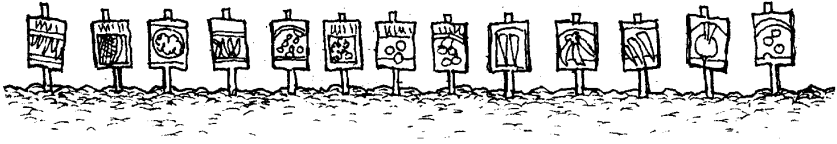


# Planning a Vegetable Garden





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## Taste the difference

**Home** vegetable gardening is a popular pastime for many reasons. Some of us garden for mental relaxation and exercise; Many want to save money or prefer the improved flavor of home grown produce, and some want to simply grow unusual cultivars, which are unavailable at grocery stores. Whatever your reason is for gardening, this publication will help get your vegetable garden underway. Additional information on vegetable gardening can be found by referring to other publications listed at the end of this bulletin.

An early start is one key to a successful garden. Crops such as beets, onions, chard, carrots, lettuce, spinach, the cabbage family, radishes, peas, and turnips grow well in an early garden. Warm weather crops, such as corn, tomatoes, peppers, eggplant, beans, melons, and squash require all danger of frost to have past before seedling emergence or transplanting. Fall soil preparation of the garden will help you get a quicker spring start. A small, carefully-tended garden produces as much or more than a large neglected garden. Beginning vegetable gardeners are advised to start with a small garden spot, maybe 10 x 10 feet, using just a few different vegetables. A garden 30 x 30 feet is large enough for a family of four. If you plan to can, freeze, or dehydrate your produce, then plant a larger garden.

## Site selection

**The** size and location of your garden will often be determined by the area available to you. A small garden can be grown in containers on a patio if land is not available. To avoid soil diseases from building up, use new soil in pots and rotate vegetable families to other areas of the garden each year. If you have the opportunity to choose, select an area that will have as much sunlight as possible because most vegetables need 6 to 12 hours of full sunlight for bountiful production. Avoid low, wet areas that are slow to dry out and slow to warm up in the spring. Select a site not infested with tree roots or perennial weeds. If perennial weeds are present, eradicate them one year prior to beginning the garden.



## Soil preparation and fertilization

**To** prevent damaging soil structure, prepare your garden spot when the soil is not overly wet. To determine if the soil is dry enough to work, squeeze a handful of the soil into a tight ball and break it apart with your fingers. If the ball crumbles easily, it is safe to spade or rototill, but if the soil clings together like modeling clay and is sticky, it is too wet to work.

The best garden soil is a sandy loam, but rarely will you have a choice of soils. You'll just have to use what's available. Physical soil conditions and soil fertility improve with

annual applications of organic matter such as shredded leaves, compost, or livestock manure. The main benefit of adding organic matter is to improve the soil's drainage and workability and its nutrient and water holding capacity. Some types of organic matter are better than others. For example, uncomposted manure, straw, or hay may introduce new weeds to the garden.

Organic matter, incorporated in the fall, will have ample time to decay prior to spring planting. Apply manure at a rate of 30 to 40 pounds for each 100 square feet of garden. Work it into the top 8 to 12 inches of soil. If the garden is small, figure a cubic foot of manure to 100 square feet of garden. (Table 1 lists some figures to use for manure application.) Poultry manure is high in nitrogen. For this reason, reduce the amount used by half to prevent plant burns due to excess salts. If a tough, woody material like rotted sawdust or straw is incorporated, add a high nitrogen fertilizer such as ammonium sulfate (21-0-0) at the rate of 1 cup fertilizer for each bushel of sawdust added. No more than 2 to 4 inches of uncomposted organic matter should be added at any one time because nitrogen deficiency can result.

Gardens will grow without the use of commercial fertilizers if organic or green manures are added annually. (A green manure is a crop specifically grown to be rototilled into the soil while it is green and immature to help improve soil nutrients and structure.) Whether plant nutrients are added in the form of organic materials or as inorganic salts like those found in commercial fertilizer, plants can only absorb nutrient elements in an inorganic form. Consequently, organic materials must be broken down into inorganic elements by soil microbes before absorption by a plant can occur. (Microbes are beneficial soil fungi and bacteria.) Organic fertilizers are usually slow release materials with low analyses, and often it will take a larger amount of such materials to obtain the desired rate than when a high analysis commercial fertilizer is used. However, organic fertilizers help improve soil structure by adding beneficial organic material to the soil while commercial fertilizers do not. Table 1 lists some organic fertilizers with different analyses and the rates at which they should be used.

# Table 1. Organic fertilizers

Organic amendment	Primary benefit	Average analysis	Average application rate (per 100 sq. ft)
Alfalfa meal	Nitrogen	8-1-2	6 lb
Blood meal	Nitrogen	15-1-1	4 lb
Bonemeal	Phosphorus	3-20-0 (contains 24% calcium)	4 lb
Coffee grounds (1)	Nitrogen	2-0.3-1	NA
Compost (commercial)	Organic matter	1-1-1	270 lb
Compost (homemade)(2)	Organic matter	0.5-0.5-0.5 to 4-4-4	270 lb to 70 lb
Cottonseed meal	Nitrogen	7-2-1	8 lb
Eggshells (crushed)	Calcium	1-0.4-0.1 (contains calcium plus trace minerals)	2 lb
Epsom salts	Balancer; magnesium	10% magnesium; 13% sulfur	3 lb
Fish meal	Nitrogen; Phosphorus	10-6-0	4 lb
Horse manure (aged) (2)	Organic matter	1-0.2-1	130 lb
Peat moss	Organic matter	pH range 3.0-4.5	25 lb
Poultry manure (aged) (2)	Organic matter	4-3-2	50 lb
Rock phosphate	Phosphate	0-32-0 (contains calcium plus trace minerals)	6 lb
Sawdust (3)	Organic matter	0.2-0-0.2	150 lb

Organic amendment	Primary benefit	Average analysis	Average application rate (per 100 sq. ft)
Sheep manure (aged)	Organic matter	1-0.5-1	130 lb
Steer manure (aged) (2)	Organic matter	1-0.5-1	130 lb
Wood ashes (4)	Potash	0-1-7	1.5 lb

- 1) Acid forming; needs limestone supplement if used in large amounts.
- 2) Should be composted or applied in the fall. Composts and livestock manures vary widely in nutrient content. Consequently, analyses and amounts to apply are only estimates.
- 3) Be sure sawdust is well rotted. Additional nitrogen will be needed.
- 4) Alkaline: do not use if pH is above 7.



A fertilizer analysis (the three hyphenated numbers in Table 2) is shown on all fertilizer containers. The first number gives the percentage of nitrogen (N) in the package, the second, the percentage of available phosphorus (P) and the third, the percentage of water soluble potassium (K). A fertilizer analysis of 10-10-5 contains 10 pounds N, 10 pounds P and 5 pounds K per 100 pounds of fertilizer. A fertilizer analysis of 16-20-0 contains 16 pounds N, 20 pounds P, and no K per 100 pounds of fertilizer. Table 2 lists some inorganic fertilizers.

## Table 2. Inorganic fertilizers

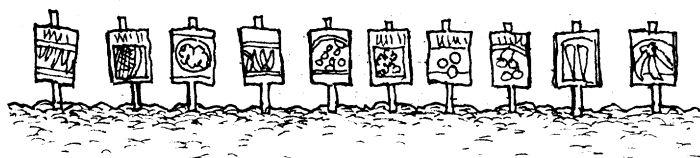
Fertilizer analysis N-P-K	lbs per 100 sq ft	Cups per 100 sq ft
2-3-2	10.0	20
4-10-10	5.0	10
6-10-4	3.4	6.6
8-10-8	2.4	5
10-10-5	2.0	4
11-55-0	2.0	4
12-12-5	1.6	3.3
13-13-13	1.5	3.3
15-10-0	1.2	2.6
16-20-0	1.2	2.6
20-16-0	1.0	2
21-0-0 (ammonium sulfate)	1.0	2
33-0-0 (ammonium nitrate)	0.6	1.25
46-0-0 (urea)	0.4	1

If you have a fertilizer showing an analysis not listed in the tables, follow the package directions or select the closest analysis with a similar nitrogen rate from the table and apply that recommended rate. For example, a 10-10-5 analysis recommends applying 4 cups per 100 square feet. A 10-10-10 fertilizer would use that same recommended rate. Check with your local University of Idaho Cooperative Extension Educator to determine requirements for phosphorus, potas-



sium, and micronutrients in your particular area. Have your soil tested to determine your soil's fertility and fertility potential. For a more complete review of soil fertility in Idaho gardens, refer to University of Idaho CIS 922, "Fertilizing Gardens."

Fertilizer may be broadcast before seeding and tilled into the soil or it can be side-dressed (laid in a narrow band near the row). When side dressing, put the fertilizer 2 to 3 inches below the soil surface and 4 to 6 inches to one side of the seed row. Do not put fertilizer in direct contact with the seed, as it may kill the germinating plant.



## Garden layout

**How** you decide to design your garden is a matter of personal choice and convenience. Planting perennial vegetables such as asparagus, rhubarb, and horseradish to one side of the garden will keep them out of the way when rototilling. Put tall growing vegetables such as sweet corn, staked tomatoes, and pole beans on the north side of the garden to avoid shading low growing crops, unless shade is desired. Some gardeners like to plant early seeded, fast growing, quick maturing crops such as lettuce, radishes, spinach, and green onions in one area for easy harvest, while grouping long season crops such as sweet corn, tomatoes, squash, and cucumbers elsewhere.

Consider wide rows and raised beds as two methods of garden layout. Compared to single rows, wide rows are a more efficient use of space that leaves less area open to weeds. Wide rows may be 2 to 4 feet wide, whichever width works best with your arm length and irrigation method.

Raised beds are an excellent way to warm up clay soils more quickly in early spring and allow for better drainage.

Raised beds may range from 6 inches in height to 2 feet or more. The higher the bed, the less bending is required during garden maintenance. There are many ways to design your garden for fun and productivity.

## Intercropping (interplanting)

**For** more efficient use of space, try intercropping. Intercropping is the use of two or three crops in the same area often combining fast growing crops with slow maturing crops for maximum use of space. The fast maturing crop is harvested before the slow maturing crop shades the area or requires the space.

Examples of intercropping are growing green onions or leaf lettuce between tomatoes, growing spinach or radishes between corn or growing radishes between cabbages. Intercropping is one of the most important techniques that you can use to increase the productivity of your garden. It ensures that no space is left idle and makes the most efficient use of light, soil nutrients, and moisture. Also, by keeping a canopy over the soil at all times, weeds are reduced.

## Companion crops

**Companion** planting is defined as the interplanting of two or more crops that will benefit from being near each other. An example of a beneficial companion cropping arrangement is growing vegetables with certain herbs. Many herbs contain essential oils that can control insects. For example, crushed leaves of peppermint will repel the Colorado potato beetle. Marigolds, when planted around a garden's border, will repel nematodes. Books on the subject exist but much more research is needed to substantiate which combinations of plants are beneficial. Try some backyard research to see which ones work for you.

# Table 3. Sample garden plot (50' x 100')

Row Number and Width	Plants
1 • 4'	Asparagus, Rhubarb, 100 feet, 50 feet
2 • 1"	Onion sets, Spinach, Onions, Parsley
3 • 3'	Potatoes
4 • 3'	Potatoes
5 • 1'	Leaf lettuce, Turnips, Kohlrabi
6 • 1'	Peas (lettuce and snap beans late)
7 • 2'	Early cabbage, Late cabbage
8 • 2'	Carrots, Beets
9 • 1'	Parsnips planted with radishes, Swiss chard
10 • 3'	Early sweet corn, Mid season sweet corn, Late season sweet corn
11 • 3'	Early sweet corn, Mid season sweet corn, Late season sweet corn
12 • 3'	Early sweet corn, Mid season sweet corn, Late season sweet corn
13 • 1'	Snap beans
14 • 2'	Eggplant, Peppers, Bush lima beans
15 • 3'	Tomato plants, Cucumbers
16 • 6'	Watermelons, Muskmelon
17 • 6'	Summer squash, Winter squash

## Double cropping (succession cropping)

Many vegetable crops occupy garden space for only a couple months. In warmer areas of Idaho, the garden season can last up to seven months. Double cropping—like intercropping—is another valuable method of increasing garden productivity. It can double total potential yields from a given space and help keep weeds down. Double cropping is accomplished by planting an early frost-hardy vegetable that matures quickly. Following the harvest of that crop, the same space is planted with a frost-tender vegetable. For example, after harvesting lettuce, radishes, spinach, green onions, or similar vegetables, the same area may be used for growing warm season, frost tender vegetables such as tomatoes, cucumbers, peppers, eggplant, bush beans, and sweet corn. In a similar manner, cold-tolerant vegetables such as peas and spinach can be grown in the fall after warm season crops are harvested. This allows for a third crop using the same patch of ground.

## Seed sowing

After considering a design the next step is seed sowing. To get good crops in your garden, you will need three ingredients: viable (live) seeds, water, and the appropriate soil temperature for the crop. Some vegetable seeds can be saved from year to year, but may lose vigor if not stored correctly. (See CIS #813 “Collecting and Storing Seeds From Your Garden.”) Often it is easier to buy new seed each year and for some crops, like hybrid corn, it is a must. The seed package will have instructions on how deep to plant, but an easy rule of thumb to remember is to plant seeds at a depth 2 to 3 times their smallest diameter. The vegetable planting chart (Table 4) shows a range of planting depths for many vegetables. Use the shallower depth shown on the chart for heavy, clay soils, and the deeper depth for loose, sandy soils. Small seeds are planted very shallow and often need extra

## Table 4. Vegetable planting chart

Vegetable	Classification by resistance to frost	Weeks from seeding to transplanting	Depth to sow or plant (inches)	Days to maturity (will vary with location)	Planting distance (inches) in rows after thinning	Planting distance (inches) between rows
Asparagus	Hardy		crowns, 6 to 8	2 to 3yrs	12 to 18	36 to 48
Beans, lima	Very tender		1 to 2	65 to 88	6 to 8	24 to 30
Beans, snap	Tender		1 to 2	50 to 68	3 to 4	18 to 24
Beets	Half hardy		1/2 to 1	60 to 65	2 to 3	18 to 24
Broccoli	Hardy	4 to 6	transplants or 1/2	55 to 74	24	30 to 36
Brussels sprouts	Hardy	4 to 6	transplants or 1/2	90 to 95	18 to 24	24 to 30
Cabbage	Hardy	4 to 6	transplants or 1/2	63 to 100	15 to 24	24 to 30
Carrots	Half hardy		1/4 to 1/2	68 to 85	1 to 3	18 to 24
Cauliflower	Half hardy	4 to 6	transplants or 1/2	60 to 85	18 to 24	30 to 36
Celery	Very tender	10 to 12	transplants or 1/2	100 to 125	4 to 8	30 to 36
Chinese cabbage	Half hardy		1/2	70	10 to 12	24 to 36
Collards	Half hardy		1/2	75	6 to 8	24 to 30
Cucumbers	Very tender	4	1/2 to 1	50 to 72	12 to 24	48 to 72
Eggplant	Very tender	8 to 10	transplants	72 to 80	24 to 30	30 to 36
Endive	Half hardy		1/2	85 to 98	8 to 12	12 to 18

## Table 4. Vegetable planting chart (continued)

Vegetable	Classification by resistance to frost	Weeks from seeding to transplanting	Depth to sow or plant (inches)	Days to maturity (will vary with location)	Planting distance (inches) in rows after thinning	between rows
Garlic	Hardy		cloves, 2 roots, 2 to 3	115	3	12 to 18
Horseradish	Hardy			180 to 200	12	48
Kale	Hardy		1/2 to 1	55	8 to 15	18 to 24
Kohlrabi	Hardy	4 to 6	1 to 1 1/2	55	4 to 8	18 to 24
Leeks	Hardy		1/2	130	1 to 2	15 to 18
Lettuce (head)	Hardy	4 to 6	1/4 to 1/2	73	8 to 15	15 to 18
Lettuce (leaf)	Hardy		1/4 to 1/2	45 to 50	6 to 12	6 to 12
Muskmelon	Very tender	4	1 to 2	82 to 90	36 to 72	48 to 84
Mustard	Half hardy		1/2	35 to 45	1	18 to 24
Okra	Very tender		1/2	55 to 58	12 to 15	36
Onion (sets)	Hardy		1 to 2	90	2 to 3	12 to 18
Onion (seeds)	Hardy	4 to 6	1/2	105 to 130	2 to 3	12 to 18
Parsley	Hardy		1/4 to 1/2	75 to 85	6	12 to 18
Parsnips	Hardy		1/2	130	3 to 4	24
Peas	Hardy		1 to 2	62 to 69	2 to 3	18 to 24
Peppers	Very tender	8 to 10	transplants	62 to 80	14 to 18	18 to 24
Popcorn	Tender		2 to 2 1/2	90 to 120	10 to 12	30 to 36

<b>Vegetable</b>	<b>Classification by resistance to frost</b>	<b>Weeks from seeding to transplanting</b>	<b>Depth to sow or plant (inches)</b>	<b>Days to maturity (will vary with location)</b>	<b>Planting distance (inches) in rows after thinning</b>	<b>Planting distance (inches) between rows</b>
Potatoes	Half hardy	8 to 10	seed pieces,	100 to 120	10 to 12	24 to 36
Potatoes (sweet)	Very tender		4 plants	150	12 to 18	36 to 48
Pumpkins	Very tender		1/2	100 to 120	36 to 96	36 to 96
Radishes	Hardy		1/2	24 to 28	1 to 2	6 to 12
Rhubarb	Hardy		transplants	365	36 to 48	48
Salsify	Half hardy		1/2	120	3 to 4	15 to 18
Spinach	Hardy		1/2 to 1	46 to 70	4 to 6	12 to 18
Squash (summer)	Very tender		1 to 1 1/2	49 to 55	36 to 48	36 to 48
Squash (winter)	Very tender		1 to 1 1/2	85 to 110	48 to 60	60 to 72
Corn (sweet)	Tender		2 to 2 1/2	63 to 94	10 to 12	30 to 36
Swiss chard	Half hardy		1/2	60	6 to 8	18 to 24
Tomatoes	Tender	4 to 6	transplants	62 to 83	36 to 60	36 to 48
Turnips	Hardy		1 to 1 1/2	58 to 60	4 to 6	18 to 24
Watermelons	Very tender	4	1 to 2	88 to 90	72 to 96	72 to 96

Hardy – Plant as soon as ground can be worked, about 6 to 8 weeks before last killing frost.

Half hardy – Plant 2 to 4 weeks before last killing frost.

Tender – Not planted before last killing frost, plant about 10 days later.

Very tender – Plant when soil and weather are warm, 2 to 3 weeks after last killing frost.

water before emergence if it doesn't rain. Large seeded vegetables are planted deeper and may not need additional water until after emergence. Planting in rows helps you find the seedlings when they are small, but planting in beds maximizes space. Most people plant more seed than needed, and thin later to obtain the desired spacing after the seedlings emerge. This practice eliminates some of the risk associated with poor seed quality and unfavorable environmental conditions. (Thinning distances are also indicated in Table 4.)

To tell if your soil is ready for planting, squeeze a handful of soil into a ball. The soil ball should not be sticky or wet, and it should break apart when dropped onto a hard surface from a height of 4 inches. If the soil is too wet, wait a week and try again.

## Setting out plants

**You** can grow your own transplants indoors to save money or purchase them from a garden center or greenhouse to save time. Transplants must be set out at the proper time of year to avoid frost injury, otherwise invest in some form of frost protection such as plastic or gauze-like row covers, or wax paper hotcaps. Before transplanting, saturate the soil in the pots to prevent root injury and lessen transplant shock. Set transplants in the garden slightly deeper (about an inch) than they were growing in the flat or pot. Tomatoes can be set several inches deeper because roots will form along their stems. When transplanting tiny seedlings, hold the plant by the root ball or leaves to avoid pinching or damaging the stem. Containers should always be removed before planting to prevent root constriction. An exception might be when roots have grown into and out the sides of a thin peat con-



tainer. If this happens, tear the top of the container off to prevent wicking from the root ball. To avoid permanent stunting due to girdling roots, slice the root ball on 2 to 4 sides 1/4 to 1/2 inch into the ball. (Girdling roots take the shape of the pot.)

The best time to transplant is on a cloudy day or in late afternoon. In hot weather, shade the plants for a few days to prevent wilting. Try using cardboard or wide boards placed on the south and west sides of the plant. In windy weather you may want to cover the plants with hot caps to prevent damage.



## Weed control

Every time the soil is turned or stirred, new weed seeds are exposed, and a flush of weed growth occurs. Competition by weeds will reduce vegetable yields. One key to success in establishing a vegetable garden is getting the crop seedlings off to a good start ahead of the weeds. Plant your seeds as soon as you can after tilling. If you wait several days before planting, the weeds will have several days head start. If you must wait awhile after tilling to plant, cultivate the rows lightly with a hoe to kill any weeds that have emerged prior to sowing or planting.

Hoeing and mulching are two methods used for early season weed control in the home garden. Hand pulling may also be necessary to control early weed growth in a row or bed. If weeds are allowed to get large, you may accidentally injure or rip out the vegetable seedlings along with the weeds. To save time, vegetable seedlings can be thinned during this first weeding.

For vegetable species that occupy garden space for a long time, such as tomatoes, it is often easier to use a mulch instead of continuous hoeing and hand weeding. A mulch is a layer of some kind of organic material that acts as a protective barrier on top of the soil. Mulches can reduce erosion and water loss. They also prevent weed growth by covering the ground to reduce the amount of light that reaches the soil surface. This interferes with weed establishment. Organic mulches cushion soil from compaction and conserve water by reducing surface evaporation. They moderate soil temperatures and reduce disease by eliminating the splashing of soil up on to fruit. Apply a 2- to 4-inch thick layer of organic mulch, such as dried grass clippings, shredded leaves, or rotted sawdust. Organic mulches provide an extra benefit by adding nutrients and organic material for improved soil structures.

Solid sheet black plastic or fabric mulch can be used in vegetable gardens. They are laid down before planting, and anchored along the edges. Transplants or seeds are planted through holes sliced in the mulches. Plastic and fabric mulches can reduce weed growth but they will not add the other benefits derived from organic mulches. For more information on mulches and mulching, see University of Idaho Extension Current Information Series Bulletin #837 “Mulches for the Home Landscape and Garden.”

Aside from limited use of Roundup (glyphosate), herbicides are not practical after planting in the home vegetable garden because of plant injury. For more information on herbicides, and weed control refer to the PNW Weed Control Handbook (found in Cooperative Extension offices) or the University of Idaho Extension Bulletin #726 “Weed Control in the Home Garden.”



## Insect control

**Keep** yearly records on crop performance and pest problems that develop. If you had a problem last year with soil insects such as wireworms or root maggots, you may wish to apply an insecticide before or during planting. Rotating susceptible crops to another area of the garden may reduce or eliminate some pest problems. Once plants emerge, insects like flea beetles or cutworms can become a problem. Later in the season, aphid populations may develop and stunt plants. Insecticidal soap is a nontoxic control that works well on soft-bodied insects like aphids. Conventional insecticides are also available.

Cabbage butterflies on the cabbage family of crops produce caterpillar larvae that can decimate crop leaves. *Bacillus thuringiensis* (Bt) is an effective nontoxic control for caterpillars. Other insects common in gardens are squash bugs on squash and pumpkins, potato beetles on potatoes and eggplants, corn earworm on corn, and spider mites on most any crop.

Insect controls, both conventional and organic, are available for use on pests. Natural predators such as lady bugs, praying mantis, and lacewings can be introduced to control insects. Parasitic wasps are sometimes used to control caterpillars. Use of predatory insects is not a quick method of control. Large pest insects can be hand picked, small ones washed off with blasts of water, or insect eggs can be squashed on leaf surfaces to reduce pest populations in a small garden. If insect numbers increase rapidly, however, or the garden is too large, it may be necessary to use a quicker method of control. When insecticides are used, complete coverage of the plant, including the undersides of leaves, is

important for effective control. Both organic and synthetic materials are available.

Caution is important when handling any pesticide. Use the proper recommended material for only those crops and insects that appear on the insecticide label. Wear rubber gloves and rubber boots to apply pesticides. For the safety of yourself, your family, and the environment always follow label instructions carefully on mixing and application rates. For more information on insects and insecticide use, see University of Idaho Ext 740, "Insect Pest Management for the Home Garden."

## Perennial vegetables

**Perennial** vegetables live over the winter and come up every spring. They include asparagus, rhubarb, and horseradish. Perennials should be planted in garden areas where they won't interfere with spading or rototilling.

### Asparagus

Asparagus plantings are established by using either seeds or crowns. Space crowns 12 to 18 inches apart in rows that are 3 feet apart. Dig a trench 18 inches wide and 6 to 8 inches deep. Set the star-shaped crowns by spreading over a mound of soil. Add about 2 inches of soil and then water to settle the soil. After the plants have grown through this soil by several inches, add a couple more inches of soil. When the shoots have grown through this, cover with the remainder of the soil. Don't be too quick to fill in the soil over the summer, but by fall the trench should be filled.

Asparagus should not be harvested during the first two seasons. When harvest is delayed until the crowns are well developed, the plants remain more productive over a longer period. Harvest spears the third season, but only cut spears for about 3 weeks. You can cut for 6 to 8 weeks during the fourth and subsequent seasons. After harvesting, allow the fern growth to develop to build up the crowns for a good crop the following season. An asparagus patch can last 15 years or more.

## Horseradish

Horseradish is grown for its tangy roots. To produce strong, well-shaped roots, a deep well-drained soil is desirable. Horseradish has large spreading leaves and is difficult to eradicate once planted. Pick your garden planting spot carefully with this in mind. Planting along the edge of the garden or in an isolated patch might be wiser than planting in the middle. A small patch will be sufficient for even a large family.

Use pieces of 4 to 6 inches long roots that are the thickness of a lead pencil. When planting, place the roots at an angle with their tops or larger end 2 to 3 inches below the soil surface. Good roots will be produced the first year. Dig the roots in the late fall and grate them. Enough roots are usually left in the soil to preserve the patch, which can live for many years. Use white wine vinegar to preserve the grated roots; this prevents them from losing their fresh white color.

## Rhubarb

Rhubarb does well anywhere in Idaho. A few plants on the edge of the garden will produce enough for most families. This plant produces best in a deep, well-drained, fertile soil. The fall before planting, spade in generous quantities of well-rotted manure to a depth of a foot or more.

Dividing the crowns is the best method of rhubarb propagation. Place plants 3 to 4 feet apart. Plant the crown with its top just at the soil surface. Established rhubarb beds should be divided every 5 to 9 years or when production of numerous small stalks indicates crowding.

Harvest by pulling out the red stems and twisting off the leaves. Place the leaves next to the plant to shade the ground and prevent weed growth. Eat only the red stems because rhubarb leaves are poisonous containing high levels of oxalic acid.





## Annual vegetables—Greens

**Greens** are annual vegetables that only occupy the garden one season or less under Idaho conditions. The leaves and leaf stems of immature plants are harvested and prepared by steaming or boiling. All of these vegetables are cold-tolerant; and some, such as spinach, kale, turnip, and mustard, require cool temperatures to produce tender foliage. Plant greens as early as you can in spring, or in late summer for a fall crop.

### Spinach

Spinach seed is planted in early spring or fall in furrows a 1/2 inch to an inch deep and covered with soil. After the plants have 3 or 4 leaves, thin to 4 inches apart. Spinach prefers a well-drained fertile soil. Harvest and process before hot weather or before the plants start to produce a flower stalk. Late-planted spinach can easily be overwintered using a deep protective mulch.

Leaf miners can be a major pest. After planting, cover spinach with row covers like Reemay or Garden Blanket (gauze-like garden fabrics) to reduce frost and insect damage. These materials promote faster plant growth and prevent the adult leaf miner flies from laying their eggs. This method also works for chard and beets.

### Chard

Swiss chard is a type of beet that has been developed for its top instead of its root. You can harvest crop after crop of the outer leaves without injuring the plant. The leaves freeze better for later use if the midrib is removed. Plant like spinach but thin seedlings to 6 inches apart. One planting will last the entire year. Chard comes in two different types: 'Ruby Red' (red stalks) and 'Fordhook Giant' (white stalks). The red stalked variety is said to have a milder flavor.

## Kale

Kale, a member of the cabbage family, is high in vitamin C. It does especially well in cool climates. Kale is sown in rows 18 to 24 inches apart in early spring and again in late summer for a fall harvest. The seed is sown 1/2-inch deep in rows, broadcast lightly, and raked into the soil. Thin plants as you would Swiss chard. Kale is harvested by cutting the entire plant or just the larger leaves. Kale becomes tough, stringy, and pungent as it ages. Flowering kale is a beautiful, cold hardy addition to the landscape.



## Annual salad vegetables

### Lettuce

Lettuce grows in both spring and fall. This cool-weather crop can be started indoors or in a hot bed outdoors and transplanted when the plant has four or five leaves. It may be seeded directly into the garden in fall or as early as possible in the spring. Mixing several varieties gives both an aesthetic quality to the landscape or garden and a delightful dimension to your salads. Lettuce withstands temperatures to 28°F.

### Parsley

Parsley is a biennial herb that is grown as an annual. Soak seed overnight before planting directly into the garden or sow seed indoors and transplant. Leaves may be harvested anytime during the growing season as a garnish or salad addition. Parsley can also be dried for use later as a seasoning. Parsley comes in two types: 'Italian' (flat leaf) and 'Moss Curled' (curly leaf).



## Annual root vegetables

**These** crops require deep friable soil to allow roots to grow. Except for potato, they are very cold-tolerant and can be planted early in spring. If careful attention is given to watering the seedbed, plantings can be started in summer for fall and winter use. Except for potatoes and beets, fall crops that have been heavily mulched (18 inches) to prevent the soil from freezing, can be dug as needed during the winter.

### Beets

Table beets can be sown at intervals of 3 weeks up into the middle of summer in order to have a continuous supply of young tender beets during the growing season. Seed should be covered with a 1/2 inch of soil. Thin the seedlings 2 to 3 inches apart in the rows. Beets are somewhat shade-tolerant and can be grown next to a tall crop that casts a shadow. For best flavor and tenderness, harvest when the root diameter is 2 to 3 inches.

### Carrots

Carrots do best in sandy loam but will grow on any fertile, moist, deeply worked soil. Short-rooted cultivars are available for heavy soils. Sow as early in the spring as the ground can be worked, plant two or three rows per bed or broadcast seed over a 3- to 4-foot wide bed. Thinning is easily done in the broadcasted bed by drawing a hard-tined rake after seedlings emerge. Plant at intervals of 3 weeks for a continuous



supply of tender carrots. Several new varieties such as ‘A+’ and ‘Orlando Gold’ have several times the vitamin content of varieties grown only a few years ago and perform well in the home garden.

Carrot seed should be lightly covered with a thin layer (1/4 to 1/2 inch) of soil and kept moist until emergence by daily sprinkling. Lay burlap or an old sheet over the bed and water through it to help seedlings stay moist longer between sprinklings. Remove the material once seedlings emerge from the soil. Thin to 10 to 12 plants per foot of row for large carrots. Carrots are subject to the rust fly which can be treated with a soil insecticide like Diazinon before planting.

## Parsnips

Parsnips are often sown thickly, but the seedlings need to be thinned to 3 inches apart. Because parsnip seed is slow to germinate, parsnips need to be planted shallow (1/2 inch), and the soil kept moist with daily light irrigation until the plants emerge. Plants stay hardy once they are up and growing. Parsnips should be harvested only after a hard freeze. Freezing temperatures cause the starch in the parsnip roots to change into sugar, resulting in a sweet, nut-like flavor.

## Potato

Potatoes do best in well-drained, fertile soils. Use only certified seed potatoes each year to reduce the risk of introducing viruses and other diseases into your garden that can reduce yield potential. Rotation is an important practice to follow with all vegetables but especially with potatoes. Because potatoes are in the same family as tomato, eggplant and peppers, they should not follow those crops in your rotation nor should those crops follow potato.

Seed pieces should be 1 1/2 ounces (about the size of an egg) and have at least one eye. After cutting a potato, allow the cut surface to air dry for 2 days before planting. Plant the seed pieces in a trench 4 inches deep. Cover with 2 to 3 inches of soil. Potato sprouts will emerge from the soil after a few weeks. Once the shoots are up, continue to mound soil up 1 to 2 inches around the stems. Continue mounding soil up around the stems until the vines get tall. This prevents the

new tubers from pushing out of the soil which can expose them to light and cause greening under the skin.

Potatoes are subject to the Colorado potato beetle, which is treated with insecticides, or Bt, a non-toxic bacterium.

Potatoes are usually allowed to mature for storage, but they also can be eaten any time they are of sufficient size for use. Immature potatoes should not be stored because they will not keep well. For storage, potatoes are allowed to mature and develop a thick skin. A few days after the top of the plant dies, the tubers will be ready to harvest for storage. Handle newly dug potatoes with care until the skin surface has dried or cured for several hours. Tubers can be kept in baskets or slatted crates.

Store sound, mature tubers in darkness at 45° to 48°F with a minimum relative humidity of 95 percent for highest quality. For very long storage, keep at a temperature of 38° to 40°F to prevent sprouting. Potatoes will not show any external effect from exposure to colder temperatures, however, they will taste sweet and turn dark when fried. Exposure to light causes potatoes to turn green. This should be avoided because the green portion contains bitter, toxic alkaloids that can cause stomach upset. **Peel off any green portion on the tuber before cooking.**

## Radish

One of the easiest vegetables to grow, radishes require early planting and prompt harvest for acceptable quality. Repeated plantings can be made during the growing season. Larger and longer-season oriental varieties do well in Idaho. Radishes and turnips are subject to serious damage by cabbage maggots unless they are controlled with a soil-applied insecticide at planting. Flea beetles may also pose a problem.

## Sweet potato

Sweet potatoes may be grown in Idaho's warmer areas which offer at least 150 frost-free days. Cut a sweet potato lengthwise and lay the pieces cut side down in a tray or large pot. Bury the pieces shallowly in sand 6 weeks before the last frost. Keep the pot in a bright window or under artificial light. As the sprouts arise, add a little more sand or peat moss to encourage deeper rooting. These shoots, complete with

roots, will later be detached from the sweet potato and transplanted into raised beds in the garden after the last frost. Solid sheet black plastic is sometimes laid in the bed or row prior to planting the slips. This encourages soil warming and heat absorption which can extend the growing season. The plastic is then sliced to plant the slips.

## Turnip

Turnips are planted early in the garden, about three weeks before the last frost date. When seedlings are established, thin to a spacing of 3 to 4 inches. Tops may be used for greens when thinning. For a fall harvest, sow seeds in mid-summer. See the above section on radishes for potential insect problems. Turnips store well for long periods in a cool basement or root cellar. To store, cut tops to within 1/2 inch of the root and sink roots into boxes of sawdust or moist sand.



## Vine vegetables

**Vine** crops include watermelons, muskmelons, cucumbers, pumpkins, and squashes. They usually require a lot of space and for this reason are often grown vertically on supports. However, if space is a problem, these vegetables are available as varieties with a bush or short vining growth habit rather than the usual long trailing habit. Such varieties are useful in small gardens and are often earlier and higher yielding. Bush-type vine crops will often set more fruit than can be matured. To ensure that earlier set fruit will mature completely remove later fruit. Vine vegetables need deep soils

and plenty of heat, particularly melons and cucumbers. Cool nights in June greatly restrict growth. These crops benefit from heat contributed by black plastic mulch, row covers or individual hot caps. They are usually grown in hills or raised beds to increase soil depth, soil heating, and drainage.

## Watermelon

Watermelon needs a long, hot season to mature. It grows best on sandy loam soil because of good drainage and soil heating. If bush varieties are not used, the hills need to be 6 to 8 feet apart. Plant several seeds in each foot wide hill. Later thin to three plants per hill. Plant when the ground is warm and danger of frost is long past.

When ripe, watermelons are cut from the vine, leaving a 1-inch piece of stem attached. Ripeness is difficult to determine. In ripening, the bottom of the watermelon (where the melon lies on the soil) turns from a light green to white to an ivory or yellowish white color when mature. Green, curly tendrils on the stem, near the melon's point of attachment, will turn brown and dry when the melon is ripe. Thumping a melon to determine ripeness is not always reliable, but it's fun to listen for that proper "hollow" sound.

## Muskmelon (cantaloupe)

This fruit has the same soil and climatic requirements as watermelon. Plant three muskmelon seeds per hill making sure hills are spaced 3 to 6 feet apart with rows 4 to 8 feet apart. A cantaloupe must ripen on the vine for maximum quality and sweetness. In most cultivars the stem separates easily from the fruit when ripe. Softening of the blossom end, a change in skin color below the corky "netting" from green to yellow and a strong, sweet cantaloupe smell indicate ripening.

## Cucumbers

Cucumbers do best in warm weather, but they are not restricted to the warmer areas of Idaho. In cooler areas, they should be planted on a slope with a southerly exposure or trained with strings to grow up the south wall of a light colored building to capture all the warmth possible.



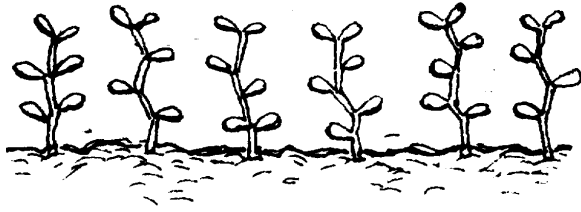
Cucumbers do best grown in a sandy loam soil. Plant seed 1/2 to 1 inch deep, and thin the seedlings to two plants every 18 inches in the row. Do not set out seedlings until danger of frost is past. Plant protectors such as hot caps are often desirable to promote growth. The cucumber plant has both male flowers and female flowers; the male flowers fall off, while the female flowers produce fruit. New varieties are now available that produce female flowers only, however, a small number of male pollinator plants will be needed. Bees are necessary for pollination. If temperatures are below 60°F, bees are not active and no pollination takes place. Harvest cucumbers before they turn yellow. If overripe cucumbers are left on the vine, the plant will produce less fruit.

## Pumpkins

Pumpkins are grown much like other vine crops. There are several varieties and sizes available, from the tiny 'Jack-be-Little' to the large 'Jack-O-Lantern.' Plant in hills 3 by 10 feet apart or place on the edge of the garden where the large plants can spread out. Harvest pumpkins before a hard frost occurs. The best storage temperature for pumpkins is 50°F or slightly above. Make sure a 2- to 6-inch stem is left attached after harvest. If the stem breaks off, the pumpkin will not store for long.

## Squash

Squash are hardier than cucumbers and melons, but their culture is similar. This vegetable is classified into summer and winter squashes. Winter squash have a hard skin and are usually stored for later use, while summer squash are harvested for use when still immature and tender skinned. Zucchini and crookneck are two summer squashes. Seed squash when danger of frost is past in hills 3 feet apart and sow three seeds per hill. Winter squash are stored at 50 to 55°F. Harvest winter squash before hard frosts occur.



## Legumes

**Large** seeded legumes are among the easiest vegetables to grow because the seedlings are robust and grow fast. Legumes have the ability to fix nitrogen, which will enrich any soil they are planted in. Cultivars with either a small bush habit or a climbing vine habit are available. Bush-type cultivars are usually easier to grow because they bear earlier and don't require strings or poles for support.

### Beans

Because beans are tender plants and sensitive to cool temperatures, sow seed when the soil is warm so plants emerge when all danger of frost is past. If you plant early use frost protectors such as hot caps or floating row covers.

Pick the bean pods when they are young and before their seeds begin to enlarge and harden. If you freeze beans, pick the pods a little sooner than you would for fresh use or canning. Lima beans can be grown only in warmer areas of Idaho, while green beans can be grown almost anywhere.

### Peas

Peas are planted as soon as the ground can be worked, about 6 to 8 weeks before the last killing frost in the spring. Because peas are a cool season crop, they are limited to the spring in most of Idaho. For best quality, pick the pods early in the morning and process or cook as soon as possible.

Edible pod peas are of two types. Oriental peas, which are also called sugar peas or snow peas, are flat and should be picked when pod seeds start to form (no larger than a BB). Otherwise the pods will be tough and stringy. The second type is the round-pod 'Sugar Snap' pea that is best eaten when the peas in the pods are fully developed.

# Cabbage or cole group

**This** group is hardy and does well in cool areas having fertile soil and sufficient moisture. All plants in the cabbage family grown in Idaho, including kohlrabi and bok choy, are often bothered by maggots. Damage is heaviest early in the season. Cabbage maggot adults lay eggs on or near the stems at the soil line, and the maggots burrow into the stems and roots. The soil can be treated with an insecticide at planting. For cabbage butterflies, which produce a caterpillar larva that riddles leaves, use Bt (Dipel).

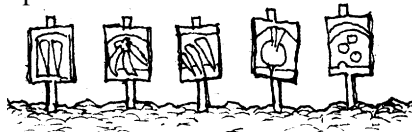
## Brussels sprouts

These are hardier than cabbage and will survive well into the winter in the warmer parts of Idaho. The sprouts or small heads are formed in the axils of the leaves. When the heads begin to crowd, break the lower leaves from the stem of the plant to give them more room. Be sure to retain the top leaves to supply nourishment.

For winter use in cold areas, dig up the plants that have plenty of heads developed and set them close together in a cold frame or cellar. Pack soil firmly around the roots. Kept cool, but not freezing; they will continue to mature.

## Broccoli

Many new broccoli hybrids are available. 'Pochman', 'Green Comet', and 'Premium Crop' are among the best of the new cultivars. Large, older cultivars should be spaced 3 feet apart in the row and picked up to five times during a season. The hybrid varieties usually are smaller and can be planted 1 foot apart in the row. Follow package directions if you are unaware of the type you have. The main head will be large with only a few small second heads for later picking. Use transplants or direct seed in March or April. The plants are hardy and will stand some frost. Pick the heads before the flower buds start to open. Broccoli makes an excellent frozen product.



## Cabbage

Plants should be started indoors, in greenhouses, or hot beds 6 weeks before planting time. Spring cabbage plants are planted 6 to 8 weeks before the last killing frost. They may be planted earlier if hot caps or other frost protectors are used. A second cabbage crop may be planted in late summer for fall harvest.

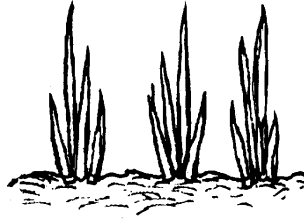
## Cauliflower

Cauliflower is not quite as hardy as cabbage. It is grown in spring or fall. Excessively cold weather causes premature heading, while too much warm weather prevents heading. Plant the fall crop so heading occurs in cool weather. 'Snow Crown' and 'Imperial 10-6' are two cultivars that perform well. For most varieties, except 'Purple Head,' tie the leaves together when the heads or buttons begin to form to keep the heads white. Cauliflower does not keep long in the garden after the heads form. The 'Purple Head' variety turns green when cooked. Cauliflower can be frozen for later use if the curd is not too mature.

## Kohlrabi

This vegetable is grown primarily for its swollen stem. It can be started like cabbage and transplanted into the garden, but generally it is sown in place. Kohlrabi has a mild flavor if harvested while young and tender, around 2 to 3 inches in diameter for best quality. Larger stems tend to be woody and hard to peel or cut.





## Onion family

**Members** of the onion family occupy little space and are adapted to a variety of soils. High fertility and adequate even moisture are required. Plants in the onion family have shallow root systems, and are not very competitive with weeds. They are cold-tolerant and should be planted as early in the spring as possible. Often onions are interplanted with other crops to maximize space and deter insects.

### Chives

Chives are started from seeds or divisions. These onion-like perennials may be grown in the garden near other perennials, or they can be used in the border of a flower bed. Leaves are harvested by clipping after plants are 4 inches tall, or any time after established plants start growing in the spring. After several years the plants become dense and should be divided and reset. Chives may be grown in pots for handy kitchen use. Chive flowers are also edible.

### Garlic

Garlic is propagated by planting the cloves or bulblets that make up the large bulbs. Plant the separated cloves in the fall for a large bulb; spring-plant garlic for a smaller bulb. Only use garlic that has been certified by the Idaho Department of Agriculture as being free of white rot fungus. Cover bulblets with 2 inches of soil.

Bulbs are considered mature when the stems turn yellow. Dig them to braid or tie them in bunches to cure in a dry, well-ventilated place. Store in a cool, dry place but avoid freezing.

The great-headed or elephant garlic can produce an onion like solid bulb or large cloves that weigh up to one pound each. It is not as pungent as regular garlic. To grow the biggest bulbs leave some in the garden to overwinter for a second season's growth.

## Leek

Leeks are propagated by seed, similar to onions. Sow seeds or plant transplants in a shallow trench and gradually fill it in as plants grow to blanch the base of the stems. Leeks do not form a bulb like an onion, but produce a thick, fleshy stem more like a large green onion. You can harvest leeks any time. They will grow to 1 1/2 inches or more in diameter with a white lower stem 6 to 8 inches long. Dig leeks in the fall and store them like celery or cabbage in a cold frame, refrigerator, or root cellar. Also, it is possible in warmer areas of Idaho to overwinter leeks in the garden by using a deep mulch (18 inches).

## Onion

Any fertile soil will grow onions. You can start onions by planting sets, seedlings, or seed. Immature onion plants may be harvested any time for use as scallions. Onions from sets will mature about 2 to 3 weeks earlier than those planted from seed. Onions for storage should be harvested when the tops have died down. Dig them up, leave their roots on, brush off all soil and dry them for a day. Good air circulation is needed for at least 2 weeks to fully cure and prepare onions for permanent storage. To store, cut tops to 2 inches long.



# Fleshy-fruited vegetables

**These** are warm season vegetables that thrive in hot climates. Not only are they subject to frost injury, but cool night temperatures early in the season inhibit growth and cause flower abortion. Row covers and plastic mulches can greatly accelerate growth.

## Eggplant

Eggplant does well in warmer areas of Idaho. Sow seed in a hot bed or indoor pots 8 weeks before plants are transplanted. Plants are not tolerant of low temperatures. Varieties include purple as well as white-skinned fruit. Harvest fruit when it is shiny (purple or white) before it becomes dull in color. Give eggplant an open, sunny location. Regular moisture is necessary for proper fruit development.

## Pepper

Start pepper plants indoors 6 to 8 weeks before they are to be set out. Pepper seed requires warm germination temperatures. Transplant when soil has warmed and danger of frost is past. Many varieties with different shapes are available. Small hot varieties are especially easy to grow. Colored peppers (red, yellow, orange, purple, and chocolate brown) are obtained by leaving the fruit on the plant until fully ripe. Bell peppers are best harvested in the mature green stage, when they have reached full size, just before turning red.

## Tomato

There are many varieties of tomatoes available from the huge 'Beefsteak' variety to tiny cherry tomatoes. There are even yellow varieties, striped varieties, and hollow tomatoes used for stuffing—'Ruffled Yellow' and 'Striped Cavern.'

Start early tomato plants from 5 to 7 weeks before they are to be transplanted to the garden. Seeds germinate best at 70°F. Set out seedlings after danger of frost is over, or protect them using frost protection devices.

Train and tie tomatoes to stakes or a trellis to keep fruit off the ground. Some people choose not to stake tomatoes.

Yield per plant is sometimes lower with unstaked plants, but early fruiting is encouraged. Set tomato plants 18 inches apart in 3-foot rows if staked; if not, plant 18 inches apart in rows 4 to 5 feet apart. Smaller tomato varieties require less space and can be planted 12 to 18 inches apart in 3-foot rows. It is not necessary to prune out the suckers that grow from the leaf axils. Pruning of the top of the plant late in the season reduces further fruit set and encourages maturation of existing fruit.

## Sweet corn

Plant sweet corn when the ground has warmed above 50°F and danger of heavy frost is past. To assure a supply of fresh corn the entire summer, plant at 2-week intervals or plant early, mid season and late varieties at one time. Plant in rows 2 to 2 1/2 feet apart and space plants 6 to 12 inches apart within the row. Taller, late season varieties need more space than smaller early varieties. To assure adequate pollination, plant each variety of sweet corn in several short rows or blocks instead of a few single long rows.

Eating sweet corn picked at the right maturity is one of the great joys of having a vegetable garden. For best eating quality, harvest sweet corn when the kernels are plump and sweet about 3 weeks after silking. This is called the milk stage. When corn is almost ready for harvest, the silks will dry up beyond the ends of the husks, the juice from the kernels will be milky if punctured, and tip kernels will have filled out. Because the kernels have developed enough size to fill the husks, the husks will feel tightly fitted around the ear. Experience will help you determine maturity. Begin by testing a few ears by feel and pull the husk back to verify what you are feeling.

Freeze, can, or cook corn immediately after harvest because the sugar in sweet corn changes to starch soon after picking.