



University of California
Agriculture and Natural Resources



GARDEN OF THE SUN

PLANT A ROW

Home Vegetable Gardening in the Central Valley

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The Basic Rules of Vegetable Gardening

Vegetables can be grown in containers, home yards, community garden lots, or large ranch areas. Without careful planning, you may not plant enough, or your garden will be too large and difficult to maintain, and too much of your produce will be wasted. It is important to plan, giving consideration to the following basic rules.

- Plant only as large a garden as you can easily maintain. Be careful to not exceed your skill level or the time commitment you have set, especially when first beginning to vegetable garden. Have a plan for weed and pest control and for regular irrigation, before you begin.
- Plan your garden on paper before you begin.
- Grow crops that produce the maximum amount of food in the amount of space available. If space is limited, plant bush, dwarf or other compact varieties.
- Plant during the correct season for the crop you plan to grow. Choose varieties recommended for our valley. See the variety guide for details.
- Select a site that receives at least 8 hours of full sun each day. It should be relatively level, well-drained and close to a water source. Avoid locations that are shaded for long portions of the day.
- Prepare the soil properly and amend. Just prior to planting, apply a starter fertilizer of 0-10-10 at a rate of 1-2 pounds per 100 square feet. As plants begin to grow, fertilize lightly with a nitrogen type fertilizer every 3-4 weeks.
- Harvest vegetables at their proper stage of maturity. Store them promptly if they are not being immediately consumed.

Cool and Warm Season Vegetable Crops

Cool-season vegetables grow best and produce the best quality crops when average temperatures are 55° to 75°F, and they usually will tolerate a slight frost once established. The food value of cool-season vegetables is typically higher per pound and per square foot than warm-season vegetables because the edible parts of the plant are the vegetative parts – such as roots, stems, leaves, or immature flower parts, rather than the fruits.

Examples:

Root: beets, carrots, parsnips, radish, turnip

Stem: asparagus, white potato, kohlrabi

Leaf: cabbage, celery, lettuce, onion, spinach, kale

Immature flower parts: broccoli, cauliflower, globe artichoke

Warm-season vegetables require long, hot days and warm soil to mature. They grow best and produce the best quality crop when average temperatures are 65° to 95°F and are intolerant of prolonged freezing temperatures. The food value of warm-season vegetables is usually lower per pound than cool season crops because we consume the fruit of the plant. Many warm-season vegetables are really immature or mature fruits.

Examples:

Mature fruit: cantaloupe, winter squash, tomato, watermelon

Immature fruit: sweet corn, snap and lima beans, summer squash

Seeds and Plants

You can grow many vegetables from seeds but you can also purchase young plants from the nursery, called transplants. Nursery plants are grown from seed under sheltered conditions and are started earlier in the season than you could safely plant seed outdoors. The most common vegetables grown from transplants include broccoli, celery, cabbage, cauliflower, brussels sprouts, eggplant, tomatoes, peppers and onions. You can grow your own transplants from seed but it is important to pay attention to proper germination temperatures for success. If the soil temperature is too cold or too warm, the seed will not germinate properly. Buy fresh seed

from a nursery or catalog source. Some seed such as corn, pea, parsley and parsnip, lose viability after about a year. Seeds of other vegetables are good for 3 years or more. To store seeds, keep them in a cool, dry place – not in a hot garage or in the freezer! A mason jar with ringed lids works well for seed storage.

Fertilizers

Vegetables typically require some fertilizer for best growth. Most plants will especially require additional nitrogen. You can use organic forms of fertilizer (manure, composts) or inorganic forms (chemicals).

If you use manure, it must be applied several weeks or even months before planting and worked well into the soil. Add about 1 pound of dry steer or dairy manure per square foot of soil surface. If you use poultry manure, use it more sparingly (about 1 pound to 4 to 5 square feet). If there is straw, shavings or sawdust in the manure, you will need to apply additional commercial nitrogen fertilizer.

Commercial fertilizers are available in a wide variety of compounds and concentrations. Suitable nitrogen fertilizers include alfalfa meal, cottonseed meal, ammonium nitrate, ammonium sulphate, calcium nitrate and urea. Limit application of these materials to ½ to 1 pound per 100 square feet when used. Other fertilizers such as 5-10-5, 5-10-10, 8-16-16, or 12-12-12 are also commonly used. Apply 1 to 2 pounds per 100 square feet. Water all fertilizers in well after application. Once plants are well established and 3-4 inches high, side-dress at a similar rate as done before planting, with nitrogen fertilizer just outside the root zone so as to not burn the plants. Always water well after application.

Irrigation

Vegetable gardens in the Central Valley require regular water during the spring, summer and fall and even in the winter if winter rains are inadequate. The amount and timing of irrigation is difficult to predict but generally, it is best to adjust irrigation to meet the needs of shallow rooted crops. If their water needs are met, the medium and deep rooted crops automatically get enough water. The same rule applies where the soil is shallow due to hardpan or claypan, e.g. when only 1-2 feet of soil is available for root growth. Shallow-rooted crops are those whose main root system is in the top 1-2 feet of soil. Examples are cabbage, cauliflower, lettuce, celery, sweet corn, onion, white potato and radish. Moderately deep-rooted crops are those that have the main root system in the top 1-4 feet of soil and include crops such as snap bean, carrot, cucumber, eggplant, peas, pepper and summer squash. Deep-rooted crops have their roots in the top 1-6 feet of soil and include asparagus, globe artichoke, cantaloupe, pumpkin, tomato and watermelon.

Irrigate your garden about one or two times per week in the summer. Wet the soil to a depth of at least 18 inches at each watering. If you keep only the surface of the soil moist, most of the water evaporates into the air and is lost to the roots. You can use a sprinkler, flood, furrow (beds should be raised 5-6 inches high), drip or use soaker hoses to irrigate. Advantages of drip: water is applied only at the root zone at a slow rate with little or no waste. Disadvantage: startup cost and monitoring for occasional plugged drip orifices.

Weeds

Weeds can destroy the joy of vegetable gardening. Weeds adversely affect crop growth by competing for nutrients, water and sunlight. The key is to prevent weeds from getting well established. One way to reduce weeds is to ready the garden beds for planting. Irrigate the area well and pre-germinate the weed seeds near the soil surface. Remove the weeds seedlings and then plant your vegetables. Frequent cultivation before weeds go to seed also reduces future weed problems. Herbicides, both pre- and post-emergence types, should be avoided in the vegetable garden.

Using mulches is a very efficient means of weed control with the added benefit of conserving moisture and moderating soil temperature. The mulch must be applied 2-4 inches thick to reduce weed germination. Organic mulches include weathered sawdust, straw, and lawn clippings. Other materials such as weed-block fabric, newspaper, old carpet, and black plastic can be used successfully as a mulch, but do not offer the soil conditioning potential of organic mulches.

Thinning

Overcrowding plants doesn't increase plant production. Yield is reduced because of competition for water, nutrients and sunlight. Thin small plants of root crops, salad crops, and those grown for early greens--at the second or third true leaf stage. Thin beets and carrots so the plants are 2 inches apart in the row. Radishes should be thinned to 1 inch apart and head lettuce to 12 inches apart. Cutting the unwanted plants off at ground level with scissors is an effective way to thin without disturbing the remaining plant roots.

Integrated Pest Management in Vegetable Gardens

Integrated Pest Management (IPM) of a vegetable garden uses environmentally sound, yet effective, strategies that focus on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target pest. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

Some of the key methods of IPM include:

- Planting pest resistant plants or well adapted plant varieties
- Discouraging pests by the way you design, irrigate, fertilize, and manage your garden
- Altering the garden or home environment to deprive pests of food, water, and shelter; or keeping pests out of the home and garden by using barriers, screens, and caulking
- Squashing, trapping, washing off, or pruning out pests
- Relying on good bugs in your garden to eat pests, thereby eliminating the need for insecticides that may end up in our waterways
- Reducing pesticide impacts on the environment

Most gardens contain far more types of good bugs or beneficial insects than pest insects. Beneficial insects and other organisms that kill pest insects are called natural enemies. In any pest management program, it is important to encourage these natural enemies by avoiding pesticides that kill them. You can also encourage beneficial insects by choosing plants that provide them with pollen, nectar and shelter and by keeping ants out of plants and garden areas. Learn to identify good bugs in both their adult and immature stages.

Common good bugs found in California:

- Lady Beetles: both adults and larvae consume aphids
- Lacewing: larvae feed on many insect pests; adults are often seen around lights
- Syrphid Flies: larvae consume aphids around flowers
- Parasitic Mini-wasp: many species of tiny wasps lay their eggs in pests like aphids or caterpillars; their hatching larvae consume the pest and kill it
- Spiders: all spiders feed on insects or other arthropods and are beneficial in the garden

Major Pest Problems of Home Vegetable Gardens

Snails and slugs are among the most troublesome garden pests. They like moist conditions and shelter from sunlight. They feed at night on decaying matter and do most damage on young seedlings and soft, tender leafy vegetative plant parts and fruit.

Management: Remove daytime hiding places and remove snails from permanent structure hiding places. Regular handpicking at night and in early morning can be effective. Place traps in your garden and dispose of trapped snails daily. Erect a copper foil barrier around the vegetable beds. Reduce moist surfaces as much as possible. Snail baits can be effective if used in conjunction with other cultural practices. Use iron phosphate baits instead of metaldehyde, which is toxic to dogs. <http://www.ipm.ucdavis.edu/PDF/QT/qtsnailsslugs.pdf>

Aphid damage includes honeydew, leaf curling, death of young seedlings, and transmission of mosaic virus to cucurbits.

Management: Moderate levels can be tolerated in most cases. Most aphids are major problems for only 4 to 8 weeks a year and die back in the heat of summer. Aphids like lush new growth, so take care not to over fertilize. Control ants that protect aphids from natural enemies that are common in unsprayed yards. Aphids' natural enemies include adult and larvae lady beetles, lacewings, syrphid fly larvae, soldier beetles and parasitic wasps. Select plant species or varieties that are aphid resistant. Use least toxic methods first such as knocking aphid populations off plants by shaking or spraying with a strong stream of water. Insecticidal soap or insecticidal oil sprays may be used and are less toxic to natural enemies. Synthetic broad-range insecticides should be avoided in most cases as they kill natural enemies and are usually unnecessary. Avoid systemic chemicals often suggested for aphids. They are much more toxic and might kill honey bees and parasites on flowering plants. <http://www.ipm.ucdavis.edu/PDF/QT/qtaphids.pdf>

Leaf or bud feeding caterpillars chew medium to large holes in leaves, and remove or distort buds. Look for caterpillars or their feces around or below injured leaves or buds. Look for egg masses also.

Management: On small plants, caterpillars can sometimes be hand picked. Caterpillars have many natural enemies including parasitic wasps, lacewings, assassin bugs, spiders, big-eyed bugs, damsel bugs, and predatory ground beetles.

The microbial insecticide, *Bacillus thuringiensis* (Bt), kills most leaf feeding caterpillars. It is best applied when caterpillars are small. Caterpillars must eat treated leaves in order to ingest the bacteria; good coverage is important. <http://www.ipm.ucdavis.edu/PDF/QT/qtlfcaterpillars.pdf>

Stinkbugs and Harlequin bugs are common among vegetable gardens. Damage from feeding by Harlequin bugs is manifested in yellow or white blotches. A heavy infestation can cause plants to wilt, turn brown and die.

Management: Good weed management and sanitation is important when controlling stinkbugs. Many weeds harbor the pests. Hand picking can be done in small gardens and be effective. Check underside of leaves for developing populations and egg masses.

Squash bugs are common in cucurbit crops such as squash and pumpkins. Eggs are bronze, elliptical shaped and laid in groups. Leaves fed on by squash bugs first develop small specks, and eventually turn brown to black and crisp. Small plants may be killed.

Management: Good sanitation after each crop is important. Hand pick adult bugs or nymphs and destroy eggs in the spring and early summer. Trap bugs under boards near plants at night and destroy them in the morning. Garden insecticides are not very effective, especially on larger bugs. Insecticidal soap or neem oil may control the smallest nymphs.

Leafhoppers have piercing sucking mouthparts and suck plant juices from green parts of plants, resulting in white stippling, tip burn, drying of leaves, and a diamond-shape yellowing from the leaf tip can be caused by some species. Leafhoppers can transmit viruses to some vegetables.

Management: They are not easy to control due to mobility and abundance. Low to moderate populations of leafhoppers can be tolerated in most home garden situations. Leafhoppers have many natural enemies.

Using Pesticides

- Use pesticides only when non-chemical controls fail to provide adequate control of pests or when pest populations begin to cause unacceptable losses.
- Use pesticides in combination with the methods described above and apply at the correct time. The pest must be present and in a vulnerable life stage for the pesticide to be effective.
- Choose pesticides carefully so the least toxic most effective material is used to protect human health and the environment

The Least Toxic Pesticides to use in the vegetable garden include the following:

- Insecticidal Soap (Safer Soap)
- Summer Weight Oil (Sunspray or Safe-T-Cide)
- Pyrethrin (Bug Buster-O, a natural pyrethrin)
- Esfenvalerate (Bug Buster, a synthetic pyrethroid)
- *Baccillus thuringiensis* (Caterpillar Clobber, Worm Ender, Dipel, BT)

Broad spectrum insecticides are not selective and may be even more toxic to natural enemies than to the pest itself. Or it can have an impact on a wide range of pests and natural enemies. Examples include organophosphates (malathion), carbamate (carbaryl-Sevin), and pyrethroids.

For more information about home garden pest and disease, look on-line at the following recommended web sites:

- Statewide Integrated Pest Management website- www.ipm.ucdavis.edu
- Agriculture and Natural Resources Catalog- <http://anrcatalog.ucdavis.edu>
- Information was taken from Publication #3332: Pests of the Garden and Small Farm (second edition) by Mary Louise Flint, UCCE Entomologist.

For contact information for UCCE Master Gardeners Fresno County, visit online:

<http://ucanr.org/sites/mgfresno/>

Suggested Varieties for Summer/Spring Crops (Planting Periods):

Beans, Lima (May-June)

Fordhook 242 Bush
Henderson's Bush (Pole type)
Dixie Butterpe
Baby Fordhook Bush)

Beans (Snap-Bush)

Contender
Harvester
Roman
Tendercrop

Beans (Snap-Pole)

Fortex
Emerite
Kentucky Wonder

Romano

Kwintus

Cantaloupes/other melons (April-June)

Samson
Ambrosia
Saticoy Hybrid
Topmark
Bush star
Honeybush
Crenshaw
Casaba
Galia
Rocky Sweet
Honeydew
Tam dew
Fruit Punch
Limelight

Chayote (April-May)

Corn, Sweet (March-July)

Golden Cross Bantam (yellow)
Jubilee
Butter and Sugar (bicolor)
Silver Queen (white)
Sugary-enhanced
How Sweet It Is (white)
Breeder's Choice (light yellow)
Kandy Korn (yellow)
Concord (bi-color)
Super Sweet
Early Xtra Sweet (yellow)
Ivory 'n Gold (bicolor)
Butterfruit (yellow)
Sweetie (yellow)

Supersweet Jubilee (yellow)

Cucumbers (April-June)

Pickling

Liberty Hybrid
Saldin
Picklebush
Pot Luck (container)

Slicing

Dasher II
Sweet Success
Sweet Slice
Burpee Hybrid
Bush Champion (container)
Parks Bush Whopper
Sapcemaster

Eggplant (April-June)

Black Beauty
Epic
Early Bird
Dusky
Imperial
Rosa Bianca
Oriental type
Ichaban
Tycoon

Okra (May)

Clemson Spineless Bondy

Peppers (March-May)

Hot

Tam Mild Jalapeno
Anaheim
Cayenne Long Red Slim
Hungarian Yellow Wax
Serrano Chili Pepper

Sweet Bell

Bell Boy
California Wonder
Yolo Wonder
Keystone Resistant Giant
Jupiter
Golden Summer Hybrid
Golden Bell

Peppers (March-May)

Sweet Yellow
 Sweet Banana
 Gypsy
 Hy-Fry
 Cubanene
 Nardello
 Corni de Toro

Potatoes, Sweet (April-June)

Dry-fleshed (yellow)
 Jersey
 Moist-fleshed (yams)
 Garnet
 Jewel

Pumpkins (April-June)

Spirit
 Autumn Gold
 Jack O'Lantern
 Big Max
 Bushkin
 Cinderella

Squash, Summer (March-June)

Scallop (Patty pan)
 Peter Pan Hybrid
 Sunburst
 Scallopini
 Yellow
 Early Prolific Straightneck
 Early Golden Summer Crookneck

Squash, Winter (March-June)

Acorn
 Table King
 Table Ace
 Jersey Golden
 Sweet Mama
 Butternut
 Waltham
 Early Butternut
 Burpee Butterbush

Tomatoes (March-June)

Many

Watermelons (March-June)

Bush Vine
 Garden baby
 Bush Charleston Gray
 Bush Sugar baby
 Large vine
 Calsweet
 Crimson Sweet
 Sugar Baby
 Sweet Baby
 Prince Charles
 Seedless
 Triple sweet Hybrid
 Tri X-313 Hybrid
 Firecracker
 Yellow Fleshed Fruit
 Yellow Baby
 Yellow Doll

Zucchini

Aristocrat
 Greyzini
 Ambassador
 Gold Rush
 Burpee Fordhook

Varieties listed are adapted from "The Master Gardener Handbook", 2002, Division of Agriculture and Natural Resources, University of California.

Suggested Varieties for Fall/Winter Crops (Planting Period)

Snap Bean (August, September)

Bush: Contender, Harvester,
Roman, Tendercrop
Pole: Kentucky Wonder, Romano,
Scarlet Runner
Beets: (February, March): Ruby
Queen, Detroit Dark Red,
Little Ball, Early Wonder,
Burpee's Golden Beet

Broccoli (July, August)

Green Comet, Premium Crop,
Green Goliath, Duke, Green
Valiant, Emperor, Packman

Brussels sprouts (July, August)

Jade Cross, Long Island Improved,
Prince Marvel

Cabbage (July)

Early: Stonehead, Early Jersey
Wakefield, Golden Acre
Late: Premium Flat Dutch, Danish
Roundhead
Red: Ruby Ball Hybrid, Red
Head
Savoy Savoy Ace, Savoy King

Chinese cabbage (August, September)

Jade Pagoda, Michili
Chinese-Napa: China Pride
Pak Choi: Lei Choi, Joi Choi

Carrot (August, September)

Baby: Short n' Sweet, Little
Finger, Lady Finger, Amsterdam
Elevated Vitamin A: A-Plus
Hybrid, Vitasweet group
Long Tapered: (for deep soil):
Gold Pak 28, Emperor, and
Danvers Medium Long: Nantes,
Chantenay, and Danvers-half long

Cauliflower (July, August)

Snow King, Snowball "Y", Snow
Crown

Celery (July, August)

Giant Pasca. Tall Utah 52-70

Chard (July, August, September)

Fordhook Giant, Lucullus, Rhubarb
Chard, Ruby

Chives (February and March)

(No named varieties available)

Endive (August, September)

Full Heart Batavian, Large Green
Curled

Fennel (August)

Florence

Garlic (October-December)

California Late, California Early

Kale (August, September)

Vates Dwarf Blue Curled, Salad
Savoy, Ornamental

Kohlrabi (August, September)

Grand Duke, Early White Vienna,
Purple Vienna

Leek (January-April)

Large American Flag, Electra, Titan

Lettuce (August, September)

Butterhead: Buttercrunch, Dark
Green Boston, Summer Bibb
Romaine: Parris Island, Valmaine
Iceberg: (difficult to grow and not
recommended for the home garden)
Loose Leaf: Salad Bowl, Oak
Leaf, Green Ice, Red Sails, Ruby

Onion (bulb) Plant early varieties from November – January for late spring or summer harvest

Grano (red or white), Granes (red or
white), California Early Red
Plant late varieties from January –
March for late summer or fall
harvest

Onion

Fiesta, Yellow Sweet Spanish,
White Sweet Spanish, Southport
Globe (red or white), Stockton
Yellow Globe

Pea (September – January)

China, snow or sugar: Dwarf Grey
Sugar, Mammoth Melting Sugar
Green Garden: Freezonian, Green
Arrow, Maestro
Snap: Sugar Ann (dwarf), Sweet
Snap (semi-dwarf), Sugar Rae
(dwarf), and Sugar Daddy
(stringless, dwarf), Sugar Snap

White Potatoes (January – March)

White Rose, Kennebec, Chieftain,
Norgold Russet, Red Lasoda, and
many other varieties (fingerling,
blue, gold, etc.)

Radish (September – April)

Cherry Belle, Champion, Scarlet
Knight White: April Cross, Icicle,
Snowbelle

Rutabaga (December – February)

American Purple Top

Spinach (September – January)

Melody Hybrid, America

Turnip (August)

Purple Top, White Globe, Seven
Top (greens), All Top Hybrid

Varieties listed are adapted from “The Master Gardener Handbook”, 2002, Division of Agriculture and Natural Resources, University of California.

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<http://ucanr.edu/sites/mgfresno/files/164283.pdf>**

