Great Vegetable Garden Soils

For a gardener, little is more rewarding than successfully growing a luscious crop of vegetables to share with friends and family. Strolling through the garden in the late afternoon to gather home-grown cherry tomatoes for the evening meal is a pleasure and a satisfaction that few would not envy.

One of the keys to gardening success is to have great soil for the vegetables you are growing. The right soil can help plants grow larger, faster, and healthier. Soil plays a role in immunity to disease and insects. And great soils make for great-tasting vegetables.

Some gardeners are lucky enough to have naturally great soil. Others in the Mid-Atlantic area may be dealing with heavy clay soils. Near the coast, gardeners are likely to encounter very sandy soils. In this article, we will take a look at what soil is, how to identify the needs of your soil, and how to build up the soils you have to grow great vegetables.

What is Soil Made Of?

Soil is made up of four basic parts: rock, water, air, and organic matter. The main ways that you can improve your soil are by amending the rock and organic matter. Here is some background to help you understand your soil, and some easy tests you can do to find out what will make your soil better.

Rock particles

The rock in soil is generally in the form of tiny particles. We call the biggest rock particles sand. Smaller particles are called loam or silt. The tiniest particles are called clay. The size of the rock particles that you have in your garden affects your plants' roots can access water and air in their roots. Soil with a lot of sand in it drains easily, but dries out quickly. Clay helps soil hold more water, but it can sometimes hold so much water that the plants' roots don't get enough air. The best soil for growing plants has a lot of loam in it. Loam holds water long enough for the plants to get a long drink, but then drains and allows air to reach the roots.

You can easily tell whether your soil is mostly clay, mostly loam, or mostly sand. Dig up some soil from your garden area with a trowel. Pour a cup of water on the soil and let it soak in for a few minutes. Then take a handful of soil and squeeze it gently into a cylinder shape. Sandy soils will not stick together, and your soil will fall apart when you open your hand. Clay soils will form a cylinder that doesn't crumble. Loam soils will form a soft cylinder, which will break into pieces about two inches long when you hold it by one end. This is the ideal soil for growing vegetables.

Organic matter

The organic matter in soil is decaying leaves, twigs, and other previously-living materials from past seasons. Organic matter is a source of nutrition for your plants. It is also the cushioning

between your soil particles which helps to hold the particles together and to move water between them. Organic matter naturally forms on the ground. Gardeners also create extra organic matter by composting.

Organic matter is black or darkest brown. If your garden soil is a lighter color, or if it is reddish, it may benefit from extra organic matter.

How Can I Make Soil Great?

When you have the right rock particle sizes plus organic matter that is rich in nutrients, you get the best soil. Great soils give plants the nutritional support they need in every stage of their growth, and supply the roots with the right amounts of water and air. Plants are healthy and strong, with better resistance to disease and insects. Vegetables grown on great soil are tasty and prolific. As the common saying goes, “Better to plant a $2 plant in a $25 hole than to plant a $25 plant in a $2 hole.”

But in many places, soil is not as good as our vegetables would prefer. To understand how to improve garden soils, let’s take a look at what plants need from their soil.

Plants need a variety of nutrients, which they get from the soil and from the air. The nutrients most commonly added to enhance soil are nitrogen, phosphorus, and potassium. These three nutrients are abbreviated N-P-K (N = Nitrogen, P = Phosphorus, K = Potassium).

How do you know whether your soil needs fertilizers? The most accurate method is to have a soil test. Laboratory soil tests will provide you with a detailed analysis of your soil’s composition, and identify the best amendments for your specific garden and the type of plants you wish to grow.

Soil tests are available from cooperative extension agencies. There are many agencies and locations available. Here are a few links:

Rutgers--New Jersey Agricultural Experiment Station: https://njaes.rutgers.edu/soil-testing-lab/how-to.php

Penn State Extension: https://extension.psu.edu/soil-testing

University of Delaware Cooperative Extension: http://extension.udel.edu/dstp/

University of Maryland Extension: https://extension.umd.edu/hgic/topics/soil-testing

You can also tell what your soil may need when you see how your plants grow. Nitrogen supports the growth of foliage. Poor leaf growth may indicate a need for more nitrogen. Phosphorus is heavily used in forming roots, buds, flowers, and seeds. Problems in these areas, when they are not caused by sun, insects, or drought, may respond to additional phosphorus. Potassium helps plants photosynthesize and supports their immunity to disease. Additional potassium builds overall plant health.

Building Great Vegetable Garden Soil

Many soils can use a boost to help them grow great vegetable gardens. The two main types of soil improvements are called fertilizers and soil conditioners. Fertilizers provide extra nutrients and minerals to the soil. Conditioners improve the soil texture, making it easier for roots to grow deep, for earthworms to tunnel, and for the soil to hold the optimal amounts of air and water. Some soil amendments both fertilize and condition the soil.

Fertilizers

Which fertilizers should you choose for your vegetable garden? You want the fertilizer that will provide the nutrients your soil needs in the right proportions and the right form.

One popular option is to use synthetic fertilizers. These inexpensive products are formulated in the laboratory to contain N-P-K nutrients in precise ratios. Many synthetic blends include both immediate fertilizers and slow-release pellets, so you don't have to worry about fertilizing your garden throughout the growing season. Any garden center offers bags of soil with synthetic fertilizers pre-measured and mixed in, making it easy to enjoy luxuriant plant growth for the whole growing season. Synthetic fertilizers take effect quickly and improvements in your plants are evident soon after the application of fertilizer.

Buy synthetic fertilizers in any garden center. Look for the nutrient ratios indicated by your soil test. Bags of synthetic fertilizers list their N-P-K ratio. For example, 20:10:20 fertilizer would contain 20% nitrogen, 10% phosphorus, and 20% potassium. The percentages are calculated by the weight of the element in the fertilizer as a whole, so the numbers may not add up to 100%. Some of the weight is filler to help distribute the nutrients evenly.

You can also use an "all purpose" or "vegetable garden" fertilizer. It is likely to help your soil, but it will not correct your soil conditions as well as a fertilizer that is an exact match for your soil.

When you apply the fertilizer, follow the instructions carefully. It is possible for plants to suffer from too much fertilizer as well as too little. Using excessive fertilizer can also have a negative effect on local streams and estuaries.

Although not as fast or as simple as synthetic fertilizers, many people prefer organic fertilizers for their ability to build long-term soil health. Organic fertilizers are made from the same kinds of organic matter that make up soil. Because they contain the remains or byproducts of plants and animals, the nutrients they provide are less concentrated but more varied than synthetic fertilizers. In addition to adding the macronutrients N-P-K to the soil, organic fertilizers may also provide trace nutrients, improve soil texture, and encourage beneficial microorganisms. Some of the main types of organic fertilizers are described below.

Plant Compost is leftover plant material (such as stalks, roots, trimmings, and leaves) from previous seasons' plants. As the waste decays and the plant structure breaks down, its nutrients and minerals become available to the roots of another plant. You can buy compost or you can make your own. It takes several weeks to several months to produce your own compost.

Whether you are making or buying compost, make sure that the plant wastes have broken down to a fine, fluffy, dark brown substance. Incompletely broken down compost can take minerals from your soil as it completes the decomposition process. Completely decayed compost is ready to contribute nutrients and minerals to your plants.

LeafGro is a brand of compost made from recycled yard waste in Maryland. Leaves and grass trimmings are composted locally, and the result is a compost that returns to your garden the very nutrients that were raked up in last fall's leaf piles.

Composted manure is compost made from the droppings of animals, usually mixed with some plant material and composted at high temperatures to kill pathogens. Almost all manure must be composted to be safe to use on vegetables gardens. (An exception is rabbit pellets, which may be spread in the garden as a fertilizer without composting.) Composted manure is as chemical-free as the feed of the animals which made it. Like composted leaves, it is a fertilizer that can be very similar to naturally occurring ecological processes.

Kelp fertilizer is a highly renewable source of trace minerals. Dried kelp powder can be mixed into soil. Liquid kelp fertilizer is also very effective when sprayed onto the leaves of plants.

Blood meal is an excellent source of nitrogen, which is the nutrient that soils often need the most. Blood meal is inexpensive and you don't need to use much. It is a byproduct of cattle processing. Blood meal makes nitrogen available in the soil over the course of about four months. Therefore it is an excellent choice for long-term soil improvement, but if your leaves are yellow now, you may need to use an additional fertilizer that targets the current growing season.

When choosing blood meal, it is important to read the label and see the product's country of origin. Blood meal cannot be composted to remove pathogens, including viruses. Buy blood meal only from countries with a record of safe beef and cattle products.

Since blood meal is derived from an organic and not a synthetic source, it is generally labeled as an organic fertilizer. But if you have a chemical-free garden, you may also want to seek out blood meal from cows raised without growth hormones or antibiotics.

Cover crops can be a helpful source of extra nitrogen, especially for gardeners who don't wish to add animal byproducts to their garden. Legumes such as vetch and clovers have special bacteria in their roots which "fix" nitrogen in the soil to make it easy for plant roots to absorb.

Scatter the seeds of vetch or clover after you harvest your final crops, and let the plants grow throughout the winter and early spring. If winter weather does not kill the cover crop, you will

need to do the job yourself so that the cover crop doesn't compete with your vegetables. A few weeks before you plant the first vegetables of the season, till the cover crop into the soil. Hoe the area once a week to ensure that the cover crop will not reappear as weeds in your garden.

Soil Conditioners

How do you improve the structure and texture of your garden soil? When you need to improve clay or sandy soil, the answer is soil conditioners. Soil conditioners help your garden retain enough water for your plants, while allowing drainage so that air can also reach the roots. Improving soil structure creates a welcoming environment for earthworms and beneficial microbes which will further improve your soil and your plants' health.

The simplest and most foolproof way to improve your garden soil is to add *compost*. Although compost is optional as a fertilizer, it is always welcome in the garden as a soil conditioner. Compost is simple because all you do is mix it into your soil. It is foolproof because there is no "wrong type" of compost, and it would be very hard to use too much. Moreover, compost improves the structure of any soil type.

All compost should be well broken down. Big clumps of organic material don't improve the soil as much as finely textured compost.

While browsing your local garden center, you may see a product called mushroom compost. Mushroom compost is made by composting the material on which mushrooms are grown. It is helpful in improving soil structure, but not as rich in nutrients as most fertilizers. If you wish to try mushroom compost, ensure that you are using "spent mushroom substrate" and not a product intended for growing mushrooms. The salts that mushrooms need to grow are too harsh for most vegetables.

Lime raises pH, making the soil more acidic. Most vegetables grow best in slightly acidic soil. Lime adds calcium to soil, and makes other nutrients more available to plants. If your garden has plenty of nitrogen, but the leaves of your plants yellow between the veins, an application of lime may help.

The need for lime can vary from one yard to the next, so have a laboratory soil test to determine whether your garden can benefit from lime. The amount of lime needed also varies in clay and sandy soils, so follow the recommended application schedule from the soil test. Pelletized lime is usually easiest for the home gardener to apply. Pulverized lime is more challenging and best left to those with specialized equipment. Adding lime to a garden is a long term solution. It probably won't save this year's garden, but it can improve your garden next year.

Gypsum and gypsum sulfate are naturally occurring minerals which supply calcium to the soil and improve the structure of the soil, so that it is neither too compacted nor too loose. Areas that get more than 40 inches of rainfall per year, as the mid-Atlantic region often does, sometimes benefit from gypsum. Adding gypsum to soil is especially useful for flowers that rot and fall off before they set fruit.

I've Improved My Soil! Now What?

Enjoy the beautiful vegetables that your soil is producing! And keep in mind that you can continue to improve your soil quality from year to year. Nature takes up to 100 years to produce one inch of topsoil. We can use good soil building practices to get great soil much more quickly!

Follow up on your chosen fertilizing and conditioning methods. Most methods require re-application one to four times per year. Read the package for specific directions. If you are making your own compost and there are no printed directions, you can add compost around the plants at any time. Don't dig the compost deeply into the soil once you have planted an area, so you don't disturb the roots.

Establish a watering schedule for your gardens and keep to it. Your vegetables and other living organisms will thrive on predictable moisture.

You can further protect you soils by mulching your beds after planting, or once your seedlings have leaves that are taller than the mulch. Mulching keeps soils cool in summer's heat and keeps water from evaporating quickly. It also reduces the growth of weeds. Choose a mulch without chemical additives or dyes to encourage beneficial microorganisms in the garden.

Another good practice is to establish permanent pathways in your garden. When you walk only on the pathways year after year, the soil in your beds remains light and loose, a haven for roots, earthworms, and helpful microbes alike.

As you continue to build your soil's health over time, the gardens you have planted will improve their yield and the quality of their produce for years to come.

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