils with a high clay or sand content. Peat moss, compost and decomposed manures are good sources of organic matter.

To take full advantage of the deep rooting potential with raised beds, the base soil should be worked up by roto-tilling or hand digging before bringing in additional soil. Many gardeners double dig beds.



Figure 7

To double dig prior to establishing a raised bed, remove all the soil from the bed one spade's depth. Dig the next layer down, leaving the soil in place. Return the topsoil to the bed and thoroughly mix the layers. Double digging permits deeper rooting by plants growing in the bed.

Double digging involves removing the topsoil the depth of a spade, setting the soil aside and then loosening the subsoil another spade's depth (see Figure 7). Finally, the topsoil is returned with added amendments, such as compost, manure or fertilizers. This labor-intensive soil preparation method provides an excellent rooting zone for plants. However, less-intensive methods also permit satisfactory plant growth.

Avoid hauling in new layers of soil without mixing them into existing soil. Distinct layers of soil create barriers through which water will not readily penetrate and roots will not easily grow.

Maintenance of raised beds

Soil in raised beds warms faster and dries out more quickly than soil at ground level. In spring and fall, these traits are desirable. But through the heat of summer, soil temperatures are higher and drying in raised beds is faster than in surrounding soil.

Use of organic mulches, such as straw or hay, in vegetable gardens or wood chips placed on landscape fabric weed barriers around ornamental plantings helps combat both problems. Soil temperatures are lower under organic mulches, less water is lost through evaporation, and weed growth is suppressed. Use irrigation to supplement natural rainfall during dry periods. Soaker hoses or drip irrigation may be placed directly on the bed. Overhead sprinklers can also be used, but because they wet foliage they are more likely to spread diseases.

For vegetable gardens at the end of the growing season plant residue can be tilled into the soil, adding organic matter. Additional compost may be added before successive plantings. Over time, the soil may become improved enough so little additional tillage will be necessary.

Fertilization of plants grown in raised beds is similar to that of plants grown conventionally. For most crops, a complete fertilizer such as 10-10-10 applied at the rate of 1 to 2 pounds per 100 square feet is satisfactory. Organic fertilizers and manures may also be used. For more specific fertilizer suggestions, rely on recommendations based on soil tests.

This guide was developed by Denny Schrock, former extension associate, Department of Horticulture.

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