Soil Improvement and Preparation

The soil provides plants with air, water, and nutrients. Garden soils are of three general types.

- **Loam and sandy loam soils** are of medium texture, easy to irrigate, and usually drain well. These soils are easy to work.

- **Clay soil** is fine-textured and usually more fertile and productive than other soils. However, clay soil compacts easily, so it drains slowly. It must not be worked when very wet, and it crusts when dried out. If wet, it takes longer to warm up in the spring.

- **Sandy soil** is coarse-textured and has good drainage, but it retains very little water or nutrients. It is easy to work and irrigate.

Soil in good physical condition (good tilth) can hold and provide adequate quantities of nutrients, water, and air to plant roots. It will also drain well when large quantities of water are applied, and it will be easy to work with—becoming sticky when wet and crusted when dry. If your garden soil has poor tilth, it can be improved by adding organic matter, such as compost, manure, sawdust, leaves, lawn clippings, or peat moss. Be careful to avoid excessive amounts of organic matter: for example, large quantities of manure can cause excessive salt buildup. Never use lawn clippings recently treated with pesticides. Additional nitrogen fertilizer may be needed when organic matter is used. Cover crops or green manures, such as rye, oats, wheat, etc., can also improve the condition of soil when they are tilled under in fall or spring. To produce these crops in time for fall or spring tilling, sow seeds in early fall. Additional information on amending garden soil can be found in chapter 3.

The first step in soil preparation is spading, rototilling, or plowing the garden. Do not till the soil if it is too wet, especially if it is clay. In some areas, it is possible to give the garden an early spading before winter rains or frosts occur. If it is not possible to work the soil before winter rains, prepare it as soon as it is dry enough to work easily without resulting in compaction. Work the soil to a depth of at least 6 inches (15 cm). Immediately after spading, break up large clods with a spading fork or rake to ensure that the soil is pulverized into pea-sized granules. Soil can be formed into beds if desired.

**Fertilizers**

Vegetables grown in most California soils often require some fertilizer for best growth. In general, the plants will need nitrogen; however, some soils are low in available phosphorus, and a few are deficient in potassium. You can use either organic forms (manures, composts) or inorganic forms (chemicals) to supply needed nutrients. Often, a combination of the two forms gives better results with vegetables than either used alone, particularly if phosphorus and potassium are required in addition to nitrogen. Tables 3.7 and 3.8 in chapter 3, “Soil and Fertilizer Management,” provide analysis of several organic and inorganic fertilizers.

If you use manure, apply it several weeks or even months before planting and work it well into the soil. This usually allows adequate time for the manure to decompose and some of the manure salts to leach from the surface soil before seeding or transplanting. Adding 1 pound (0.45 kg) of dry steer or dairy manure per square foot of soil surface is usually sufficient. If you use poultry manure, which is more concentrated, apply it more sparingly (1 pound to 4 or 5 square feet [0.45 to 1.2 or 1.5 sq m]). If you use manure that contains litter (straw, shavings, sawdust, or similar materials), also apply nitrogen fertilizer to avoid tying up nitrogen already present in the soil as well as that being added as manure.

Commercial fertilizers are available in a wide variety of compounds and concentrations. If you use manure or other organic materials, the usual commercial fertilizer need is for nitrogen alone. Nitrogen fertilizers suitable for home garden use include alfalfa meal, cottonseed meal, ammonium nitrate, ammonium sulfate, calcium nitrate, and urea. Limit application of these materials to 0.5 to 1 pound (0.23 to 0.45 kg) per 100 square feet (30 sq m) whenever they are used.

If you do not apply manure or other organic matter, it is usually wise to apply fertilizer that contains both nitrogen and phosphorus before planting. Ammonium phosphate (16-20-0 or 11-48-0) is one such material. Other commonly used inorganic fertilizers, which contain potassium also, include 5-10-5, 5-10-10, 8-16-16, and 12-12-12. Apply 1 to 2 pounds (0.45 to 0.90 kg) per 100 square feet (30 sq m) whenever these materials are used. Chapter 3 includes some sample calculations for applying fertilizer.
You can apply fertilizer either by broadcasting it before preparing the seedbeds or in bands at seeding time. If you broadcast the fertilizer, work it into the soil fairly soon to prevent nitrogen losses through ammonia volatilization. Sometimes banding is a more efficient way to use fertilizer. To band a fertilizer, first determine where you are going to plant the seeds or plants. Then mark the row with a small furrow or a string tied from one end of the row to the other. Dig a shallow trench 2 to 4 inches (5 to 10 cm) to one side of the row and 2 to 4 inches (5 to 10 cm) below where the seed is to be placed. Place the fertilizer in the bottom of the trench and cover it with soil. To use furrow irrigation, place the fertilizer band between the seed or plant row and the irrigation furrow. To irrigate by sprinkler, band fertilizer on either side of the row.

Use 1 to 2 pounds (0.45 to 0.90 kg) of fertilizer per 100 feet (30 m) of row.

After plants or transplants are well established and 3 to 4 inches (4 to 10 cm) high, it may be desirable to sidedress with nitrogen, particularly in sandy soils and where you have not applied any manure. Two or three sidedress applications will benefit crops grown for their leaves or other vegetative parts. Sidedress nitrogen at rates and in a manner similar to those described for banding fertilizer before planting. However, make the trench farther away from the plant row so the nitrogen is not placed close enough to burn plant roots.

It is also possible to apply fertilizer through a drip irrigation system. Follow the manufacturer's directions for this type of fertilizer application.

Consult table 14.2 for recommended planting dates for the major regions of California. These dates are based on the average temperatures for each region; you may have to make some adjustment if your area varies widely from the average. Unless otherwise stated, the planting times given in the table are for seeds. In California, allow 6 to 8 weeks for seeds to produce plants large enough for transplanting. Temperature is probably the most important climatic factor that affects the success of your garden. Carefully study table 14.2 for information about your area. It will repay you in the yield and quality of the vegetables you grow.

Other climatic factors that affect the growth and quality of vegetables are soil moisture and length of day from sunrise to sunset.