

TRY VEGETABLE GARDENING

by Vincent Lazaneo, Urban Horticulture Advisor Emeritus (6/1/13)

Growing your own vegetables and herbs is a fulfilling experience whether you garden alone, with other adults or with children. It connects you with nature and rewards your efforts with tasty nutritious produce. Anyone can grow delicious vine ripe tomatoes, tender salad greens, and fresh aromatic herbs. With a little space and effort you will soon be harvesting your favorite crops.

PLAN

What You Need for a Garden

- **Location** – A garden can be in a sunny part of a front or back yard, or on a patio in large containers. It's best if the ground is nearly level or has only a gentle slope. As slope increases gardens become more expensive to install and more difficult to manage.
- **Light** – Vegetables need at least 6-8 hours of full sun each day. Avoid areas shaded by buildings, fences or trees. Remember, shadow patterns change with the seasons. It's best to run rows north and south so plants receive sun on both sides. This is very important for cool season crops that grow during winter when the sun is low in the sky. If rows run east to west sunburn is more likely to occur on the south side of the row during summer on tomatoes, peppers, and other crops.
- **Water** – Vegetables need frequent irrigation. An adequate source of water should be near the garden. Softened water should not be used to water vegetables. Its sodium content can injure plants and damage soil structure.
- **Equipment** – The basics include a long-handled shovel and spading fork (clay soil), metal garden rake, hoe, hand trowel, hand pruners, garden hose, and nozzle with a shut-off valve.
- **Supplies** – Common items include fertilizer, compost (you can make your own), seed, transplants, short stakes, twine and yardstick (to mark rows), and tall stakes (for vining plants). Other items you may need are: small containers for starting seed, potting soil, plant labels, floating row cover fabric (to protect seed/seedlings from pests), compost bin, lumber and fasteners to make raised beds or large containers.

Things to Consider

- **Garden Size** – If you have not gardened before it's best to start small and learn from the experience. You can always plant more next year.
- **What to Grow** – Start by planting what your family likes to eat and the quantity you can use. Select disease resistant varieties and consider each plant's space requirement, planting season, time from planting to harvest, duration of harvest and productivity. Get the most from your garden by growing crops throughout the year. Grow warm season crops such as tomatoes, squash and beans from spring to fall and grow cool season crops such as lettuce, peas, root and cole crops from fall to spring.

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- **Seed or Transplants** – Buying seed offers the widest selection including disease-resistant varieties. Buying young plants is usually more expensive than seed, but you can harvest sooner. Sow seed directly in the garden when growing conditions are favorable or in containers in a sheltered spot 6-8 weeks before plants will be set out in the garden. Plants commonly transplanted are herbs, tomatoes, peppers, eggplant, squash, lettuce, cole crops (cabbage, broccoli, cauliflower), and celery. Artichoke and asparagus can be grown from seed, but they are usually planted in winter using dormant crowns purchased from a nursery.

Evaluate the Garden Site

- **Look for Problems** - Evaluate potential sites for a garden and select the one where plants will grow best. Try to avoid areas with severe problems such as too much shade, tree roots, aggressive weeds, steep slope and soil with severe physical or chemical limitations. Also, look for signs of vertebrate pests such as pocket gophers, ground squirrels, rabbits and deer.
- **Check Soil Drainage** - Consider the slope and where surface water drains. Water should not stand in a garden after rain or irrigation. Also, check the soil's internal drainage by digging a hole a foot deep and filling it with water. When the hole is empty, fill it again and observe how fast the water drains. If it drains slowly or not at all, crop roots may drown unless you garden in raised beds (see section on raised beds below).
- **Soil Tests** - Vegetables will usually grow well in an area if weeds, turf grass or other plants are or were growing well in the area. If no plants previously grew in an area or if you suspect a soil chemical problem it may be helpful to submit a soil sample to a laboratory for analysis.

It's important to submit a sample of soil that adequately represents the entire area being evaluated. Use a trowel to scrape away surface debris and dig a hole about 6" deep. Then collect a thin slice of soil from the side of the hole to a depth of 6 inches. Combine 6-10 sub-samples from different locations in the garden to create a representative sample of soil for analysis.

Two very useful tests are soil pH (level of acidity or alkalinity) and soil salinity (concentration of total soluble salts). Soil fertility tests are also available, but they are often not needed since some fertilizer is normally mixed into soil before vegetables are planted. Soil should be tested for lead or other heavy metals if there is reason to believe that a garden site may be contaminated (e.g. from removal of lead-based paint or previous industrial activity at the site). Laboratory analysis will not identify physical problems such as shallow soil and impervious layers that can limit plant growth. Soil tests will also not identify disease-causing organisms such as pathogenic fungi and plant parasitic nematodes that can damage plants.

PREPARE

Prepare Soil for Planting

- **Eliminate Weeds** – Cut and remove tall weeds before digging the soil. If perennial weeds such as Bermudagrass are growing at the garden site it's best to eliminate them before the area is prepared for planting. Bermudagrass can safely be controlled with a non-selective systemic herbicide glyphosate (Roundup) if it is applied when the grass is actively growing and before soil is dug up. Bermudagrass spreads by runners (above and below ground) and more plants will be

created if live stems are cut into pieces. (See Bermudagrass Pest Note in reference list for chemical and non-chemical control methods.)

- **Dig Soil** - Work soil when it is moist, not wet. Working soil that is too dry or wet can pulverize or compact it and make growing plants more difficult. If soil is dry, water deeply and wait several days until the surface is dry. Then dig a shovelful to check the moisture content. If soil sticks to the shovel or if clods do not break apart, the soil is too wet to work. Wait a few days and check again. Soil is ready to work when it is moist and clods break apart easily with a little pressure.

Mark the garden area with stakes. Dig the soil about a foot deep and break clods into small pieces. Remove rocks, roots, and other debris. When the soil is loose, evenly apply and mix in some pre-plant (starter) fertilizer and compost or other organic matter. Also mix in other amendments such as sulfur or gypsum if a soil test indicates a need. Mix the soil thoroughly so it has a uniform consistency at least 6 inches deep. Use a rake to level the surface and create a seed bed with a fine crumbly texture. If soil clods are dry and hard, sprinkle them lightly with water and wait a day, then work them down with a rake. Repeat the process as needed until you have a seed bed with a fine crumbly texture free of clods.

Modifying Soil

- **Add Organic Matter** – Organic amendments help improve plant growth by changing the physical and/or chemical properties of soil. Composted organic matter is one of the best soil amendments. It increases the nutrient and water holding capacity of sandy soils and improves aeration and drainage in clay soils. As organic matter decomposes it binds small mineral particles into larger aggregates. This improves soil structure and tilth, which makes soil easier to work.

To be effective, a large amount of organic matter must be added to soil when it is initially prepared. Adding at least a third compost by volume to native soil is desirable and adding less than 20% by volume may not be very effective. To amend soil with 1/3 compost, apply a 3” deep layer over an area and mix it well into the top 6” of soil. Thoroughly water the amended soil and allow it to sit a few weeks before planting. Organic matter quickly decomposes in amended garden soil, and some additional compost or other organic matter should be mixed into soil each time it is prepared for planting. It’s easy to make your own compost from crop residue, yard trimmings, and other organic material. (See “Compost in a Hurry” listed in the reference section for information on how to make compost.)

If soil is amended with non-composted organic matter that has a high carbon content (e.g. raw wood shavings, ground bark, or peat moss), add enough fertilizer to supply 0.5 pounds of actual nitrogen (e.g. about 2.4 pounds or 4.5 cups of ammonium sulfate – 21% N) for every 10 cubic feet of amendment. If extra nitrogen is not added, plants may suffer a nitrogen deficiency as microorganisms draw nitrogen from the soil to decompose the organic matter.

Sand should not be used to amend clay soil since this usually increases soil density without improving aeration or drainage. Adding a small amount of sand to clay soil will not improve plant growth. The best way to improve clay soil is by adding compost or other organic matter every time the soil is prepared.

- **Soil pH** - Most vegetables grow best when soil is slightly acidic to neutral (pH is 6.0 to 7.0). The availability of some micronutrients decreases as soil becomes alkaline (pH above 7.0) and this may limit plant growth. Sulfur or peat moss can be mixed into soil to make it more acidic. For 100 square feet of garden area applying 1 pound of sulfur on sandy soil, 2 pounds on loam soil or 3 pounds on clay soil can reduce soil pH up to 1 unit. Bacteria in soil slowly convert sulfur to sulfuric acid and it can take 1-2 years to see the full effect from an application of sulfur. Sphagnum peat moss is very acidic (pH 4.0) and quickly changes soil pH but it is more expensive than sulfur. Peat moss also has a high water and nutrient holding capacity that can be beneficial for sandy soil. Lime makes soil more alkaline and it is rarely needed on soils in San Diego County. It should be used only if soil is very acidic (below pH 5.5).

Gypsum (calcium sulfate) does not change soil pH. It is used to help remove sodium from soils (when there is a high level of exchangeable sodium on clay particles). Excess sodium breaks soil aggregates into individual particles and decreases soil drainage and aeration. If soil has a high level of sodium it can be reclaimed by mixing in gypsum at the rate of 20 pounds for 100 square feet of area. The calcium in gypsum will replace sodium on soil particles so it can be leached away with periodic thorough irrigation.

Fertilizer

Most of the 17 elements plants require for growth are adequately supplied by soil and water. The only elements that usually need to be supplemented with fertilizer are nitrogen (N), phosphorus (P), and sometimes potassium (K). Fertilizer products list the percent by weight of N, P and K in this order on the label. For example, ammonium phosphate (16-20-0) contains 16% nitrogen, 20% phosphorous, and no potassium.

- **Pre-Plant** - A pre-plant (starter) fertilizer usually contains nitrogen and a larger, or at least the same amount, of phosphorous. A fertilizer that also contains potassium can be used although this element is adequate in most California soils.
- **Type** - You can use a chemical or organic fertilizer or a combination of both types to grow vegetables. Each type has its advantages and disadvantages.

Organic fertilizers contain a variety of plant nutrients that crops growing in a particular soil may or may not need. They contain organic compounds that “feed” many soil organisms in addition to plants. Most organic fertilizers have a low nutrient content and they are usually relatively expensive on a nutrient comparison basis. Organic fertilizers release chemical elements for plants to absorb as they decompose and this process occurs faster in summer when soil is warm than in winter when soil is cold. The slow rate of decomposition can keep nitrogen and other nutrients from leaching out of soil with rain or irrigation. If decomposition is too slow, there may not be enough nitrogen available for optimum plant growth.

Chemical fertilizers can supply a single plant nutrient (e.g. ammonium nitrate – 33% N) or a combination of elements depending on the product. These fertilizers often have a relatively high concentration of chemical elements and are usually less expensive than organic fertilizers on a nutrient comparison basis. Crop damage can occur if too much soluble fertilizer is applied at one time or not enough water is applied to dissolve and dilute the fertilizer. Soluble chemical

fertilizers release nutrients immediately for plants to use when they are applied to soil and irrigated. This can be helpful when a crop requires nitrogen but excess rain or irrigation can leach soluble nitrogen below the crop's root zone. Slow release chemical fertilizers which gradually release nutrients over a 3-4 month period are more expensive than soluble fertilizers but they can effectively be used to grow crops that are heavily watered and when plants are grown in sandy soil or in containers filled with porous potting soil.

- **Amount** – The amount of fertilizer applied before planting will vary depending on the type of material and concentration of nutrients a product contains. Measure your garden area and calculate its size in square feet. Then evenly apply the amount of fertilizer recommended on the product label and mix it into the soil 6" deep. If ammonium phosphate (16-20-0) is used as a pre-plant fertilizer, evenly apply 1-1.5 pounds (about 2-3 cups) to 100 square feet of garden area and mix it in 6 inches deep. A typical application of animal manure for 100 square feet of garden area is 20 pounds of composted poultry manure or 60 pounds of composted steer or dairy manure. Do not use fresh manure in a vegetable garden since it can contain bacteria that cause human disease.
- **When?** – If chemical fertilizers are used, mix them into the soil just before planting as their nutrients are in a form that plant roots can immediately absorb. Organic fertilizers release nutrients as they decompose and it's best to mix them into the soil at least two weeks before planting. Water well to moisten the soil and promote decomposition. Animal manures contain sodium chloride (salt) that can harm plants. If manure is used, mix it into the soil at least a month before planting and irrigate periodically to leach salts from surface soil.

Raised Beds

- **Why?** - Raised beds are expensive to build but they can make gardening easier and have other benefits. Vegetables often grow better in raised beds especially if native soil does not drain well. Amending soil with organic matter and creating raised beds improves soil drainage and aeration, which promotes better root growth. Soil in a raised bed also warms faster in spring so heat-loving crops can be planted sooner.
- **How?** – An inexpensive raised bed can be created by raking soil into a low mound with a flat top (30-48" wide). Use one or more parallel lengths of drip tape or individual drip emitters on top of the bed for irrigation. More expensive, permanent raised beds can be created using lumber, masonry block or other material to hold soil in place. A framework can be built with 2x12 decay-resistant lumber to create a raised bed of a convenient height. A bed can be any length but should not be more than 4' wide to easily reach the middle from either side. Where pocket gophers occur, you can exclude them from a raised bed by attaching ½" wire mesh to the bottom of the framework before it is filled with soil.
- **Soil** - Fill beds with good native soil or with amended soil made by mixing one part compost (not manure) with 1-2 parts soil. Less compost is needed if a good quality loam soil is used. Soil should be dry or slightly moist when it is mixed with compost. Clods of soil and clumps of compost should be broken up and uniformly mixed before the amended soil is placed in the raised bed.

PLANTING AND CARE

Planting the Garden

- **Make a Plan** - Developing a plan on paper before you plant can help you get the most from your garden and avoid costly mistakes. Measure your garden and draw it to scale on grid paper. Prepare a list of vegetables you want to grow, then mark on the plan where each vegetable will be planted and the spacing between rows. Also note other useful information like planting dates, expected time of harvest, and new crops to plant when old ones are removed. Place tall crops such as tomatoes, pole beans, and corn on the north side of the garden so they won't shade low-growing crops. It is best to grow perennial crops such as artichoke, asparagus, and some herbs in a separate area where they will not be disturbed when annual crops are replanted.
- **When?** - Vegetables will grow best if you plant them when the air and soil temperatures are favorable for the crop. Warm season crops such as tomatoes, squash and beans are grown from spring to fall and cool season crops such as lettuce, peas, root and cole crops are grown from fall to spring. The Vegetable Planting Guide (<http://www.mastergardenersd.org/downloads/VegetablePlantingGuide.pdf>) gives planting dates for common warm and cool season vegetables in coastal and inland areas of San Diego County. Most seed packets also provide information on planting dates, planting depth and plant spacing.
- **How?** - Planting in rows makes it easier to identify vegetable seedlings and remove weeds. Mark a row with stakes and string, then make a shallow furrow with a hoe or trowel. Check seed packets for the correct planting depth. Be careful not to bury small seeds too deep. As a general rule the planting depth for seed is 2 to 3 times their diameter. Cover seed with fine soil and gently tamp the surface so soil will be in good contact with the seed. Covering soil after seed is planted with light weight row cover fabric (laid on the ground or supported on heavy wire hoops) will speed germination and protect seedlings from pests.

If you grow your own transplants from seed in small containers, use a fine, porous potting soil and sow the seed 6-8 weeks before the desired planting date. Seedlings grown indoors (by a south facing window or under grow lights) or in a greenhouse must be gradually exposed to outdoor conditions to harden them off before they are planted in the garden.

- **Water** - Irrigate thoroughly after planting to wet the soil at least 6" deep. Use a fine mist or gentle spray and be careful not to create puddles so small seeds are not washed out of the soil.

Early Care

- **Irrigation** - Water lightly as needed to keep soil moist until seeds sprout. Small seeds need to be watered more often (1-3 times a day) than large seeds that are planted deeper. Large seeds may rot if the soil is kept too wet. Before you water, poke a finger into the soil where large seeds are planted to check moisture below the surface.

New transplants may need to be watered one or two times a day for a week to keep the root ball moist until new roots grow into the garden soil. As plants grow larger, water less often and apply more water. Most cool season crops have a shallower root system than warm season crops. Water often enough to keep soil in the root zone moist but not constantly wet. Never let the soil dry completely. Applying a layer of compost or other mulch on soil around plants (especially warm season crops) will help conserve water and discourage weeds.

- **Thinning** – Crowding stunts young plants and may keep them from producing a crop. Thin seedlings when they have their first set of true leaves by pulling out or pinching off some plants so those that remain will have enough space to grow. If needed continue to thin young plants as they grow until the final spacing for mature plants is attained. Keep and use thinned greens and root crops.
- **Weeds** - Remove any weeds growing near crop plants as soon as possible so they won't compete with the crop. Carefully pull or cut off the tops of weeds growing near young plants so crop roots will not be disturbed.
- **Fertilizer** – Phosphorous (P) and potassium (K) are held in soil for a long period of time and a pre-plant application of fertilizer containing these elements will provide annual vegetables with enough P and K for the growing season. Soluble forms of nitrogen (N) are not held in soil very long and many pre-plant fertilizers usually do not provide vegetables with enough N for the entire growing season. To grow well, most crops need one or more additional applications of fertilizer containing nitrogen during the growing season. When vegetable seedlings are well-established (2-4" tall), side dress with nitrogen fertilizer. Fertilize transplants a few weeks after they are planted in the garden. Two or three applications of nitrogen applied 4-6 weeks apart will benefit crops grown for their leaves or vegetative parts.

If nitrogen is supplied with ammonium sulfate (21% N), use 1.25 cups for 100 feet of row or 1/8 cup (2 tablespoons) for 10 feet of row. If another nitrogen fertilizer is used, apply enough to supply 0.1-0.15 pounds of actual nitrogen for 100 feet of row. To calculate the amount of fertilizer needed, divide the amount of nitrogen desired by the percent of nitrogen in the fertilizer product and multiply the amount by 100. For example, if you want to apply 0.1 pounds of nitrogen using a fertilizer containing 5% nitrogen, you'll need to apply 2 pounds of the fertilizer (0.1 pounds of actual nitrogen desired divided by 5% times 100 equals 2 pounds of fertilizer).

If vegetables are hand watered, scatter fertilizer evenly along both sides of the row a few inches from the plants. Water well to dissolve soluble fertilizers and carry it into the root zone. If organic fertilizer is applied, rake it lightly into the surface soil. If vegetables are watered with drip irrigation, apply the fertilizer through the irrigation line if possible or place the fertilizer near the drip emitters so water will dissolve the fertilizer when the system is operating. Plant damage may occur if too much soluble fertilizer is applied near the root system. Plant damage is less likely to occur if a slow release fertilizer is used.

- **Pests** – Learn what pests and diseases commonly attack crops grown in your area. Whenever possible protect plants (especially when they are young) before they are injured. Use a variety of non-chemical methods (e.g. barriers such as row cover fabric) and good cultural practices. Check often for harmful pests such as snails, slugs, insects and mites. If you think a pest is damaging a plant, identify the pest and use the least-toxic method that will effectively control it. (See UC Pest Notes at www.ipm.ucdavis.edu for information on managing specific pests.) Before you use any pesticide in the garden, read the product label to make sure it can safely be used on the plants you want to treat. Carefully follow label directions.

References

www.mastergardenersd.org

Vegetable Planting Guide
Tips on Growing Tomatoes
Joyce Gemmell's Veggie Guide

www.ipm.ucdavis.edu for Pest Notes:

Soil Solarization for Gardens and Landscapes
Bermudagrass
Snails and slugs
Aphids

<http://anrcatalog.ucdavis.edu/>

Compost in a Hurry #8037

<http://ucanr.edu/sites/gardenweb/Vegetables/>

See the California Garden Web for information on planning, preparing, caring for, and growing specific vegetables