

# Preparing the Soil

What is the secret to a bountiful garden? Excellent soil. In addition to anchoring roots, soil provides life-sustaining water and nutrients. Plants in poor soils will struggle to grow, even if optimal water and light are available. In contrast, plants in good soils will grow stronger and experience fewer problems with insects and disease.

## Soil Prep Step 1: Soil Testing

Before planting a school garden to grow edible crops, it is important to conduct a soil test. This will tell you if you need to add amendments to adjust the soil pH for optimal plant growth or correct any nutrient deficiencies. Be sure to ask that your soil be tested for unsafe levels of lead and other heavy metals as well.

### Testing for Nutrients and pH

A soil test will also provide you with information about the nutrient content of the soil, especially two of the three major nutrients needed by your plants – phosphorus and potassium, and will tell you the soil pH (acidity or alkalinity). Knowing the current level of nutrients present helps you apply the correct amount of fertilizer needed for healthy crops and avoid over-fertilizing. Most soil tests results also include recommendation for the types and amounts of fertilizer needed to correct any nutrient imbalances. Not only is this an environmentally friendly process, it also saves you money.

It's important to know the soil pH because it influences the availability to plants of nutrients in the soil. The pH scale ranges from 1 (acid) to 14 (alkaline). Most fruit and vegetable plants grow best in soil with a pH between 6.0 and 7.0. Optimally, test for nutrients and pH at least two months before planting so you can make adjustments, if needed.

### Testing for Lead and other Contaminants

Lead is the most common concern, as even minute amounts in a child's system can lower intelligence and slow neurological development, but other heavy metals or pollutants may also be a concern on some sites. Because lead is not biodegradable or mobile, once it's in the soil it remains a long-term source of contamination. While we tend to think of lead contamination as primarily a problem in urban areas, the fact is that the wide use of lead in paint, as a gasoline additive, and in some pesticides in the past make its presence in soil a possibility in suburban and even rural areas as well. Gardeners should try to find out the history of their garden site before planting edible crops. But because of the extent of the health threat, even in areas with an acceptable history it is always best to be cautious and test the soil in all areas planned for school gardens. Some extension services, EPA offices, and private labs offer this service. Call them for instructions on collecting and delivering your soil sample. Inform them that you intend to grow edibles in a school garden with children and need the soil checked for lead and other pollutants.

The main route of exposure to lead in the garden is through inadvertent direct ingestion of the contaminated soil and dust that gardeners and plants come into contact with in the garden. While plants grown on soil high in lead may take up some through their roots and store it in their leaves and fruits, most of the risk comes from ingesting the lead contaminated soil or dust deposits on the plants rather than from actual uptake of lead by the plants themselves. Similarly, contaminated soil can be ingested via dirt and dust on hands, a significant concern especially when children are working in the garden.

While it's typically considered safe to eat fruits and vegetables grown in soils with lead levels up to 300 ppm, a level found in many urban soils, this standard applies only where soil exposure to children is not a concern. Where soil ingestion can occur, as with children who may touch their mouths or food with dirty hands, soil with lead levels greater than 100 ppm should not be used for gardening.

If the soil test determines areas your site has lead levels above 100 ppm, be sure seek out expert advice from your local Cooperative Extension Service or Health Department on the safest strategies before beginning to garden. Do NOT grow edibles in the ground. You may still be able to garden safely by laying heavy-duty landscape fabric over the ground and pathways and mulching thickly to keep kids from easily coming into contact with the soil. Then

construct raised beds at least 18 inches tall and fill them with fresh, uncontaminated soil. Supervise young children to ensure they do not eat dirt or unwashed vegetables and make sure everyone washes hands immediately after gardening and before meals.

If you are not growing edibles, you still need to take steps to limit children's direct contact with contaminated soil and dust if lead levels exceed 100 ppm. Always put down landscape fabric and top it with mulch. Soils with lead levels that are not suitable for veggies may still grow great shade trees, flowering shrubs, and cut flowers, as long as adults taking proper precautions do the planting and working of the soil. Risk varies with the level of contamination, and if your soil test reveals lead levels above 100 ppm, be sure seek out expert advice from your local Cooperative Extension Service or Health Department on the safest strategies before beginning to garden. A word of caution though, if your soil has high lead levels and you choose to grow non-edibles; make sure knowledge about the contamination is passed down to the new garden coordinators each year so that later on, your ornamentals are not replaced with edibles.

For more information, see Plan for a Safe and Successful Edible Garden.

## Soil Prep Step 2: Cultivating the Soil

Once lead and nutrient testing is complete, it is time to literally dig in. If your site is brand new, till the soil (by hand or with a tiller) a month before you intend to plant to break down the existing vegetation, and remove tenacious weeds by hand. If the soil is very wet, wait for it to drain before you work the soil so you will not compact it. To test for the right moisture level, squeeze a handful of soil. If it forms a tight ball that drips water or holds its shape when you open your hand, it's too wet. The soil ball should hold together slightly, but crumble easily when you touch it.

Also at this time you can add lime to raise pH or sulfur to lower it, according to your soil test recommendations, and fertilizer to replenish nutrients. As plants grow, they remove nutrients from the soil. When they die, worms, insects, mites, and microbes break the plants down, returning their nutrients to the soil. But in the garden, we break this cycle by harvesting plants and remove the remaining dead plant material at the end of the season. So we have to replenish nutrients each gardening season by incorporating organic matter, like compost, and by adding fertilizers. Manufactured fertilizers, both synthetic and organically based, come in handy for improving the supply of available nutrients in the soil, but they don't improve soil structure and encourage beneficial soil microbes the way organic matter does, so you shouldn't rely solely on them for your garden's fertility. Adding a 2-3 inch thick layer of organic matter not only improves nutrient content, it also improves the soil's ability to hold moisture, air, and minerals. As another benefit, organic matter steadily releases its nutrients to plants rather than making them available all at once.

Once your garden is established, it is not necessary to till or turn over the soil each spring. Tilling can actually be detrimental to the soil, disrupting the ecosystem of beneficial microorganisms, harming soil structure, and speeding up the breakdown of organic matter in the soil. Especially if you are gardening in permanent beds, whether raised or ground-level, it's easy to cover the bare soil with a protective layer of mulch over the winter to prevent erosion and inhibit weed growth in the spring. Then gently rake the mulch to one side to scatter fertilizer, if needed; add a new layer of organic matter, and only dig in the soil as needed to plant your seedlings or seeds. Finally, renew the layer of mulch to keep weeds under control.

### Soil for Raised Beds

When planting raised beds, you will most likely bring in soil from an outside source like a landscaping company. You want to find soil specifically formulated for growing garden plants like fruits and vegetables. Although some municipalities may be willing to donate compost or soil for your organization, be cautious with any donations. Ask questions about any soil you bring in (donated or purchased) and find out where it comes from and if any testing has been completed to make sure it is free of contaminants. To be on the safe side, you should complete your own soil test once delivered. Always secure the best soil you can find for your raised beds. Good soil is an important and wise investment in a school garden program.

## Soil for Containers

You do not want to use common garden soil for container plantings. Garden soil is generally too heavy and will not drain adequately when used for container plants, and may contain plant disease-causing organisms and weed seeds. Instead, you will want to purchase a potting mix, which is a mixture that may include some true soil, but will also include materials like peat moss and compost to retain water, along with materials like vermiculite and perlite for good drainage and aeration. Potting mixes generally are sterilized to kill disease-causing organisms and weed seeds. There are many commercial mixes available that are specifically created for container gardens.