Appendix C. Gardening Resources

Types of Gardens

There are three types of gardens that are most adaptable to school gardening needs: in-ground gardens, raised beds, and container gardens. Which one you select is influenced by how much space is available, the quality of the soil on the school property, and your preference.

Here are the basics on each garden type:

An in-ground garden is a plot of land on the school grounds. Depending on its size, its advantage is that it allows you to grow a large quantity of different vegetables and many people can work in the garden simultaneously. The larger the garden plot, the more labor will be required to build and maintain the garden.

The soil available in your in-ground garden is important. First, you will want to test the soil. Soils can be acidic, alkaline, or neutral as measured by the pH level. Vegetables prefer soils with a pH reading of 6.0 to 7.0, which means slightly acidic to neutral. When you find out what the pH level of your soil is, you can determine what kind of amendments, such as fertilizer, that you may need. You also want to test for contaminants, such as lead, to make sure that the food you grow in the garden is safe to eat. You can ask your local Cooperative Extension agent (*http://www.csrees.usda.gov/Extension*) who can provide you with sampling materials for a lab in your State.

Secondly, soil preparation plays an important role in whether the fruits and vegetables you plant in an in-ground garden will thrive. There are three types of soil: sand, clay, and loam. Sandy soil is loose and helps the roots of plants breathe because it lets the air pass through easily. Clay soil absorbs water faster and keeps it inside longer, so a soil composition that has more clay particles in it would be ideal for places that are too hot and the soil dries up quickly. Loam is a mixture of about 40 percent sand, 40 percent silt (quartz particles), and 20 percent clay. You can amend your soil to make it easier for your garden to grow. Again, your Cooperative Extension agent or Master Gardener can help guide you.

A raised bed garden is one built on top of your plot of land. Raised bed gardens can be contained, e.g., with wood boards to keep the bed intact, or they can be more free form, with soil and amendments merely piled several inches high. Raised bed gardens offer several advantages:

- They allow you to compensate for poor soil in the ground by using new soil.
- They warm more quickly in spring, allowing you to work the soil and plant earlier.
- They drain better.
- They may be easier to work because you don't need to bend as low to the ground.

Container gardening is the practice of growing plants in containers instead of planting them in the ground. Containers may include terracotta or plastic pots of different sizes, as well as half-barrels and other large containers. The advantages to growing plants in containers include:

- There is less risk of soil-borne disease because you provide the soil.
- Containers eliminate most weed problems.
- Movable pots allow more control over moisture, sunlight, and temperature.
- Container gardens can fit into most classrooms.

The disadvantage, of course, is that you can grow only a small quantity of fruits and vegetables in a container garden.

If you opt for a container garden, make sure there is a hole in the bottom of the pots to allow water to drain out.

Grow Sheets

Leaf Lettuce

Lettuce is an easy-to-grow cool-season crop for school gardens that can withstand light frost.

When to plant (spring garden): Lettuce can be planted in most parts of the United States up to 8 weeks before the last expected frost. It can be planted every 10 - 14 days for a continuous harvest. Baby lettuce is ready to harvest 3–4 weeks after planting, depending on weather conditions. Increasing day length and high summer temperatures usually causes seed stalk formation (bolting) and bitter flavor.

When to plant (fall garden): Start planting seeds when students return to school and continue until 6 weeks prior to the first expected fall frost. Lettuce seed germinates slowly when soil temperature is above 80° F. Plant in partial shade to speed germination. Floating row covers, i.e., protective coverings of lightweight materials (e.g., on hoops) that shield plants from the elements, will help to shade late summer/early fall lettuce from direct sunlight and high temperatures.

How to plant: Sow 10 to 20 seeds per foot in rows 8 to 12 inches apart. Leaf lettuce also grows very successfully in a wide bed arrangement when seedlings are thinned to 4 to 8 inches on all sides. Sow seeds evenly, cover lightly with fine soil (¼ inch), and firm gently. Mist or lightly water the soil after planting and keep the soil evenly moist but not too wet until seeds germinate.

Thinning seedlings: When plants are a few inches tall, pull out extra plants so that each remaining plant is 4 to 8 inches from its neighbor. The more space between plants, the larger the plant can grow.

Care of plants:

- **Fertilizing:** Medium-heavy feeder. Mix organic matter and fertilizer into the soil prior to planting. If plants are growing poorly, fertilize lightly every 2 weeks after planting with compost tea or a liquid fertilizer.
- **Watering:** Use frequent, light watering to encourage rapid growth, but do not over-water, as this may contribute to root and leaf diseases. Overhead watering should always be done in the morning to give plants time to dry off.
- **Weeding:** Cultivate carefully, as lettuce is shallow-rooted. Cover the soil around lettuce plants with a 1 to 2-inch-thick organic mulch (e.g., sections of newspaper covered with straw or grass clippings) to maintain soil moisture and suppress weeds.
- **Special Directions:** Floating row covers are very useful in promoting rapid growth in the early spring and minimizing slug and other pest feeding. Lettuce production can be also extended later in the fall with floating row covers (garden fabric stretched over hoops) or cold frames; in the Northern States, heavy snowfall could collapse hoop houses or tear fabric. Some lettuce cultivars may overwinter if healthy 3-week-old transplants are set out around October 15. These small plants will establish a root system and be able to withstand cold weather with protection. When spring arrives they will begin active growth and produce early harvests. Some recommended cultivars for overwintering include Black Seeded Simpson, Waldmann's Dark Green, Salad Bowl, Winter Density, Brune D'Hiver, Winter Marvel, and Arctic King.

Harvesting: Leaf lettuce can be cut as soon as plants are 5 to 6 inches tall—usually 21–30 days from seeding depending on weather conditions. Use sharp scissors to cut older, outer leaves which contain high levels of calcium first. You may wish to harvest every other one of the largest plants to accomplish thinning. You can also let the plants grow to full size (45–50 days from planting) and cut the entire plant at ground level.

Cut and Come Again Harvesting: For continuous harvests of quick-and-easy salad greens, sow a raised bed thickly (about 1 inch apart) with a mixture of your favorite salad greens (with maturity dates close to one another). Shear the plants with sharp scissors when they are 6 to 10 inches tall. Take off 2 to 4 inches or cut them to the crown. They will quickly re-grow if watered and fertilized and be ready to cut a second time 2–3 weeks later. Sow a second bed. Turn under the plants when they become overly mature and bitter.

Spinach

Spinach is a hardy annual plant that grows to a height of 8- to 12-inches. There are two types of regular spinach—smooth leaf and savoy leaf. The savoy types have more texture, but soil and sand tend to catch in the crinkles of the leaves.

When to plant (spring garden): Plant seed as soon as the soil can be loosened, raked, and leveled.

When to plant (fall garden): Plant seed as soon as students return to school.

How to plant: Space seeds 3 inches apart in rows, or broadcast seed evenly in wide rows or beds. Cover with soil, barely covering the seeds, and then tamp down to ensure good soil-to-seed contact. Make several small plantings several days apart.

Note: spinach seed is slow to germinate. You can speed the process by soaking seeds in water for 24 hours prior to planting.

Thinning seedlings: Remove or cut every other plant 2–3 weeks after seedlings emerge so that plants are spaced 6 inches apart. Thinnings may be used in salads or sautéed.

Care of plants:

- **Fertilizing:** Spinach is a heavy feeder. Incorporate lots of compost and apply a garden fertilizer (according to label directions) prior to planting.
- **Watering:** Keep plants uniformly supplied with moisture for best performance. Water deeply and regularly during dry periods.
- **Weeding:** Remove all young weed seedlings by hand and mulch along each side of the row to keep weed seeds from germinating.
- **Special Directions:** Use floating row covers to exclude pests such as spinach leaf miners and to speed the growth of the plants. Spinach bolts (sends up a flower stalk) as the days lengthen and temperatures rise. Make a final harvest when the plants send up their flower stalks. Because spinach tolerates frost, it is a good crop for the fall garden and with protection can be harvested into December. In mild areas, spinach sown in late fall will overwinter and make new growth in the spring.

Harvesting: Spinach matures in 28–45 days from planting. Cut full-size leaves and new leaves will regrow from the base.

Carrots

There are a number of types of carrots that will grow well in spring and fall gardens. Some fast-growing varieties produce carrots that are only 2–3 inches long.

When to plant (spring garden): Plant seed as soon as the soil can be loosened, raked, and leveled. Direct seed into loose, well-drained soil that is free from rocks, clods, or debris. Raised beds work well for carrots. Carrot seeds take 1–3 weeks to germinate, so try marking the rows by sprinkling a few radish seeds in with them. (Harvest radishes before they compete with carrots.) Best shape and quality are achieved when carrots are grown between 55–75° F.

When to plant (fall garden): Plant 10–12 weeks before the first frost. This usually requires planting before school starts in the fall.

How to plant: Plant seeds about ½ inch apart in rows that are 12 inches apart or broadcast seed over a bed. Cover seed with ¼ to ½ inch of soil, tamp down with hands to ensure good soil to seed contact, and keep evenly moist.

Thinning seedlings: Thin excess seedlings so that plants are 1–4 inches (depending on the variety and seed packet instructions) apart when plants are about 2 inches tall. Cut seedlings rather than pulling them out to avoid root disturbance.

Care of plants:

- **Fertilizing:** Medium feeder. Fertilize lightly before planting with a garden fertilizer.
- **Watering:** In dry weather, water lightly each day until plants are established. Ease up on watering near time of harvest, as excessive moisture may cause roots to crack.
- **Weeding:** Apply compost or mulch around plants to control weeds. Alternatively, you can hand-pull weeds or use a hand cultivator or hoe to slice weeds at the soil line. Use only shallow cultivation to avoid root disturbance.

Harvesting: For fresh use, harvest carrots before they exceed 1 inch in diameter, or about 65–75 days after planting. Fall-planted carrots can be harvested throughout the winter months if covered with an organic mulch of straw or shredded leaves.

Beets

The beet (Beta vulgaris) is an enchanting vegetable for young gardeners that does double duty: children love the excitement of pulling up the storage roots and the leaves are very good to eat fresh or steamed (and are a good source of calcium and vitamin A). The history of beet cultivation stretches back about 4,000 years. The plant was probably domesticated somewhere along the Mediterranean. Beets are easy to grow and come in a variety of interesting shapes and beautiful colors.

When to plant (spring garden): Plant seed as soon as garden soil can be loosened, raked, and leveled. Your beet plants will grow best in full sun.

When to plant (fall garden): Plant seed in late August–early September, as soon as students return to school.

How to plant: Space seeds 1–2 inches apart in rows, or broadcast seed evenly in wide rows or beds. Cover seeds with about ½-inch of fine soil and then tamp down to ensure good soil to seed contact. Expect germination in 10 to 15 days.

Thinning seedlings: Beet seed is actually a fruit or seed ball with several embryos. Unless you buy seed designated as monogerm seed—one embryo per fruit—you will need to thin the planting when plants are 2 inches in height. Thinnings can be used in salads. Final spacing should be 3 inches in all directions.

Care of plants:

- **Fertilizing:** Beet is a heavy feeder. Incorporate lots of compost and apply a garden fertilizer (according to label directions) prior to planting.
- **Watering:** Keep plants uniformly supplied with moisture for best performance. Water deeply and regularly during dry periods.
- **Weeding:** Remove all young weed seedlings by hand. You can also lay down an organic mulch along each side of the row to keep weed seeds from germinating. When using hand cultivators or hoes to cut or dig out weeds, be careful not to damage enlarging beet roots. Frequent shallow cultivation or weed pulling is important because beets compete poorly with weeds, especially when small.
- **Special directions:** Soaking seed in warm water for 24 hours before planting will aid germination which, in turn, may help prevent soil rot problems in cool, spring soil. Use floating row covers to exclude pests, such as leaf miners, and to speed the growth of the plants.

Harvesting: Begin harvesting 50 to 60 days from the date you plant seed. Pull beet roots when they are 1 to 3 inches in diameter.

Swiss Chard

Swiss chard (Beta vulgaris var. cicla) is a leafy vegetable in the same species as beet. The word Swiss was used to distinguish chard from French spinach varieties by 19th century seed catalog publishers. The first varieties of this popular leafy vegetable have been traced to Sicily. While tender young Swiss chard leaves are eaten raw in salads, older chard leaves and stems are typically cooked or sautéed.

Some cultivars, such as "Lucullus" and "Fordhook Giant," have cream-colored midribs. Some, such as "Ruby Chard" and "Rhubarb Chard," have red mid-ribs. There are some beautiful cultivars, such as "Rainbow Chard," with multi-colored mid-ribs. All parts of the chard plant contain oxalic acid.

Swiss chard leaves grow vigorously throughout the season, and the plants can reach a height of 3 feet.

When to plant (spring garden): Plant seeds in loose, fertile soil in an area that receives full sun. Plant in early spring, 2-3 weeks before the last spring frost date.

When to plant (fall garden): Plant seed as soon as students return to school.

How to plant: Space seeds 2 inches apart in rows, or broadcast seed evenly in wide rows or beds. Cover with about ½ inch of soil and then tamp down to ensure good soil-to-seed-contact.

Thinning seedlings: Similar to beet seed, Swiss chard seed is really a fruit containing several embryos which will need to be thinned. Thin plants to 4 inches apart when they are about 2 inches high. You can replant the thinned seedlings, but you will need to water them twice daily until they establish new root systems. Continue to thin out plants if plants are growing vigorously before the end of the school year. Large plants need 12- to 18-inch spacing.

Care of plants:

- **Fertilizing:** Swiss chard is a heavy feeder. Incorporate lots of compost and apply a garden fertilizer (according to label directions) prior to planting.
- **Watering:** Keep plants uniformly supplied with moisture for best performance. Water deeply and regularly during dry periods.
- **Weeding:** Remove all young weed seedlings by hand and lay down mulch along each side of the row to keep weed seeds from germinating.
- **Special directions:** Soaking seeds in warm water for 24 hours before sowing will aid germination and may help prevent soil rot problems in cool, spring soil. Use floating row covers to exclude pests, such as leaf miners, and to speed the growth of the plants.

Harvesting: Swiss chard can be harvested while the leaves are young and tender or after maturity when they are larger and have slightly tougher stems. Young leaves (smaller than 4 inches) may be eaten fresh in salads. Mature leaves may be chopped and sautéed. The "ribs" may be eaten like celery. It can be harvested until frost. At any point in the growing season, snip leaves 2 inches above crowns to rejuvenate plants. New, succulent leaves soon will be ready to harvest.

Raspberry/Blackberry

These plants are referred to as "brambles." They are perennials—they live from year to year—and most are thorny. Brambles are fairly easy to grow in full-sun locations and can be grown organically. Most brambles produce biennial canes. In year 1, new shoots (primocanes) from the crown (base) grow through the spring and summer. The shoots live through the winter in a dormant state. In year 2, the shoots (now floricanes) produce flowers and fruit and then die.

Fall-bearing raspberry is a type of bramble plant that is probably best suited to a school garden and has a slightly different growth habit. The primocanes produce flowers and fruit from late July until the first frost. The plants can then be cut down to within 6 inches of the ground, making them very manageable through the fall and winter. "Caroline," "Josephine," "Jaclyn," and "Anne" are some recommended cultivars.

Raspberry plants (other than the fall-bearing type) will bear fruit in June and blackberry in July depending on location in the United States. There are a number of erect, thornless blackberry cultivars that take up considerably less space than trailing thornless blackberry cultivars. These include "Navaho," "Apache," and "Arapaho."

Each bramble plant requires a minimum of 10 square feet of growing space. They are difficult to grow in containers because of their growth habit, the need to keep containers watered consistently, and the potential for root injury from very cold winter weather.

When to plant: Early spring. Purchase dormant crowns and plant in a full-sun location in garden soil to which lots of compost has been added.

Care of plants:

- **Fertilizing:** Add a 1-inch layer of compost around plants each year. Sprinkle a garden fertilizer (always follow label instructions) around plants each spring during bloom.
- **Watering:** Regular watering during dry periods is critical. Water around the base of plants, not over the top of plants. Brambles have shallow root systems and will drown in poorly drained soils that remain sopping wet after rainfall.
- **Weeding:** Place organic mulch (e.g., newspapers covered with straw or shredded leaves) around plants and hand-pull weeds when necessary.
- **Special directions:** Drive an 8-foot metal or wooden fence post 2 feet into the ground at either end of the row. Connect the posts with a wire stretched taut between them at a height of 3 feet. Tie the canes to the wire. You will also need to run strong twine down either side of the plants and around the posts to keep the fruit-laden canes upright. Raspberry, in particular, will produce many new shoots that need to be thinned in spring to a 6- to 8-inch spacing. Check out the online resources from regional Extension Services for specific pruning and training information.

Harvesting: When fruits are fully ripe. Bramble fruit do not sweeten after being picked.

Strawberry

Strawberry plants are perennial, i.e., they live from year to year. New shoots emerge from the base (crown) each spring that produce leaves, flowers, and soft, delicious fruits with seeds on the outside! Most varieties are "June-bearing," producing their entire crop over a short period of time. Day-neutral varieties are also available and have some advantages for school gardens:

They bear fruit the first year after planting; plants don't spread out very much; they can be grown in containers; and they produce flowers and fruits throughout the growing season, but mostly in late spring/early summer and late summer/early fall.

When to plant (spring garden): June-bearing or day-neutral varieties: Plant in early spring as soon as soil can be loosened, raked, and leveled. Incorporate compost into the planting area. Order plants ahead of time from a fruit nursery or purchase plants locally.

When to plant (fall garden): Day-neutral varieties: Plant in September, after students have returned to school. Plants will produce flowers and fruit the following spring. Cover plants with mulch or a floating row cover to protect them over the winter.

How to plant: Plant June-bearing varieties 12 inches apart in rows 2 feet apart. Plant day-neutral varieties 6- to 8-inches apart in rows 3 feet apart. If plants arrive too early, wrap the roots in moist shredded newspaper or stand the plants up in a container with water at the bottom. Don't let the roots dry out prior to planting.

Care of plants:

- **Fertilizing:**
  - *June-bearing varieties:* Sprinkle a garden fertilizer (always follow label instructions) around plants each spring during bloom and again in late summer/early fall before next year's buds begin to form.
  - *Day-neutral varieties:* Sprinkle a garden fertilizer (always follow label instructions) around plants once a month while plants are actively growing.
  - *For both types of strawberry plants:* Try to add a 1-inch layer of compost around plants each year and be sure to sweep fertilizer off the foliage.
- **Watering:** Regular watering during dry periods is critical. Water around the base of plants, not over the tops of plants.
- **Weeding:** Plants have a shallow root system and are easily damaged by cultivation close to plants. Place organic mulch (e.g., newspapers covered with straw) around plants and hand-pull weeds when necessary.
- **Special directions:** For June-bearing varieties, pull off all blossoms the first growing season after planting. For day-neutral varieties, remove all "runners" the first season. Runners are the creeping stems with leaves (stolons) that grow out from the mother plant and become daughter plants when they root to the soil.

Harvesting: When fruits are fully ripe. Strawberries do not sweeten after being picked.

Gardening Resources

You can learn more about how to establish and maintain a school garden, as well as how to use it as a classroom resource, from USDA's School Gardens Web site at *http://healthymeals.nal.usda.gov/resource-library/school-and-preschool-gardens*