



GARDEN INFORMATION SERIES



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SOIL AND WATER MANAGEMENT FOR VEGETABLE GARDENS



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SOIL IMPROVEMENT AND PREPARATION

Garden soil provides plants with air, water, and mineral nutrients. Soil in good physical condition (good structure or tilth) can hold and provide plant roots with adequate quantities of nutrients, water, and air; it will drain well and be easy to work without becoming sticky when wet or crusted when dry. Improve poor structure by adding organic matter, such as compost, composted manure, sawdust, leaves, lawn clippings, fine-textured wood chips or a bagged soil amendment. Thoroughly mix a 1.5- to 2.5-inch deep layer of organic matter for every six inches of soil depth that will be tilled. Avoid large quantities of poultry or dried steer manure as they can cause excessive salt buildup, and never use lawn clippings recently treated with pesticides. Additional nitrogen fertilizer usually is needed when organic matter is mixed into soil. Refer to the When and How to Amend Landscape Soils brochure of the Garden Information Series for more information about amending soils.

FERTILIZERS

Vegetable crops primarily need nitrogen; however, some Southern California soils are low in available phosphorus and a few are deficient in potassium. Fertilizers come in either organic forms (i.e. manures, composts) or inorganic chemical forms. Plants respond equally to organic or inorganic forms of fertilizer. Organic fertilizers usually provide a number of plant-essential mineral elements in low concentrations along with certain non-fertilizer compounds that aid in improving soil structure. Often, a combination of the two forms is desirable and gives better results than either one used alone.

If you use manure, apply it several weeks or even months before planting and work it well into the soil, allowing adequate time for decomposition and some of the salts to leach from the soil before seeding or transplanting. One pound of dry steer or dairy manure per square foot of soil surface is usually sufficient. If you use the more concentrated poultry manure, apply it more sparingly (one pound to four or five square feet). Also, apply commercial nitrogen fertilizer to aid decomposition and avoid tying up soil nitrogen if you use manure that contains litter (straw, shavings, sawdust, or similar materials).

Chemical fertilizers are available in a wide variety of compounds and concentrations.

If you amend with manure or other organic materials, only inorganic nitrogen fertilizer will be needed. The most common and probably least expensive nitrogen fertilizer suitable for home garden use is ammonium sulfate. Check with your nursery for other suitable materials. *Limit application of these materials to 1/2 to 1 pound per 100 square feet of soil.*

If you do not amend with manure or other organic matter, it is usually wise to apply fertilizer that contains both nitrogen and phosphorus before planting, such as ammonium phosphate (16-20-0 or 11-48-0). Commonly used inorganic fertilizers containing potassium include 5-10-5, 5-10-10, 8-16-16, and 12-12-12. Apply one to two pounds per 100 square feet.

Apply fertilizer before or at the time seeds or plants are planted and again when seedlings or plants have grown three or four inches. If no manure is applied, additional applications of nitrogen are often needed for crops growing longer than four months. Apply fertilizer by broadcasting it or by applying it as a narrow band buried along side of the plant or seed row. If broadcasted, work it into the soil immediately and water the area well. If banded, normal watering will dissolve the fertilizer toward the seed or plant row.

After plants or seedlings are well established and have grown three to four inches, it is usually

desirable to apply nitrogen if you have not applied any manure. Apply nitrogen at rates and in a manner similar to those described for banding fertilizer before planting. It is also possible to apply fertilizer through a drip irrigation system or in a liquid form. Follow the manufacturer's directions for this type of fertilizer application.

IRRIGATION

Gardens in most areas of California require regular irrigation to provide the moisture needed for maximum plant growth. Vary the amount and frequency of irrigation according to each vegetable crop you grow. It is usually best to adjust irrigation to meet the needs of shallow-rooted crops. If their needs are met, the medium- and deep-rooted crops will get enough water. This same rule applies where topsoil is shallow. Shallow-rooted crops include cabbage, cauliflower, lettuce, celery, sweet corn, onion, white potato, and radish. Moderately deep-rooted crops include snap bean, carrot, cucumber, eggplant, peas, pepper, squash, melons, and tomato.

Water your vegetable garden one to three times a week in the summer. In hot weather, interior valley locations, and those where the soil is very shallow, it might be necessary to water two to four times a week. Wet the soil to a depth of one to two feet at each

watering or slightly beyond the root zone. If you only keep the surface of the soil moist, most of the water evaporates to the air and is lost to the roots.

There are simple ways to measure how much water you give your garden. If you use a garden hose, turn it on to the force you commonly use and time it to find out how many minutes it takes to fill a 1-gallon can. Drip system emitters are usually designed to deliver one to three gallons per hour. Since one gallon of water will typically wet one square foot of ground to a depth of 1.5 inches, you can estimate how many gallons, and thus how many minutes or hours, it takes to wet your garden to the depth of the plant's roots. If you use a sprinkler system, place some empty cans under the sprinkler spray at various spots. Keep track of the length of time the sprinklers are on and then measure the depth of the water in the cans when you turn off the water. Average the various depths to determine how much water is being applied to the garden at each sprinkling.

Drip and furrow irrigation have the advantage of not wetting the leaves. Water on plant leaves sometimes increases plant diseases. Drip irrigation offers several other advantages to home gardeners: (1) water is placed more accurately in the root zone; (2) water is applied at a slow rate so there is little or no waste; (3) furrows are dry so

you can work in the garden while irrigating; (4) less water is required; and (5) little or no management is required while irrigating. The disadvantages are the added costs of the drip irrigation equipment and occasional problems of plugging of the tiny drip openings. However, the advantages outweigh the disadvantages, and a drip irrigation system, when correctly installed and maintained, can be very effective.

If you plan to use drip or furrow irrigation, use raised beds about five or six inches high, flat, and 30 to 48 inches apart from center to center. Keep the seed or plant rows about 3 inches from the edge of the bed top. Raised beds also improve drainage during wet weather.

Soaker hoses are a form of drip irrigation and can be used to advantage in small areas, but they cannot be expected to provide as uniform irrigation as that provided by a true drip system.

Ask your nursery or garden center professional for additional information and assistance about managing soil and water in vegetable gardens.

The author is Dennis R. Pittenger, Area Environmental Horticulture Advisor, University of California Cooperative Extension, Southern Region.