



Ten Steps to a Successful Vegetable Garden

Gardening with vegetables can be fun and can provide delicious and highly nutritious fresh food. Watching and working with plants can add a new dimension of enjoyment to life. Bring an awareness of the wonderful world of nature in the backyard. The marvels of nature will have special personal meaning when nurturing a small seed into a colorful productive plant with your own hands. These

accomplishments can be obtained regardless of the size of garden. A few plants or a large plot will give rewarding experiences for both young and old. The path to a successful vegetable garden is not difficult or long. Ten carefully taken steps will produce many enjoyable moments and an abundant harvest of fresh vegetables during much of the year.

Step 1

Select a good location

Choose an area with plenty of morning sunlight and some afternoon shade. Most vegetables, especially fruiting types, do best with six to eight hours of full sun exposure. Leafy and root vegetables will tolerate partial shade. Don't plant gardens under or near trees or large shrubs—their roots will rob fertility and water from vegetables. Don't plant vegetables in the narrow shaded space between houses and walls.

A loose, fertile, level, well-drained soil is best. If possible, avoid heavy clays and very sandy soils. If caliche is present it must be dug out and removed. Avoid areas that are crusted

with alkali salts or infested with hard to control weeds such as Bermudagrass, nutgrass, Johnson grass or bindweed.

A synthetic soil, self prepared or purchased, can be used in raised beds or containers (pots, tubs, boxes) if good soil is not available. Where space is limited, container gardening can be practiced. A convenient water supply for irrigating is necessary.

Microclimates occur throughout the property. Depending upon your elevation select spots on the property that are best suited to warm or cool season vegetables.

Step 2

Plan your garden layout

Planning ahead will help avoid problems and make your garden a complement to your landscape. First, sketch a plan of the intended planting area for vegetables. Write down the size of the area or location of containers. This is the beginning of a gardening notebook or journal. A gardening journal will help when making decisions for your garden in subsequent years.

- Decide on the vegetables species wanted. Select those that your household likes, that are adapted to your climate and practical for the location. If space is limited, plant those that utilize space efficiently like bush varieties, beets, broccoli, cabbage, carrots, leaf lettuce, basil, onions, radishes, Swiss chard, tomatoes, and turnips. Use vertical space by trellising climbing crops.

Refer to table 10.9 in the Arizona Master Gardener Manual for the number of plants needed for each vegetable per person in the household.

- Mark on the plan where the vegetables will be planted, making sure to leave room for growing space between plants. Also, list the planting date for each vegetable. Arrange plantings according to harvest periods and growth characteristics. Plant vegetables adjacent to each other which will be harvested about the same time. Avoid having taller plants shade younger and smaller vegetables.

Step 3

Grow recommended varieties

Gardening success can be greatly influenced by the varieties you use. Select from recommended lists and from those known to do well locally. It is a good idea to try one or two new varieties each year. Plant them next to old favorites for comparison. Keep a notebook or journal from year to year to note what varieties perform best. For mini-gardens try bush or dwarf varieties.

Some vegetables are colorful, use them in areas traditionally planted with ornaments.

Seed catalogues will be a big help in finding these. Look for All-American Selection Award winners. (www.all-americaselections.org/)

Step 4

Obtain good seed, plants, equipment and supplies

Before planting, find a reputable source for seed and other garden supplies. Seed catalogs can be helpful, but be sure the varieties are locally adapted. Buy new seed since some seeds over a year old will not germinate (sprout) well. Some seeds can be saved and are best placed in jars or in plastic bags and stored in a freezer. Due the hybridization, seed saved from hybrid vegetables will not produce plants like the parent.

Vegetable transplants can be purchased at garden stores, nurseries and greenhouses. Insist on recommended varieties. Select plants that are healthy, stocky, medium-sized, with vigorous roots and that are pest free. Avoid plants that have insects or are wilted, yellow, spindly, too large or have spots on the leaves, brown lesions on the stems or knots/galls on the roots. Obtain plants in containers (pots, 6 or 8 packs, bands or boxes) when possible so that the root systems are intact. Transplants should not be disturbed any more than necessary

and "hardened-off." Transplants can be started if desired.

Have all equipment and tools clean and in good condition before working the soil. A hoe, spade, garden rake, trowel, measuring stick and planting line are essential. A hand cultivator and seed drill reduce work in larger gardens. Hoses, sprinklers and drip lines are convenient for watering. Other needed supplies are fertilizers and mulching materials.

Study pest control recommendations to determine what may be needed after positively identifying the pest. It is important to have a quick source of materials for pest control if needed. A good sprayer or duster to control garden pests should be available for use. Care should be taken in handling, applying and storing all chemicals. **Always follow the pesticide label instructions, it is a legal document!**

Step 5

Prepare and care for the soil properly

Soil provides nutrients and water for plants. If limited or if the soil is compact or hard and crusty when dry, and water-soaked and sticky when wet, plants will not grow and develop properly. To maintain and improve soil conditions, mix organic matter and fertilizers into the soil before planting, and prepare and cultivate the soil when dry or slightly moist (never when wet).

Organic matter makes the soil loose (friable) and easy to work and improves nutrient and water-holding capacity, drainage and aeration. Well rotted manure, compost, and leaf mulch are commonly used organic materials. Composted manure is easy to use and is relatively free of weed seeds. Apply a layer of organic matter 2 to 3 inches thick on the garden area about 1 to 2 months before planting. Work it into the top 10-12 inches of soil. A thorough watering of soil at this time helps leach harmful salts from the root zone. If poultry manures are used apply them at half rate.

A fertilizer should be added containing both nitrogen and phosphorus and be applied before planting. These nutrients will benefit most garden crops. Although soils vary in fertility, a typical fertilizer application would be 1 to 2 lbs. (1 to 2 cups) of 16-20-0 (ammonium phosphate) per 100 ft.² spread evenly over the soil. Also, 3 to 5 lb. of soil sulfur/100 ft.² may be added if water drainage is poor. All these materials should be plowed, roto-tilled or spaded into the top 10 to 12 inches of soil shortly before planting.

In preparing the seedbed, do not work the soil when it is too wet. Wait for it to dry sufficiently so it crumbles in your hands. Level the area by raking. Then make raised beds if using furrow irrigation (*See Figure A*). Top dress planted area with a three inch layer of organic mulch after seedlings emerge or after transplanting (*See Step 8*). Organic mulch will cool the soil which can retard growth at the higher elevations in Arizona.

When growing vegetables in close quarters or where good soil is not available, an artificial soil can be used. If the soil doesn't drain well consider using raised beds filled with ½ garden soil and ½ artificial soil mix, coarse sand, perlite or vermiculite. (*see Figure B*).

During the growing season fertilizers may be needed. Applying bands of fertilizer, usually only nitrogen, is called "side-dressing." Apply ½ lb./100 feet of row of 21-0-0 or equivalent fertilizer, three inches deep and about four inches to the side of the plants. Alternatively, spread nitrogen fertilizer on the soil surface about 4 inches from the plant and water it in. However, too much fertilizer too close to the plant may injure plant roots. Examples of side-dressing timing are: tomatoes—after the first clusters of tomatoes form; sweet corn—when plants are "knee high" and again when they tassel and cucumbers, melons and squash when they begin to produce runners.

Step 6

Plant your vegetables properly

Most vegetables are started from seeds or transplants. Seed can be sown directly into the garden soil, while transplants are started elsewhere and later planted into the garden. Harvest can be obtained sooner with transplants; however, it is more expensive and certain plants do not transplant well. Generally, beans, beets, carrots, cucumbers, lettuce, muskmelons, onions, peas, pumpkin, radish, spinach, squash, sweet corn and watermelon are started in the garden from seed. Vegetables like asparagus, broccoli, cabbage, cauliflower, eggplant, peppers, sweet potatoes and tomatoes are generally transplanted, but care needs to be taken to minimize root drying and injury.

A few simple rules need to be followed in seeding:

- Mark out straight rows to make the garden attractive and to make cultivation, insect control and harvesting easier. To mark a row, drive two stakes into the ground at each end of the garden and draw a string tightly between them. Shallow furrows, suitable for small seed, can be made by drawing a hoe handle along the line indicated by the string. For deeper furrows, use the corner of the hoe blade. Use correct spacing between rows.
- Space seeds properly in the row. The number of seeds to sow per foot or hill (more than one seed/hole) is suggested on seed packages or in reference materials. Space the seeds uniformly. Sometimes small seeds can be handled better if they are mixed with dry, pulverized soil or sand and then spread. To aid in spacing seed spread on one layer of toilet paper placed on the soil. The contrast of the white toilet paper will aid in seeing seed spacing. Cover the paper and the seed at the same time.
- Plant at the proper depth. A general rule to follow is to place the seed at a depth about four times the diameter of the seed. Cover small seeds such as carrots and lettuce with no more than $\frac{1}{4}$ to $\frac{1}{2}$ inch of soil. Place large seeds such as corn, beans and peas 1 to 2 inches deep. In sandy soils seed can be planted somewhat deeper.
- Cover seeds and firm the soil over them by gently tamping the soil by hand or the flat back of a hoe. This prevents rain or sprinkler water from washing away the seeds.
- Irrigate by sprinkling the soil surface lightly. When using furrow irrigation, hold water until moisture moves across seed row. Seeds need moisture to germinate. Water often enough to prevent crusting and drying around the seed. After plants emerge, water less often but deeper.
- Thin plants to the desired number as soon as possible. Remove weaker plants. Scissors can aid in thinning by cutting out young plants. Do not wait too long before thinning or injury will result from crowding and disturbing the remaining plants.

When transplanting follow these directions:

- Transplants need to be hardened off when first taken outside. Before planting take several days to gradually introduce them to the full sun, cool nights and wind.
- Transplant on a cloudy day or in the evening.
- Handle plants with care. About an hour before transplanting thoroughly water plants and soil in the containers (pots, bands, flats). Carefully remove plants from their containers, disturbing the roots as little as possible. Try to keep the "soil ball" around the roots. Keep roots moist at all times when they are out of the soil. If roots are "pot bound" tease them out before planting.
- Dig a hole large enough so that the transplanted plant sets slightly deeper than it grew in the container.
- Use a start solution to get plants off to a faster start. Starter fertilizer is a soluble fertilizer high in phosphorous like 10-52-17 or 10-50-10 mixture. Mix fertilizer with water following the label directions. After plants are set in the soil, pour about 1 cup of solution around the roots of each plant. When peat or fiber pots are set in the soil add enough water to soften pot. Also, break off any excessive pot material so it is below the garden soil level to prevent water wicking. Remove any plastic or wooden bands from around roots.
- Cover the roots with soil and firm the soil around the plant.
- Protect plants for a few days from sun, wind or cold if necessary.

Step 7

Irrigate with care

Irrigation is necessary for all garden crops in Arizona because of limited and uncertain rainfall. Water enough to keep the soil moist (not wet) in the root zone of the plant throughout the growing season. Excessive fluctuations of soil moisture adversely affect plant growth and quality. Regular applications of water need to be made to prevent the soil from becoming too dry (see Figure C).

Proper watering can be accomplished by observing the plant and soil. Do not allow the plant to become stressed, wilted or slow-growing. On the other hand, too much water, especially on heavy soils, will exclude air from the

root zone, resulting in poor growth. When the soil becomes crumbly upon squeezing, it's time to irrigate. Moisture is needed around the seed for sprouting. Frequent watering will be needed to keep the soil adequately moist and prevent crusting of the surface. A three inch layer of organic mulch will help prevent evaporation. Do not place mulch on top of seedlings or transplants, but around them.

As the plant grows, the watering period should be longer, allowing deeper penetration through the root zone. Determine the moisture depth with a spade or by probing with a stick, trowel or iron rod. Most vegetables are shallow-

rooted and use water from the upper 12 to 24 inches of soil.

Frequency of watering depends on many things. A large plant needs more water than a small plant. A shallow-rooted vegetable (cabbage, onion, lettuce, corn) needs to be irrigated more often than a deep-rooted vegetable (asparagus, tomato, watermelon). Coarse textured soils (sandy loams) need to be irrigated more often than fine-textured (clay or silt loams). Plants need to be watered more often during hot periods than cool periods. In an average situation during warm weather, a good soaking of the soil every 5 to 7 days should give satisfactory results with established plants when using flood or sprinkler irrigation. More frequent watering will be required when using a drip system.

The following irrigation methods are commonly used: furrow, sprinkler, soaker hoses and drip (trickle). The furrow method delivers water alongside the plant row. Water should be kept in the furrow long enough for moisture to completely

infiltrate the soil of the root zone. Garden sprinklers apply water on both plants and soil and should not be used if the water is salty. Drip or trickle emitter systems and soaker hoses apply water through a hose which lies beside the crop row. All these methods have a place in Arizona gardens. Traditionally, a raised bed with two rows is used with furrow irrigation, while a flat bed with no furrows is normally used with the other methods. If a watering method moistens the plant foliage irrigate in the morning so plants have time to dry during the day. This will lessen disease problems. Night time watering encourages disease growth. Drip can reduce weed problems.

Plants growing in containers should be watched more closely for water needs because the roots are more crowded and temperatures of root media are more extreme. Keep soil moist but do not over-water. Make holes on the side and/or the bottom of the container for drainage and air.

Step 8

Mulch & cultivate to control weeds

Weeds compete with vegetables for water, nutrients and light. Weeds often harbor insects and diseases. Two important ways to keep down the weeds in and around your garden are mulching and cultivation. If proper attention is given to controlling weeds when small, time and effort can be saved. Small weeds are easier to control than large ones. When weeds are allowed to get large they can cause many headaches and backaches, and retard plant growth.

Mulching is covering the soil around your vegetables with a protective material. Besides controlling weeds, the mulch will conserve moisture, regulate the soil temperature and keep the vegetables cleaner. With mulch very little cultivation is needed to control weeds. Mulch materials include leaves, straw, sawdust, wood chips, cardboard, newspaper, shredded paper, old carpet, and paper and plastic sheeting.

On established plantings, materials are spread around the plants. With paper or plastic sheeting the material is rolled out on the prepared seedbed and anchored on the edges with soil. Seeds and transplants are planted through holes at the desired spacings. Water can be applied from the side through furrow irrigation or by a trickle/drip tube or soaker hose under the mulch.

Cultivate with a sharp hoe or cultivator just as the weeds begin to sprout. Scrape and loosen the total soil surface around the plants without going too deep, which would cut or damage shallow roots of the vegetable plants. Cultivation will also help aerate the soil and can be used to mix a side-dressing of nitrogen fertilizer into the soil.

Chemical herbicides for weed control are not generally recommended for use in home gardens.

Step 9

Be prepared for pests and problems

Problems of the garden can be minimized by being prepared for them. Learn about the insects and diseases that commonly occur in the area and learn control methods. Whenever possible select disease resistant varieties. Soil problems can be reduced if the steps mentioned earlier are followed; however, crop injury from salt can appear if proper management has not been followed. Avoid planting vegetables from the same family in the same spot year after year. This practice is referred to as "crop rotation".

At the lower elevations in Arizona high temperature and shallow watering often cause problems especially when plantings are made too late in the spring or too early in the fall. Also, as temperatures increase more pest problems will occur, be prepared for them. Learn as much as possible from books, bulletins and professionals. Experience is the best teacher on how to handle these problems. Recording treatments in a gardening notebook will be helpful in the future when they occur again.

Step 10

Harvest at peak quality

The job is not done until top quality vegetables are harvested from the garden. When the "fruits" of your labor are tasted, then it will be worth all the effort.

Most vegetables are at peak quality for only a short period of time and should be harvested. Learn to tell the proper time to harvest each crop. Immature vegetables will not improve after harvest and over-mature vegetables will be tough and lack the desired taste and texture.

To maintain quality after harvest, handle vegetables carefully. Cool and store vegetables like asparagus, broccoli, leafy crops, peas and sweet corn below 40° F.; tomatoes, peppers, cucumbers and eggplant around 55° F. Remove "field heat" as soon as possible, unless they are eaten immediately.

Garden vegetables offer you a variety of experiences and flavors throughout the year. Enjoy them both.