



# Get a Rise Out of Your Vegetables

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2010



[Please Judge]

Title Slide – Get a Rise Out of Your Vegetables

A look at innovative and new, as well as tried and true, ways to solve gardening problems with raised beds. In this presentation I will share various building arrangements and give assorted tips and techniques to perfect this exciting method of gardening.

# What is a Raised Bed?

A planting area that is higher than the surrounding soil.



David Ouellette

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[Please Judge]

A raised bed is any planting area that is higher than the surrounding soil. They are primarily used to make sites with poorly drained soils, steep slopes, or extremely rocky soils, more conducive for gardening. Additionally, they are easier to maintain and more accessible than standard garden methods. Finally, raised beds tend to warm up faster in the spring, allowing for an earlier start to the garden season.

So, how is it different from a container?



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Raised beds and container gardens are very similar, but unlike raised bed gardening, container gardens do not share soil with the ground beneath them. In other words, containers have a bottom, raised beds do not. Both methods are excellent ways to grow vegetables, and each one has their place. Container gardens are excellent for patios, porches and decks when open-ground is in short supply.

## Temporary Raised Beds



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There are several types of raised beds. The first are temporary raised beds. These are simply created by raking existing soil, combined with organic amendments, into a raised bed or row without a structure to contain them. As the name implies, they are typically used for only one crop or season then torn down and rebuilt as needed. This is an inexpensive way to overcome poor soil drainage and define the planting area, but it is fairly labor intensive.

## Berms



[Please Judge]

Berms are another type of raised bed that, while not contained within a structure, are generally considered “permanent”. These are typically used for ornamental plantings. They serve to greatly increase the size of planting area, improve soil drainage, and provide a visual screen.

## Permanent Raised Beds



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[Please Judge]

What most often comes to mind are the permanent raised beds. These beds are contained within a structure which keeps the soil in place, provides clearly defined planting areas and walkways, and greatly reduces the potential for erosion. The rest of today's lecture will be spent discussing various aspects of building and maintaining permanent raised beds. Lumber is the most commonly used material for constructing permanent raised beds, and we'll discuss various issues related to lumber, plus other materials that may be successfully used.

# Advantages of Raised Beds

- Improved Soil Drainage
- Use Difficult Sites
- Longer Season
- Lower Maintenance
- Pest Avoidance
- Increased Yields
- Attractive



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[Please Judge]

Raised beds are often used to improve soil drainage and may allow the gardener to use sites with poor soil, excessive rocks, or even paved sites. They may increase the length of the season because raised soil warms faster in the spring. The confined structure clearly defines and raises the planting area, making them lower maintenance than in-ground plantings. The raised area may also temporarily alleviate certain soil born diseases like root knot nematodes. In some situations, raised beds may result in increased vegetable yield. Finally, raised beds can be attractive additions to a landscape.

## Disadvantages?

- May require more water than in-ground plantings.
- Higher initial cost.



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Raised beds have only a few disadvantages. The most important disadvantages are cost and water use. Because the planting area is raised, it is more exposed to the atmosphere and may lose water through evaporation more easily than in-ground plantings, requiring more irrigation. Probably biggest disadvantage over in-ground gardens is the higher initial cost of materials and labor needed to construct the beds.



## Site Selection

- Full Sun (> 6 hours)
- Good Air Circulation
- Near a Water Source
- Convenient to Home
- Protected from Wind
- Well-drained?



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Raised vegetable beds have the same basic site requirements as traditional gardens. (Evaluate the site pictured as we go.) Gardens need full sun, with good air circulation. Ideally they should be situated near a water source and convenient to the home. Research has shown that the further a garden is from water and the residence, the less care it will receive. Less important (unless this is a major concern where you live) is to protect the site from wind. This can be accomplished by plant a screening hedge in the direction of the prevailing winds, but not so close to the garden as to cast shade upon it. Finally, the soil beneath the beds should ideally be well-draining. However, I just said that one of the main reasons for using raised beds is to overcome poor drainage. So well-draining soil beneath the beds is not absolutely critical.

# Construction Materials



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There are many options available for constructing raised beds. Will discuss the benefits and shortcomings of many of the most common types. Pictured are treated landscape timbers (left) and creosote railroad ties (right). Landscape timbers are inexpensive, but they tend to be lower quality wood that warps easily, and they may rot sooner than you would like because they are usually dipped in a preservative rather than being pressure treated.

# Construction Materials

## Treated Lumber

- Most common material
- Is it safe for vegetable beds?
- Research says Yes...
- CCA was phased-out for residential use in 2003.
- Replaced with ACQ
- YellaWood – Certified by SCS as Environmentally Preferable Product



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[Please Judge]

Pressure treated lumber is by far the most widely used material for constructing raised beds. While there is much public concern about the use of treated lumber in vegetable beds, well-documented, university research has shown that the common products used to pressure treat lumber have a very low tendency to leach into the surrounding soil. This means that any of the products should be relatively safe for vegetable gardening. Still, the most common treatment, CCA, was voluntarily phased-out by all US lumber companies in 2003 for all consumer/residential use. ACQ is now the most prevalent preservative used, and it does not contain any arsenic. An even newer product is the method used for treating YellaWood. This method has been certified as an Environmentally Preferable Product by the SCS. Finally, if you still have concerns about using treated lumber for garden beds, then simply affix plastic or rubber sheeting to the inside face of the boards. This will prevent any potential for the preservatives to leach into the bed. Also, there are naturally decay-resistant woods available such as cedar and cypress, but these products tend to be fairly expensive.

CCA = Chromated Copper Arsenate

ACQ = Alkaline Copper Quaternary

SCS = Scientific Certification Systems

# Construction Materials

## Creosote (railroad ties)

- Fresh creosote can be toxic to plants.
- Avoid new ties with strong odor and oozing creosote.
- Older, recycled ties usually safe for plants.



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Railroad ties are another common construction material used for raised beds. It's important to note that fresh creosote is toxic to plants and using new ties that have a strong odor and ooze creosote may in fact damage your crops. For this reason, only older, recycled ties should be used for garden beds.

## Synthetic (plastic) Lumber



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[Please Judge]

There are many other less commonly used products available for constructing raised beds. One of these is synthetic lumber. This product is becoming more common in building centers and is sold under several brand names. It is usually made of recycled plastic products which makes it environmentally friendly, but it usually is more expensive than natural lumber.

## Natural Rock



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[Please Judge]

Natural rock or stone are excellent materials to use for raised beds with or without mortar. They may be purchased at landscape supply stores, or you may be lucky enough to have a ready supply of your own to use.

## Cast Stone



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[Please Judge]

Cast (artificial) stone is also widely available. These products are generally molded out of concrete. Note: Whenever building a “wall” local codes will probably require it to have a footer if it is over 2 ft tall.

## Recycled Concrete



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[Please Judge]

Using recycled concrete (sidewalks, driveways, etc.) is an excellent way to reuse a product that might otherwise end up in a landfill. One caution about concrete products... Liming materials may leach out of concrete causing locally higher soil pH in the adjacent soil. If not corrected this may cause problems with plant growth and productivity.





[Please Judge]

These concrete blocks provide support for raised bed and serve as nifty planters. Notice that they are painted which may help prevent the leaching of lime from the blocks.



[Please Judge]

Straw bales can also be used as a “compostable” raised bed and replaced annually.

## Bed Design

Dependent on terrain, intended use, gardener's limitations, aesthetics, etc.

Most are rectangular.

- 3 to 4 feet wide is best
- Length is variable, 10 to 12 feet long is good
- 6 to 12 inch minimum depth
- Paths should be 2 feet wide



[Please Judge]

Bed design is as much about personal preference as anything and your imagination is the limit. In general, the design will be dependent on terrain (slope), intended use, gardener's limitations (handicap, children, or senior accessible) and aesthetics.

The basic design used by most is rectangular. One of the key concepts for using raised beds is not compact the soil by stepping in the planting area. So it is important that the gardener be able to reach the center of the bed without stepping in it. As a result, three to four feet wide is best dependent on the gardeners reach. Bed length is very flexible and could be as long or short as the location permits, but remember that you will have to walk around the beds to reach the other side. Generally 10 to 12 feet is a good length. A depth of less than 6 inches won't accomplish much and will basically just serve as a border. Typically beds 8 to 12 inches deep provide a good planting depth. Finally, paths should be a minimum of 2 feet wide to accommodate the gardener walking into the garden. You may want to go wider based on the width of implements that you will want to bring into the garden such as tillers, wagons, etc.



[Please Judge]

Here is a garden composed of very typical raised bed designs. These beds are 4 feet wide by 10 feet long and 10 inches deep. The paths between the beds are 2 feet wide and covered with gravel.



Here is a much more intricate design from a NCSU Extension demonstration garden in Wilmington, NC.



This bed in a children's garden is deeper (approximately 20 inches deep) to bring the garden up to child height. It is also square which can accommodate young gardeners working on all sides.



This bed is what is commonly called a table bed. It is actually more like a container than a true raised bed. This type of design is good for people who have difficulty bending and, when placed on a hard surface like concrete or asphalt, is accessible to people in wheel chairs. Remember that the plants' rooting depth is critical and a bed like this should be at least 8 inches deep, have drainage holes, and be sturdy enough to support the weight of wet soil and heavy plants.



Here is another table bed that was originally too shallow at only 6 inches deep and would have dried out too quickly. To remedy the problem, the gardener attached 2 inch strips of lumber at the top to increase the depth to 8 inches.



# Construction



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Constructing raised beds from lumber requires basic carpentry skills and tools. The minimum tools needed will include a hammer, power screwdriver, circular saw, and level. Most bed designs can be completed in a weekend. More elaborate designs may require greater skill and more tools than listed. Be sure to use corrosion resistant fasteners in your work.



You will want to make sure that your completed beds are level when complete.

## Weed Barrier or Not?



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Weed barrier is not typically recommended under a raised bed because it can interrupt water flow between the bed soil and native soil beneath. Ideally the bed soil and native soil should be blended together to give a gradual change in soil texture from the surface to the subsoil, mimicking natural soil profiles. In this situation however, the gardener had soil that was heavily infested by Bermudagrass which could invade the bed from underneath without the barrier. If you do decide to use a barrier, make sure it is porous so that water can percolate through it. NEVER use solid plastic sheeting.

## Paths



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Materials for the paths between beds can be grass (left), gravel (right), mulch, pavers, etc. However, if the garden is to be handicap accessible, then the paths should be constructed of a solid surface.

## Soil Preparation

1. Work native soil as deeply as possible.  
Double dig!
2. Add Organic Matter!
3. Blend added soil and amendments with native soil and return to bed.
4. Soil Test
5. NEVER step in bed!!!

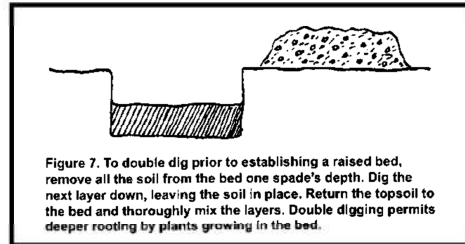


Figure 7. To double dig prior to establishing a raised bed, remove all the soil from the bed one spade's depth. Dig the next layer down, leaving the soil in place. Return the topsoil to the bed and thoroughly mix the layers. Double digging permits deeper rooting by plants growing in the bed.

- from MU Extension pub. G 6985

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Building raised beds is an excellent opportunity to create an excellent soil environment for your plants. As I mentioned earlier, you will want to blend the native soil with organic amendments, and soil test recommended nutrients (fertilizer) and lime (if recommended). First you want to cultivate the native soil as deeply as possible to decompact it and improve drainage (See Figure 7). At the same time you should incorporate organic matter like compost, soil conditioner, peat moss, etc. A 2 to 3 inch layer of compost tilled in to the top 8 inches of soil will be a greatly improve the soil. More than that is fine as well. It is a good idea to perform a soil test before adding amendments, add the materials recommended by the soil test and organic matter, then test the soil again up to a year later to see if any additional amendments are recommended.

Finally, remember to NEVER step in a bed once it is constructed. One step can destroy much of the work you've put into creating a terrific garden soil.

Double digging is a technique to cultivate soil deeply by hand and incorporate organic matter at the same time. This method is hard work but worth the effort. (Caption 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.)



There are many excellent soil amendments available to improve soil texture. These Master Gardeners are using an organic soil conditioner. Soil conditioners are usually composed of composted pine bark fines.

# Plant!



Marian St. Clair

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Now that these beds are built and filled with soil, these radish seedlings have an excellent growing environment.

# Maintenance

1. Fertilization
2. Mulching
3. Irrigation
4. Green Manures
5. Pest Management
6. Season Extension
7. Trellising



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Finally, I'll spend a few minutes discussion these maintenance techniques associated with raised beds.



# Irrigation



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There are two basic types of irrigation that may be used in raised beds, overhead spray irrigation (left photo) and drip irrigation (right photo). Of the two, drip irrigation is preferred in raised beds where practical. Drip irrigation is much more efficient than overhead because less water is lost to evaporation, and it does not wet the foliage of the garden plants, reducing the potential for disease development.

# Green Manures

Green manure (cover crop) is a way of providing organic matter to the soil.

It will recycle fertilizer and prevent leaching.

It can be very helpful in crop rotation and suppression of diseases.



Cover crop of clover and oats

GREEN MANURE CROP	
Crop	Season and Type
Crimson Clover, Vetch	- Winter legume
Rye, Wheat, Oats	- Winter non legume
Cowpea, Soybean	- Summer legume
Millet, Sudangrass, Buckwheat	- Summer non legume



Green manures (aka cover crops) are an excellent way to increase the organic matter in the raised bed soil. These are non-crop plants that cover the soil, preventing erosion, and recycle excess fertilizer from the previous crop. Green manures should be tilled into the soil at least a month prior to planting a crop. This allows them time to breakdown in the soil and release their nutrients for the garden plants. An effective green manure crop should include a nitrogen-fixing legume crop, such as field peas or clover, and a biomass providing, non-legume, such as buckwheat or oats. The table on the slide provides some common green manure crops.

## Pest Management?



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All pests aren't insects! Pest management in raised beds is generally no different than in traditional gardens. Remember to follow appropriate Integrated Pest Management (IPM) practices, relying on the cultural, mechanical, and biological pest management techniques available before resorting to chemical pesticides.

## Season Extension



**Floating Row Covers**  
offer cold and heat protection



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Raised beds lend themselves well to techniques that will extend the garden harvest. As I mentioned earlier, soil in raised beds tends to warm earlier than surrounding soil. You may also use floating row covers to protect your crop from cold or heat. Row covers are spun-bound fabrics that allow light, air, and water to penetrate, but hold in heat in the cool seasons, and because of their white color, they shelter from excessive heat in the summer. Depending on the material weight used, row covers may provide 2-4 degrees of temperature protection in either direction, effectively extending the growing season a week or two in either direction. Row covers are also good mechanical pest control by excluding pests from the crop.

## Trellising



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Trellising crops is an excellent way to maximize the use of limited space in raised beds. Vegetables grown on trellises generally provide much greater yield per unit area than those not trellised. Remember, vertical space is free! Trellises may be simple like the t-posts and netting on the left, or more intricate and unique like the stick tunnel on the right. Use your imagination and have fun!

# Additional Info

## Clemson's HGIC

[www.clemson.edu/extension/hgic](http://www.clemson.edu/extension/hgic)

## Kansas Extension Publication

<http://www.ksre.ksu.edu/library/hort2/mf2134.pdf>

## Missouri Extension Raised Bed Publication

<http://extension.missouri.edu/publications/DisplayPub.aspx?P=G6985>



Visit Clemson Extension's Home & Garden Information Center for much more information about gardening. There is a fact sheet on Raised Beds (HGIC 1257) as well as many others like Planning A Garden (HGIC 1256) and Cover Crops (HGIC 1252). Also Kansa State Extension and the University of Missouri Extension have excellent Raised Bed Gardening Publications.

# Questions?



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I'll be happy to take any questions that you might have at this time.

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Thanks for your attention!