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Home gardening continues to grow in popularity. One of every three families does some type of home gardening, according to conservative estimates, with most gardens located in urban areas. Texas gardeners can produce tasty, nutritious vegetables year-round. To be a successful gardener you will need to follow a few basic rules and make practical decisions.

Garden Site

Although many urban gardeners have little choice, selecting a garden site is extremely important. The ideal garden area gets full or nearly full sunlight and has deep, well-drained, fertile soil. The garden should be near a water outlet but not close to competing shrubs or trees. However, if you modify certain cultural practices and select the right crops, almost any site can become a highly productive garden.

Crop Selection

One of the first things you must do is decide what vegetables to grow. Table 1 lists crops suitable for small and large gardens. You will want to grow vegetables that return a good portion of nutritious food for the time and space they require. Vine crops such as watermelons, cantaloupes, winter squash and cucumbers need large amounts of space, but if you plant them near a fence or trellis you may need less space for vine crops. Plant the vegetables your family will enjoy most. Resist the urge to plant more of any particular vegetable than you need unless you plan to preserve the surplus.

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Table 1. Home garden vegetables.

Small gardens		Large gardens	
Beets	Green bean	Cantaloupe	Potato
Broccoli	Lettuce	Cauliflower	Pumpkin
Bush squash	Onion	Collard	Southern pea
Cabbage	Parsley	Cucumber	Sweet corn
Carrot	Pepper	Mustard	Sweet potato
Eggplant	Radish	Okra	Watermelon
English pea	Spinach		
Garlic	Tomato		

It is important to select the right variety of each vegetable. If you plant the wrong variety for your area you may not get a satisfactory yield no matter how much care you give the plants. Your county Extension agent can provide a list of varieties that are well adapted to your area of Texas. If you try new varieties and hybrids, limit the size of the plantings.

If your garden does not receive full or nearly full sunlight, try growing leafy crops such as leaf lettuce, mustard and parsley. Table 2 lists vegetables that do well in full sunlight and those that tolerate partial shade.

Table 2. Light requirements of common vegetables.

Require bright sunlight		
Bean	Eggplant	Potato
Broccoli	Okra	Pumpkin
Cantaloupe	Onion	Squash
Cauliflower	Pea	Tomato
Cucumber	Pepper	Watermelon
Tolerate partial shade		
Beet	Collard	Parsley
Brussels sprouts	Kale	Radish
Cabbage	Lettuce	Spinach
Carrot	Mustard	Turnip

Garden Plan

A gardener needs a plan just as an architect does. Careful planning lessens gardening work and increases the return on your labor.

Table 3 shows the relative maturity rates of various vegetable crops. Long-term crops require a long growing period. Plant them where they won't interfere with the care and harvesting of short-term crops. Plant tall-growing crops (okra, staked tomatoes, pole beans, sweet corn) on the north side of the garden where they will not shade or interfere with the growth of low-growing crops such as radishes, leaf lettuce, onions and bush beans. Group crops according to their rate of maturity so a new crop can be planted to take the place of another as soon as it is removed. When you plant a new crop, it should be totally unrelated to the crop it is replacing. This is called crop rotation. Crop rotation helps prevent the buildup of diseases and insects. For example, follow early beans with beets, squash or bell peppers.

Table 3. Maturity rates of common vegetables.

Quick (30 to 60 days)		
Beets	Mustard	Summer squash
Bush bean	Radish	Turnip
Leaf lettuce	Spinach	Turnip green
Moderate (60 to 80 days)		
Broccoli	Green onion	Parsley
Chinese cabbage	Kohlrabi	Pepper
Carrot	Lima bean	Tomato
Cucumber	Okra	
Slow (80 days or more)		
Brussels sprouts	Cauliflower	Pumpkin
Bulb onion	Eggplant	Sweet potato
Cabbage	Garlic	Tomato
Cantaloupe	Irish potato	Watermelon

Soil Preparation

Many garden sites do not have the deep, well-drained, fertile soil that is ideal for growing vegetables. If yours is one of them, you will need to alter the soil to provide good drainage and aeration. If the soil is heavy clay, adding organic matter, sand or gypsum will improve it. Organic matter also improves sandy soils.

To improve clay soils, apply 1 to 2 inches of good sand and 2 to 3 inches of organic matter to the soil surface in late winter or early spring; then turn it under to mix it thoroughly with the soil. It may take several years to improve the soil's physical condition and you'll want to add more organic matter (in the form of composted materials, peanut hulls, rice hulls, grass clippings, etc.) periodically. Turn the soil to a depth of 8 to 10 inches—the deeper the better—each time you add organic matter. Add gypsum at the rate of 6 to 8 pounds per 100 square feet where the soil is heavy clay.

When you add organic matter or sand to the garden site, be careful not to introduce soil pests such as nematodes. Contact your county Extension agent to find out how you can have your soil tested for nematodes by the Texas AgriLife Extension Soil Testing Laboratory.

Never work wet garden soil. To determine if the soil is dry enough for working, squeeze together a small handful of soil. If it sticks together in a ball and does not readily crumble under slight pressure by your thumb and finger, it is too wet for working.

Seeds germinate better in well-prepared soil than in coarse, lumpy soil. Thorough soil preparation makes planting and caring for your crops much easier. It is possible, however, to overdo the preparation of some soils. An ideal soil for planting is granular, not powdery fine.

Fertilization

Proper fertilization is another important key to successful vegetable gardening. The amount of fertilizer needed depends upon the soil type and the crops you are growing. Texas soils vary

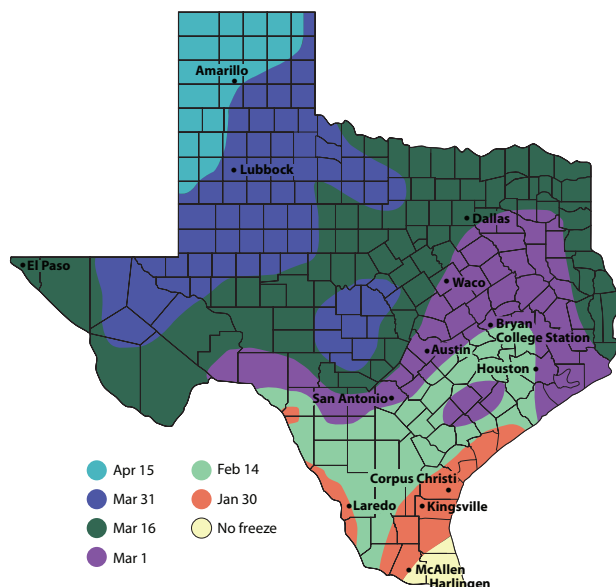


Figure 1. Average date of last spring frost.

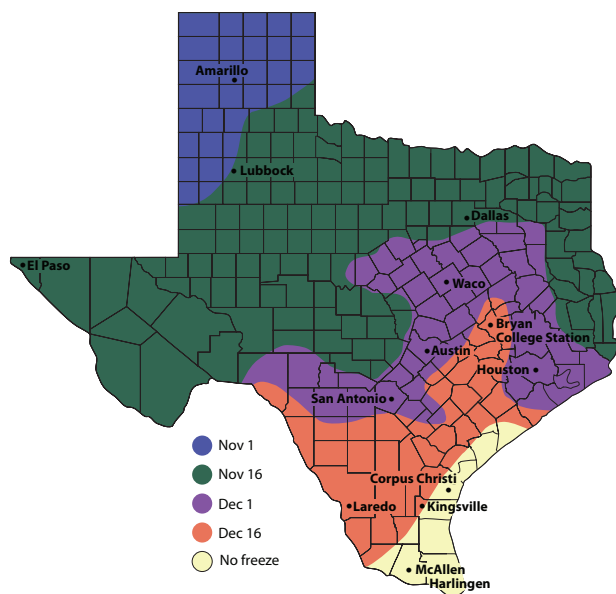


Figure 2. Average date of first fall frost.

from deep sands to fertile, well-drained soils to heavy, dark clays underlaid by layers of caliche rock or hardpan. Crops grown on sandy soils usually respond to liberal amounts of potassium,

whereas crops grown on clay soils do not.

Heavy clay soils can be fertilized much more heavily at planting than can sandy soils. Heavy clay soils and those with lots of organic matter can safely absorb and store fertilizer at three to four times the rate of sandy soils. Thin, sandy soils, which need fertilizer the most, unfortunately cannot be fed as heavily without burning plants. The solution is to feed poor, thin soils more often in lighter doses. For accurate recommendations regarding fertilizer rates, contact your county Extension agent and request a soil test kit.

In general, if your garden is located on deep, sandy soil, apply a complete preplant fertilizer such as 5-10-10 or 6-12-12 at the rate of 1 to 2 pounds per 100 square feet. If your soil has a high percentage of clay, a fertilizer such as 10-20-10 or 12-24-12 applied at 1 to 2 pounds per 100 square feet should be suitable.

Make the preplant fertilizer application a few days before planting. Spade the garden plot,

spread the fertilizer by hand or with a fertilizer distributor, and then work the soil well to properly mix the fertilizer with the soil. After the fertilizer is well mixed with the soil, bed the garden in preparation for planting.

On alkaline soils, apply 1-20-0 (superphosphate) directly beneath the intended seed row or plant row before planting. Apply the superphosphate at a rate of 1 to 1½ pounds per 100 linear feet of row. Make sure the nitrogen material will be 2 to 4 inches below the seed or transplant roots so it won't harm them. Later in the season you can apply additional nitrogen as a furrow or sidedress application. For most soils, 2 to 3 pounds of 21-0-0 (ammonium sulfate) per 100 linear feet of row, applied in the furrow and watered in, is adequate. For crops such as tomatoes, peppers and squash, make this application at first fruit set. Sidedress leafy crops such as cabbage and lettuce when they develop several sets of character leaves.

Planting

Plant your garden as early as possible in the spring and fall so the vegetables will grow and mature during ideal conditions. Using transplants rather than seeds, when possible, allows crops to mature earlier and extends the productive period of many vegetable crops. Be careful not to plant transplants too deep or too shallow, especially if plants are in containers such as peat pots. Planting too deep often causes developed roots to abort. Planting too shallow may cause roots to dry out.

Some crops can be removed from containers for planting, while others are best transplanted in containers, as indicated in Table 4. When transplanting plants such as tomatoes or peppers, use a starter solution. Purchase starter solution at a nursery or make your own by mixing 2 to 3 cups of fertilizer (such as 10-20-10) in 5 gallons of water. Use the lower rate on light, sandy soils. Pour 1 to 2 pints of starter solution (depending on plant size) into each transplant hole before planting.

This keeps the plants from drying out and gives the young, growing plants the nutrients they need.

When planting seeds, a general rule of thumb is to cover the seed two to three times as deep

Table 4. Ease of transplanting.

Easily transplanted		
Beet	Cauliflower	Onion
Broccoli	Chard	Tomato
Cabbage	Lettuce	
Require care		
Carrot	Eggplant	Pepper
Celery	Okra	Spinach
Very difficult without using containers		
Bean	Cucumber	Turnip
Cantaloupe	Pea	Watermelon
Sweet corn	Squash	

as its width. This is especially true for big seeds such as green bean, sweet corn, cucumber, cantaloupe and watermelon. Smaller seeds such as carrot, lettuce or onion can be planted about ¼ to ½ inch deep. Plant seeds fairly thickly; once they have sprouted you can thin plants to an optimum stand. After planting seeds, do not let the soil become so dry that it develops a crust, but do not overwater either. Table 5 indicates the average number of days from planting to emergence.

Table 5. Days from planting to emergence under good growing conditions.

Bean	5-10	Cucumber	6-10	Pepper	9-14
Beet	7-10	Eggplant	6-10	Radish	3-6
Broccoli	5-10	Lettuce	6-8	Spinach	7-12
Cabbage	5-10	Okra	7-10	Squash	4-6
Carrot	12-18	Onion	7-10	Tomato	6-12
Cauliflower	5-10	Pea	6-10	Turnip	4-8
Corn	5-8	Parsley	15-21	Watermelon	6-8

Watering

Apply enough water to wet the soil to a depth of at least 6 inches. For best production, most gardens require about 1 inch of rain or irrigation per week during the growing season. Light, sandy soils usually need to be watered more often than heavier, dark soils. If you use sprinklers, water in the morning so plant foliage

has time to dry before night. This helps prevent foliage diseases, since humidity and cool temperatures encourage disease development on most vegetable crops.

A drip irrigation system is best because it keeps water off plant foliage and uses water most efficiently. Drip irrigation is ideal for use with mulches.

Weed Control

A long-handled hoe is the best tool for controlling undesirable plants in vegetable gardens. Chemical weed control usually is undesirable and unsatisfactory because of the selective nature of weed control chemicals. The wide variety of vegetable crops normally planted in a small area

prohibits the use of such chemicals. Cultivate and hoe shallowly to avoid injuring vegetable roots near the soil surface. Control weeds when they are small seedlings to prevent them from seeding and re-inoculating the garden area. Mulching is also an effective means of weed control.

Mulching

Mulching increases yields, conserves moisture, prevents weed growth, regulates soil temperature, and lessens crop loss caused by ground rot. Organic mulches include straw, leaves, grass, bark, compost, sawdust and peat moss. Organic mulches incorporated into the soil will improve the soil tilth, aeration and drainage. The amount of organic mulch to use depends upon the type,

but 1 to 2 inches applied to the garden surface around growing plants is adequate.

When you have finished harvesting and it is time to turn under organic mulch for subsequent crops, add more fertilizer at the rate of about 1 pound per 100 square feet to help soil organisms break down the additional organic matter.



Pest Control

Diseases and insects can cause problems for Texas gardeners. Long growing seasons with relatively mild winters encourage large insect populations. Avoid spraying when possible, but use recommended and approved chemicals if the situation warrants. Be careful when deciding which chemicals to apply. Spray only those crops listed on the chemical's container. When used according to the manufacturer's directions and label, chemicals pose no threat to the home gardener.

Disease control is really a preventive rather than an eradication procedure. Cool, damp conditions are conducive to foliage diseases. Carefully watch your garden for symptoms of diseases. If necessary, spray with approved fungicides. Publications on disease and insect identification and control are available from your county Extension office and at the Texas AgriLife Extension Bookstore (<http://agrilifebookstore.org>).

Harvesting

Harvest time brings the reward of planting and caring for your vegetable crops. For best flavor, harvest vegetables when they are mature. A vegetable's full flavor develops only at peak maturity, result-

ing in the excellent taste of vine-ripened tomatoes, tender green beans and crisp, flavorful lettuce. For maximum flavor and nutritional content, harvest the crop the day it is to be canned, frozen or eaten.

Home Gardening Do's and Don'ts

- Do**
1. Use recommended varieties for your area of the state.
 2. Sample soil and have it tested every 2 to 3 years.
 3. Apply preplant fertilizer to the garden in the recommended amount.
 4. Examine your garden often to keep ahead of potential problems.
 5. Keep the garden free of insects, diseases and weeds.
 6. Use mulches to conserve moisture, control weeds and reduce ground rots.
 7. Water as needed, wetting soil to a depth of 6 inches.
 8. Thin when plants are small.
 9. Avoid excessive walking and working in the garden when the foliage and soil are wet.
 10. Wash your garden tools and sprayer well after each use.
 11. Keep records on garden activities.

- Don't**
1. Depend on varieties not recommended for your area, but do try limited amounts of new releases.
 2. Plant so closely that you cannot walk or work in the garden.
 3. Cultivate so deeply that plant roots are injured.
 4. Shade small plants with taller growing crops.
 5. Water excessively or in late afternoon.
 6. Place fertilizer directly in contact with plant roots or seeds.
 7. Allow weeds to grow large before cultivating.
 8. Apply chemicals or pesticides in a haphazard manner or without reading the label directions.
 9. Use chemicals not specifically recommended for garden crops.
 10. Store leftover diluted spray.

Table 6. Handy conversion table.

3 teaspoons = 1 tablespoon	2 pints = 1 quart
2 tablespoons = 1 fluid ounce	4 quarts = 1 gallon
16 tablespoons = 1 cup	1 ounce = approximately 2 tablespoons (dry weight)
2 cups = 1 pint or 16 fluid ounces	

Table 7. Common garden problems.

Symptom	Possible causes	Corrective measure(s)
Plants stunted in growth; sickly, yellow color	Not enough soil nutrients or soil pH is abnormal	Use fertilizer and correct pH according to a soil test. Use 2 to 3 pounds of complete fertilizer per 100 square feet in the absence of soil test.
	Plants growing in compacted, poorly drained soil	Modify soil with organic matter or coarse sand.
	Insect or disease damage	Use a regular spray or dust program.
	Iron deficiency	Apply iron to soil or foliage.
Plants stunted in growth; sickly, purplish color	Low temperature	Plant at the proper time. Don't use light-colored mulch too early in the season.
	Low available phosphate	Apply sufficient phosphate at planting.
Holes in leaves; leaves yellowish and dropping, or distorted in shape	Insect damage	Use recommended insecticides at regular intervals.
Plant leaves with spots; dead, dried areas; or powdery or rusty areas	Plant disease	Use resistant varieties; remove diseased plants and use a regular spray program.
Plants wilt even though they have sufficient water	Soluble salts too high or root system damage	Have soil tested. Use soil insecticides, fungicides and resistant varieties.
	Poor drainage and aeration	Add organic matter or sand to the soil.
	Insect or nematode damage	Use recommended varieties and apply soil insecticides or nematicides.
Plants tall, spindly and unproductive	Excessive shade	Relocate to a sunny area. Keep down weeds.
	Excessive nitrogen	Reduce applications of nitrogen
Blossom drop (tomato)	Hot, dry periods	Use mulch and water. Plant heat-tolerant varieties.
	Minor element deficiencies	Use fertilizer containing zinc, iron and manganese.
Failure to set fruit (vine crop)	Poor pollination	Avoid spraying when bees are present.
Leathery, dry, brown blemish on the blossom end of tomato, pepper and watermelon	Blossom end rot	Keep the soil moisture uniform. Avoid overwatering and excessive nitrogen.

Table 8. Vegetable planting.

Vegetables	Seed or plants per 100 feet	Depth of planting (in)	Distance between rows (in)	Distance between plants (in)	Height of crop (ft)	Spring planting relative to frost-free date	Fall planting relative to first freeze date
Asparagus	1 oz seed or 66 plants	1-1½ or 6-8	36-48	18	5	4 to 6 weeks before	not recommended
Beans, snap bush	½ lb seed	1-1½	30-36	3-4	1½	1 to 4 weeks after	8 to 10 weeks before
Beans, snap pole	½ lb seed	1-1½	36-48	4-6	6	1 to 4 weeks after	14 to 16 weeks before
Beans, Lima bush	½ lb seed	1-1½	30-36	3-4	1½	1 to 4 weeks after	8 to 10 weeks before
Beans, Lima pole	¼ lb seed	1-1½	36-48	12-18	6	1 to 4 weeks after	14 to 16 weeks before
Beets	1 oz seed	1	14-24	2	1½	4 to 6 weeks before	8 to 10 weeks before
Broccoli	¼ oz seed	½	24-36	14-24	3	4 to 6 weeks before	10 to 16 weeks before
Brussels Sprouts	¼ oz seed	½	24-36	14-24	2	4 to 6 weeks before	10 to 14 weeks before
Cabbage	¼ oz seed	½	24-36	14-24	1½	4 to 6 weeks before	10 to 16 weeks before
Cabbage, Chinese	¼ oz seed	½	18-30	7-12	1½	4 to 6 weeks before	12 to 14 weeks before
Carrot	½ oz seed	½	14-24	2	1	4 to 6 weeks before	12 to 14 weeks before
Cauliflower	¼ oz seed	½	24-36	14-24	3	not recommended	10 to 16 weeks before
Chard, Swiss	2 oz seed	1	18-30	6	1½	2 to 6 weeks before	12 to 16 weeks before
Collard (Kale)	¼ oz seed	½	18-36	6-12	2	2 to 6 weeks before	8 to 12 weeks before
Corn, sweet	3-4 oz seed	½	24-36	9-12	6	1 to 6 weeks after	12 to 14 weeks before
Cucumber	½ oz seed	½	48-72	8-12	1	1 to 6 weeks after	10 to 12 weeks before
Eggplant	⅛ oz seed	½	30-26	18-24	3	2 to 6 weeks after	12 to 16 weeks before
Garlic	1 lb seed	½	14-24	2-4	1	not recommended	4 to 6 weeks before
Kohlrabi	¼ oz seed	½	14-24	4-6	1½	2 to 6 weeks before	12 to 16 weeks before
Lettuce	¼ oz seed	½	18-24	2-3	1	6 weeks before or 2 weeks after	10 to 14 weeks before
Muskmelon (Cantaloupe)	½ oz seed	1	60-96	24-36	1	1 to 6 weeks after	14 to 16 weeks before

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Table 8. Vegetable planting continued.

Vegetables	Seed or plants per 100 feet	Depth of planting (in)	Distance between rows (in)	Distance between plants (in)	Height of crop (ft)	Spring planting relative to frost-free date	Fall planting relative to first freeze date
Mustard	¼ oz seed	½	14-24	6-12	1½	1 to 6 weeks after	10 to 16 weeks before
Okra	2 oz seed	1	36-42	12-24	6	2 to 6 weeks after	12 to 16 weeks before
Onion (plants)	No seed/ 400-600 plants	½	14-24	2-3	1½	4 to 10 weeks before	not recommended
Onion (seed)	1 oz seed	½	14-24	2-3	1½	6 to 8 weeks before	8 to 10 weeks before
Parsley	¼ oz seed	⅛	14-24	2-4	½	1 to 6 weeks before	6 to 16 weeks before
Peas, English	1 lb seed	2-3	18-36	1	2	2 to 8 weeks before	2 to 12 weeks before
Peas, Southern	½ lb seed	2-3	24-36	4-6	2½	2 to 10 weeks after	10-12 weeks before
Pepper	⅛ oz seed	½	30-36	18-24	3	1 to 8 weeks after	12 to 16 weeks before
Potato, Irish	6-10 lb seed	4	30-36	10-15	2	4 to 6 weeks before	14 to 16 weeks before
Potato, sweet	No seed/ 75-100 plants	3-5	36-48	12-16	1	2 to 8 weeks after	not recommended
Pumpkin	½ oz seed	½	60-96	36-48	1	1 to 4 weeks after	12 to 14 weeks before
Radish	1 oz seed	½	14-24	1	½	6 weeks before/ 4 weeks after	1 to 8 weeks before
Spinach	1 oz seed	½	14-24	3-4	1	1 to 8 weeks before	2 to 16 weeks before
Squash, summer	1 oz seed	½	36-60	18-36	3	1 to 4 weeks after	12 to 15 weeks before
Squash, winter	½ oz seed	½	60-96	24-48	1	1 to 4 weeks after	12 to 14 weeks before
Tomato	⅛ oz seed or 50 plants	½ or 4-6	36-48	36-48	3	1 to 8 weeks after	12 to 14 weeks before
Turnip, greens	½ oz seed	½	14-24	2-3	1½	2 to 6 weeks before	2 to 12 weeks before
Turnip, roots	½ oz seed	½	14-24	2-3	1½	2 to 6 weeks before	2 to 12 weeks before
Watermelon	1 oz seed	½	72-96	36-72	1	1 to 6 weeks after	14 to 16 weeks before

Table 9. Vegetable harvest and yield.

Vegetable	Days to harvest	Length of harvest	Yield/100 ft	Approximate planting/person	
				Fresh	Canned/frozen
Asparagus	730	60	30 lb	10-15 plants	10-15 plants
Beans, snap—bush	45-60	14	120 lb	15-16 ft	15-20 ft
Beans, snap—pole	60-70	30	150 lb	5-6 ft	8-10 ft
Beans, Lima—bush	65-80	14	25 lb shelled	10-15 ft	15-20 ft
Beans, Lima—pole	75-85	40	50 lb shelled	5-6 ft	8-10 ft
Beet	50-60	30	150 lb	5-10 ft	10-20 ft
Broccoli	60-80	40	100 lb	3-5 plants	5-6 plants
Brussels Sprouts	90-100	21	75 lb	2-5 plants	5-8 plants
Cabbage	60-90	40	150 lb	3-4 plants	5-10 plants
Cabbage, Chinese	65-70	21	80 heads	3-10 ft	N/A
Carrot	70-80	21	100 lb	5-10 ft	10-15 ft
Cauliflower	70-90	14	100 lb	3-5 plants	8-12 plants
Chard, Swiss	45-55	40	75 lb	3-5 plants	8-12 plants
Collard (Kale)	50-80	60	100 lb	5-10 ft	5-10 ft
Corn, sweet	70-90	10	10 dozen	10-15 ft	30-50 ft
Cucumber	50-70	30	120 lb	1-2 hills	3-5 hills
Eggplant	80-90	90	100 lb	2-3 plants	2-3 plants
Garlic	140-150	N/A	40 lb	N/A	1-5 ft
Kohlrabi	55-75	14	75 lb	3-5 ft	5-10 ft
Lettuce	40-80	21	50 lb	5-15 ft	N/A
Muskmelon/ Cantaloupe	85-100	30	100 fruits	3-5 hills	N/A
Mustard	30-40	30	100 lb	5-10 ft	10-15 ft
Okra	55-65	90	100 lb	4-6 ft	6-10 ft
Onion (bulb)	80-120	N/A	100 lb	3-5 ft	30-50 ft
Onion (seed)	90-120	N/A	100 lb	3-5 ft	30-50 ft
Parsley	70-90	90	30 lb	1-3 ft	1-3 ft
Pea, English	55-90	7	20 lb	15-20 ft	40-60 ft
Pea, Southern	60-70	30	40 lb	10-15 ft	20-50 ft
Pepper	60-90	90	60 lb	3-5 plants	3-5 plants
Potato, Irish	75-100	N/A	100 lb	50-100 ft	N/A
Potato, sweet	100-130	N/A	100 lb	5-10 plants	10-20 plants
Pumpkin	75-100	N/A	100 lb	1-2 hills	1-2 hills
Radish	25-40	N/A	100 bunches	3-5 ft	N/A
Spinach	40-60	40	3 bushels	5-10 ft	10-15 ft

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Table 9. Vegetable harvest and yield.

Vegetable	Days to harvest	Length of harvest	Yield/100 ft	Approximate planting/person	
				Fresh	Canned/frozen
Squash, summer	50-60	40	150 lb	2-3 hills	2-3 hills
Squash, winter	85-100	N/A	100 lb	1-3 hills	1-3 hills
Tomato	70-90	40	100 lb	3-5 plants	5-10 plants
Turnip, greens	30	40	50-100 lb	5-10 ft	N/A
Turnip, roots	30-60	30	50-100 lb	5-10 ft	5-10 ft
Watermelon	80-100	30	40 fruits	2-4 hills	N/A

This publication was revised from earlier versions authored by Sam Cotner and Frank J. Dainello, Professors Emeritus and former Extension Horticulturists.

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