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4-H 334 Everyone a Gardener: A Guide for Successful Gardening

Susan Schoneweis

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Everyone a Gardener!

A guide for successful gardening
# Table of Contents

- Choosing a Garden Site ........................................................................................................ 4
- Selecting Garden Tools ...................................................................................................... 6
- Planning Your Garden ....................................................................................................... 6
- Preparing Your Garden for Planting .................................................................................. 11
- Planting Your Garden ....................................................................................................... 15
- Caring for Your Garden .................................................................................................... 16
- Harvesting and Storing Your Garden Produce ................................................................. 20
- Glossary ............................................................................................................................... 22

Design and illustration by Renée Lanik
Everyone a Gardener!

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Gardening can be lots of fun. You can do it alone or with family or friends. This project manual is designed for the beginning gardener. Use it for one to three years, or until you are ready to try some other garden projects.

In this project you will learn how to pick a garden site and grow vegetables. If your family already has a garden site, you will learn how to improve it so your plants will grow even better.

Save this manual; you and your family can use it from year to year as a reference. Recycle and Reuse - a good idea for 4-H project manuals, too!

When you begin to garden it's a good idea to start small. No matter what some books say about gardening with very little input or work, the truth is even a small garden takes time and work. This project includes some ideas for saving time and labor, so your gardening experience will be both enjoyable and beneficial.
Choosing a Garden Site

Most people don’t have a choice as to where they can garden. If you have a small yard, you may not have any choice. If you live in an apartment, you may be limited to container gardening, or may want to garden somewhere else. Some towns have community gardens where you can rent a garden plot. If you live on a farm and have lots of space, you’ll have the most options when choosing an ideal location.

Selecting a good site is the first step in successful gardening. When selecting a site you’ll need to consider light, soil, water, wind protection and slope.

Light

Plants need light to grow and make their own food. Try to select a garden site that gets at least 6 hours of sunlight each day. If your garden site is shaded, it’s better for plants to receive morning sun. This way their foliage dries quickly each day, reducing the chance of disease. Trees and shrubs can shade your garden if they’re too close. Try to set your vegetable garden beyond the drip line of trees and shrubs. Generally, leafy vegetables and root crops will grow better in partial shade than those that produce fruit.

- **Will Grow in Partial shade**
  - Lettuce
  - Spinach
  - Cabbage
  - Beets
  - Carrots
  - Swiss Chard

- **Need Full Sun**
  - Tomato
  - Squash
  - Snap Beans
  - Peppers
  - Sweet Corn
  - Broccoli
  - Potatoes

Soil

The soil in your garden also is important. Plant roots absorb water and nutrients (mineral elements) from the soil and use them to make their own food. Roots also anchor and support the plant. A well-drained fertile soil is best for growing vegetables. Plant roots also take oxygen from the soil. If a soil becomes waterlogged, it means water has replaced all the oxygen in the soil and plants will not grow well. Sandy soils drain quickly and do not hold water well. Clay soils do not drain well and may get waterlogged. **Organic matter** helps improve both sandy and clay soils. Soil organic matter consists of plant, insect and animal remains. These materials continuously decay giving structure and providing nutrients to the soil. When incorporated into a sandy soil, organic matter helps the soil hold moisture and nutrients. Organic matter also helps clay soils drain better by breaking apart clay particles so air and water can move through the soil. Adding organic matter to any soil will make it easier to work, whether you are spading, planting or hoeing weeds.

Water

Although good drainage is important, so is access to water. To grow quality vegetables in Nebraska, you will need a source of water. When selecting a garden site, make sure it is close enough to an outside faucet so a hose and sprinkler will reach the garden.

Wind Protection

Wind protection is a good idea for gardens in Nebraska. The wind in Nebraska can stress your garden plants, tearing and damaging them. It also dries the soil. Summer winds usually come from the west or southwest. A hedge row, fence or building on the west side of the garden will help break the wind. **However, choose a site where the windbreak does not shade the garden until late afternoon.**

Slope

A level or gently sloping site is easiest to garden. If you have to plant on a hillside, make rows across the hill, not up and down. If rows run up and down the hill, rain and irrigation water will run down the rows washing away some of the topsoil.

Have you ever noticed how farmers plant on hills? They plant around and across the hill, rather than up and down. This is called **contour** planting. Contour planting conserves topsoil and helps water soak into the soil rather than running over it. Use the same concept if your garden is on a hill.
Activity - How well does your soil drain?

Try this experiment to see how well your garden soil drains. Dig a hole 6 inches wide and 12 inches deep. Fill the hole with water and let it sit overnight. If there's still water standing in the hole after 24 hours, the soil drains poorly. You may want to move your garden to a place where the soil drains better. Otherwise, you'll need to add organic matter to help the soil drain.

Activity - What is your garden's soil made of?

Soil can be separated into parts — sand, silt, clay and organic matter. Sand is the largest and heaviest particle. Silt is finer and smaller than sand. Clay particles are the smallest of all. Organic matter consists of plant and animal material in various stages of decay.

1. Fill a quart jar with soil from your garden site.
2. Let the soil dry, then break up any clumps and remove any rocks, twigs or sticks.
3. Refill the jar 1/4 full and add water until the jar is 3/4 full.
4. Add 1 teaspoon of a non-foamy detergent or water softener such as dishwasher detergent, Spring Rain or Calgon.
5. Put the lid on tight and shake the jar for three minutes or longer, until all the particles are separated from each other.
6. Set the jar on a table and watch closely for a few minutes. Write down what you see happening.
7. Set the jar where it will not be disturbed and let it sit for two days.
8. Place a card along side the jar. Mark off the depth of the organic matter, clay, silt, fine sand and coarse sand. (Since sand is heaviest it should fall to the bottom, followed by silt, clay and organic matter.) Label the card for each layer. Measure each layer in millimeters. Use the formula below to determine the percentage of clay, silt and sand that make up each layer.

\[
\frac{\text{# mm of layer}}{\text{# mm total sample}} = \text{decimal fraction of layer} \times 100 = \% \text{ layer}
\]

(Not including the organic matter)

Do this for each layer. Finally, measure the organic matter layer and divide it into the total sample, including organic matter. This will help you estimate how much organic matter your soil has.

What is your soil made of? How well do you think plants will grow in this soil?

Get some soil from other places and repeat the experiment. How do these soils differ from your soil?
Selecting Garden Tools

Early humans grew vegetables without the benefit of hoes, rakes and shovels. Today we have a wide variety of tools from which to choose. But you don’t need many tools to garden. A basic set of well-built tools should last you many years.

You’ll need a spade, shovel or spading fork for turning over the soil. Some people with big gardens use a rototiller or plow, but if your garden is small they are seldom worth the trouble and expense. You can use a hoe to break up the soil after it is turned and to hoe weeds. A garden rake is handy for smoothing the seed bed and for very shallow cultivation. You don’t want to make the seedbed totally smooth and fine. A very fine-textured seedbed will form a crust after it is watered making it difficult for seedlings to break through. A trowel or a hand cultivator will help you transplant small plants.

Finally, a yardstick or measuring tape, stakes, string and labels will help you make rows that are straight and properly spaced. This will make your garden neater and ensure that individual plants have room to grow.

Planning Your Garden

Before you plant anything, you’ll want to make a plan for your garden, deciding what to grow and where it will be planted in the garden. When you’re trying to decide how big to make your garden think about the amount of yard or field space you have to use; the number of people in your family and the kind of vegetables they want to eat, and your previous gardening experience.

It is easier to learn how to garden and to keep up with the harvesting, weeding and pest control if you start small. 100 square feet (10 feet wide by 10 feet long or 5 feet by 20 feet) is a nice size for a small garden. This is enough space to grow several different vegetables. Gardens may be bigger, but if you’re just starting out a small garden will be easier to maintain (or to care for).

Deciding What to Plant

Since you and your family will probably be eating the vegetables you grow, it’s a good idea to find out what everybody likes. You don’t want to harvest a bumper crop of a vegetable no one will eat. Also think about whether your family will eat the vegetables fresh from the garden, or canned or frozen. This will help you decide what cultivar or variety to plant.

**Variety** and **cultivar** are two words you’ll hear often as you garden. A variety is a distinct type of plant within a species. For example, there are three different kinds of peas - English peas, field peas and sugar peas. Each one is a different variety and is used for different purposes. Plants within a variety differ in appearance from the typical plant growth habit or fruit shape.

A second kind of variety is the cultivated variety. These varieties are developed for a specific plant type or use. Because they are a cultivated variety they are called **cultivars**. The names you see on seed packages, such as ‘Little Marvel’, ‘Tall Telephone’ or ‘Dwarf Telephone’ pea, are the cultivar names. The names usually tell you something about the cultivar such as its suitability for freezing, or whether it grows up a pole or as a bush.

There are hundreds of cultivars of many vegetables of which you’ll only choose a few.

Many discount, garden and grocery stores sell flower and vegetable seeds each spring, but they sell only a few cultivars of most plants. You may want to try some cultivars that your local stores don’t carry. This will depend on what vegetables you want to grow and how your family will use them. Farmers select specific cultivars to plant in their fields for optimum production - so can you.

In choosing vegetable varieties for the home garden, consider:

- **Disease resistance** - plants tolerant or resistant to common diseases generally need fewer pesticide applications.

- **Plant type** - determinate (bush) or indeterminate (vining). Bush type plants take less space and still yield well.

- **Shape, color, flavor of produce**.
How the vegetable will be used (fresh, frozen, canned or dried). Some cultivars preserve better than others.

Those recommended for your area. Ask your Extension office for a current listing of suggested vegetable cultivars for Nebraska. You might ask friends and neighbors for their suggestions, too.

Once you have decided what cultivars of what vegetables you’re going to plant, you need to plan when you are going to plant them. This will depend on whether they are cool season or warm season crops. Cool season crops need to grow and mature before it gets too hot. The first vegetables you’ll plant in your garden will be hardy cool-season crops that you can plant early in the spring as soon as the ground can be worked. Broccoli, cabbage and radishes are a few of the hardy vegetables.

The second group of plants to go in your garden will include the less hardy or half-hardy, cool-season crops, including carrots, spinach and beets. Plant these two to four weeks before the final spring frost is expected. The plants in this group do best if you plant them after the soil has warmed up, but they can tolerate some freezing without injury.

Warm season crops go in the garden last and also include two groups of plants. Tender plants, such as sweet corn and snap beans, should not be planted until after the last spring frost. These plants grow best during warm weather and are easily injured by frost. Even if you plant them early and they escape frost injury, they won’t grow well until the soil warms up. You should wait at least one week after the last expected frost to plant very tender crops. These plants love the heat and need hot weather to grow well.

Many people like to plant tender vegetables earlier than recommended. If you want to plant them earlier, you’ll need to protect them from frost. You can do this by recycling milk jugs and cartons to make "hot tents" for your plants.

Remove the cap and bottom from a milk jug, and set it over the plant. Put soil around the bottom of the jug to keep it from blowing away. To recycle half-gallon milk cartons, cut off the top; slit three sides of the bottom, leaving a flap. Open the flap during the day so light can reach the plant and air can circulate. At night you can close the top (until the plant gets too large) to keep the plant warm. Set the carton into the soil and keep it in place with soil around the base.

Protect Tender Transplants

Early transplants may need extra protection from the weather. Recycle milk cartons, jugs and other containers to help give tender plants an early spring boost.

Hardy: Onions, cabbage, peas, spinach, lettuce, broccoli, brussels sprouts, collards, garlic, kale, kohlrabi, leeks, lettuce, radish, spinach, turnip

Half-hardy: beets, carrots, cauliflower, celery, Swiss chard, Chinese cabbage, endive, mustard, parsnip, potato, rutabaga, salsify

Tender: New Zealand spinach, snap beans, sweet corn, soybeans

Very Tender: cucumber, eggplant, lima beans, muskmelon, okra, pepper, pumpkin, squash, sweet potato, tomato, watermelon
Helpful Planting Tips

Having selected your vegetable cultivars and planned when to plant them, consider these planting tips to help make your garden more productive and disease free.

Rotate your crops. If there was a garden previously on your site, see if you can find out what vegetables were planted where. Plant diseases and insects often stay in the soil and can infect the next year’s crop. You can help prevent this by not planting plant family members in the same place they were planted before. Often plants in the same family are susceptible to the same diseases. Some major plant families include:

Solanaceae (Nightshade family) - tomato, potato, pepper, eggplant

Leguminosae (Pea family) - snap beans, peas, peanut, dry beans

Cucurbitaceae (Squash family) - summer squash, winter squash, cucumbers, melons, pumpkins, gourds

Cruciferae (Mustard family) - broccoli, cabbage, brussels sprouts, cauliflower, kale, Chinese cabbage

Deciding How to Plant

Companion planting. You can plant some crops together in the same row to save space or mark the rows. For example, radishes can be planted thinly in rows of carrots, lettuce and beets. The radishes germinate quickly to mark the rows before the other vegetables come up. They grow fast and are ready to harvest before the other vegetables need the space.

Companion planting is also the term for planting different plants close together to benefit each other. Some people believe certain plants repel insects and help other plants to grow better. Scientific research has not proven that companion planting works. In fact, it can reduce yields due to crowding and other problems.

Interplanting. You can plant slow starting or late maturing plants between or within rows of early spring vegetables. For example, lettuce, spinach, radishes and peas can all be interplanted with tomatoes, peppers, summer squash and corn. By the time hot weather arrives, the early crops are ready to harvest and remove, leaving plenty of room for the long season plants.

Stagger planting. If you don’t want to be swamped with lettuce and radishes for a few days and then not have any, consider stagger planting. By planting very short rows of early spring vegetables, you can spread the harvest over several weeks. Simply plant a little seed every seven to 10 days and you’ll have a continuous crop.

Succession planting. As early season vegetables are harvested you can use the space to grow another crop of vegetables. When short season crops finish bearing, remove them and put a new planting in their place. For example, green beans can follow lettuce or summer squash can follow spinach.

Wide-row Planting. This method uses space more efficiently than either single or double row planting. Seeds are broadcast in rows 10 or more inches wide, separated by normal pathways. To use this method, prepare a smooth seedbed and mark off rows using a garden rake. A garden rake works well because it is usually 10-12 inches wide. Then, broadcast the seed thinly in the row so the seeds have 1-2 inches of space between each. Cover the seed or lightly rake it into the soil. When the seedlings emerge, thin them so they are the recommended distance apart. Wide rows allow more intensive cropping. Also, plants growing close together shade the ground, which restricts the growth of weeds and conserves moisture. Some crops that can be grown easily in wide rows are beets, carrots, Swiss chard, dill, lettuce, onions, peas, spinach and turnips.

Vertical supports. Growing plants vertically using stakes, cages or trellises will help you fit even more plants in your garden. Tomatoes that are staked or caged require about 1/3 to 1/2 the space as those grown on the ground. Supporting plants off the ground can reduce some disease and insect problems.

Keeping these planting hints in mind, you can now plan your garden.
<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Hardiness</th>
<th>Recommended planting time</th>
<th>Fall planting too</th>
<th>Spacing</th>
<th>Seed planting quantity</th>
<th>Approximate quantity needed for 50' row</th>
<th>Amount to plant per person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asparagus (plts)</td>
<td>H perennial</td>
<td>9-12</td>
<td>48</td>
<td></td>
<td></td>
<td>50-60 plts</td>
<td>5-10 plts</td>
</tr>
<tr>
<td>Bean, lima</td>
<td>T</td>
<td>5</td>
<td>36</td>
<td>1-1 1/2</td>
<td>2-40 lbs</td>
<td>2 oz.</td>
<td>10' row</td>
</tr>
<tr>
<td>Bean, snap</td>
<td>T</td>
<td>5</td>
<td>36</td>
<td>1-1 1/2</td>
<td>2 oz.</td>
<td>10' row</td>
<td></td>
</tr>
<tr>
<td>Bean, pole</td>
<td>T</td>
<td>6</td>
<td>48</td>
<td>1-1 1/2</td>
<td>40 oz. 1/2 lb</td>
<td>1 oz.</td>
<td>10' row</td>
</tr>
<tr>
<td>Beets</td>
<td>HH Y</td>
<td>3</td>
<td>18</td>
<td>1/2 - 1</td>
<td>1 oz.</td>
<td>10' row</td>
<td></td>
</tr>
<tr>
<td>Broccoli</td>
<td>H Y</td>
<td>18</td>
<td>36</td>
<td>1/4 - 1/2</td>
<td>36 plts</td>
<td>3 plts</td>
<td></td>
</tr>
<tr>
<td>Brussel sprouts</td>
<td>H Y (only fall)</td>
<td>18-24</td>
<td>36</td>
<td>1/4 - 1/2</td>
<td>36 plts</td>
<td>2 plts</td>
<td></td>
</tr>
<tr>
<td>Cabbage</td>
<td>H Y</td>
<td>18-24</td>
<td>36</td>
<td>1/4 - 1/2</td>
<td>36 plts</td>
<td>3 plts</td>
<td></td>
</tr>
<tr>
<td>Carrots</td>
<td>HH Y</td>
<td>2</td>
<td>18</td>
<td>1/4</td>
<td>1/4 oz.</td>
<td>10' row</td>
<td></td>
</tr>
<tr>
<td>Cauliflower</td>
<td>HH Y</td>
<td>18</td>
<td>36</td>
<td>1/4 - 1/2</td>
<td>36 plts</td>
<td>3 plts</td>
<td></td>
</tr>
<tr>
<td>Celeriac</td>
<td>HH</td>
<td>6</td>
<td>24</td>
<td>1/8</td>
<td>1 pkt</td>
<td>5' row</td>
<td></td>
</tr>
<tr>
<td>Celery</td>
<td>HH</td>
<td>6</td>
<td>24</td>
<td>1/8</td>
<td>150 plts</td>
<td>4 plts</td>
<td></td>
</tr>
<tr>
<td>Chinese cabbage</td>
<td>H Y</td>
<td>18</td>
<td>24</td>
<td>1/4 - 1/2</td>
<td>36 plts</td>
<td>2-3 plts</td>
<td></td>
</tr>
<tr>
<td>Collards</td>
<td>H Y</td>
<td>24</td>
<td>24</td>
<td>1/4</td>
<td>25 plts</td>
<td>3 plts</td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>T</td>
<td>10</td>
<td>36</td>
<td>1 1/2 - 2</td>
<td>1 oz.</td>
<td>10' row</td>
<td></td>
</tr>
<tr>
<td>Cucumber</td>
<td>T</td>
<td>18-24</td>
<td>48</td>
<td>1/2 - 1</td>
<td>1/4 oz.</td>
<td>3 plts</td>
<td></td>
</tr>
<tr>
<td>Eggplant</td>
<td>T</td>
<td>18-24</td>
<td>3</td>
<td>1/4 - 1/2</td>
<td>25-34 plts</td>
<td>1-2 plts</td>
<td></td>
</tr>
<tr>
<td>Endive</td>
<td>HH Y</td>
<td>8</td>
<td>18-24</td>
<td>1/4</td>
<td>1 pkt</td>
<td>3-5' row</td>
<td></td>
</tr>
<tr>
<td>Garlic</td>
<td>H Y*</td>
<td>6</td>
<td>18-24</td>
<td>1</td>
<td>1 lb</td>
<td>3' row</td>
<td></td>
</tr>
<tr>
<td>Horseradish</td>
<td>H Perennial</td>
<td>24</td>
<td>36</td>
<td>1</td>
<td>25 plts</td>
<td>1 plant</td>
<td></td>
</tr>
<tr>
<td>Kale</td>
<td>H Y</td>
<td>18</td>
<td>24</td>
<td>1/4 - 1/2</td>
<td>1 pkt or 36 plts</td>
<td>3-5' row</td>
<td></td>
</tr>
<tr>
<td>Kohlrabi</td>
<td>HH Y</td>
<td>6</td>
<td>18-24</td>
<td>1/4 - 1/2</td>
<td>1-2 pkt</td>
<td>3-5' row</td>
<td></td>
</tr>
<tr>
<td>Leek</td>
<td>H Y</td>
<td>4-6</td>
<td>18-24</td>
<td>1/4 - 1/2</td>
<td>2 plts</td>
<td>3' row</td>
<td></td>
</tr>
<tr>
<td>Lettuce, leaf</td>
<td>H Y</td>
<td>4</td>
<td>18</td>
<td>1/4 - 1/2</td>
<td>2 plts</td>
<td>6' row</td>
<td></td>
</tr>
<tr>
<td>Lettuce, head</td>
<td>H Y</td>
<td>10</td>
<td>24</td>
<td>1/4 - 1/2</td>
<td>1 pkt or 50 plts</td>
<td>6' row</td>
<td></td>
</tr>
<tr>
<td>Muskmelon</td>
<td>T</td>
<td>18</td>
<td>48</td>
<td>1/2 - 1</td>
<td>1/4 oz.</td>
<td>2-3 plts</td>
<td></td>
</tr>
<tr>
<td>Mustard</td>
<td>HH Y</td>
<td>3</td>
<td>24</td>
<td>1/4 - 1/2</td>
<td>1 pkt</td>
<td>2' row</td>
<td></td>
</tr>
<tr>
<td>Okra</td>
<td>VT</td>
<td>5</td>
<td>36</td>
<td>1 - 1/2</td>
<td>2 pkt</td>
<td>2' row</td>
<td></td>
</tr>
<tr>
<td>Onion, seed</td>
<td>H</td>
<td>3</td>
<td>24</td>
<td>1/2</td>
<td>1 pkt</td>
<td>1' row</td>
<td></td>
</tr>
<tr>
<td>Onion, sets</td>
<td>H</td>
<td>2-4</td>
<td>18-24</td>
<td>1 - 2</td>
<td>1/2 - 1 lb</td>
<td>10' row</td>
<td></td>
</tr>
<tr>
<td>Onion, plts</td>
<td>H</td>
<td>2-4</td>
<td>18-24</td>
<td>2 - 3</td>
<td>2 bundles</td>
<td>10' row</td>
<td></td>
</tr>
<tr>
<td>Parsley</td>
<td>HH</td>
<td>6</td>
<td>18-24</td>
<td>1/4 - 1/2</td>
<td>1 pkt</td>
<td>2-3 plts</td>
<td></td>
</tr>
<tr>
<td>Parsnip</td>
<td>H Y</td>
<td>3</td>
<td>18-24</td>
<td>1/2</td>
<td>1/4 oz.</td>
<td>4' row</td>
<td></td>
</tr>
<tr>
<td>Peas</td>
<td>H Y</td>
<td>1-3</td>
<td>24</td>
<td>1 - 2</td>
<td>1/2 lb</td>
<td>20' row</td>
<td></td>
</tr>
<tr>
<td>Peppers</td>
<td>T</td>
<td>18</td>
<td>36</td>
<td>1/4</td>
<td>36 plts</td>
<td>4 plts</td>
<td></td>
</tr>
<tr>
<td>Popcorn</td>
<td>T</td>
<td>10</td>
<td>36</td>
<td>1 - 1/2</td>
<td>1 oz.</td>
<td>10' row</td>
<td></td>
</tr>
<tr>
<td>Potato, irish</td>
<td>HH</td>
<td>10-12</td>
<td>36</td>
<td>4</td>
<td>3 - 4 lb (60 pieces)</td>
<td>10-20' row</td>
<td></td>
</tr>
<tr>
<td>Potato, sweet</td>
<td>VT</td>
<td>12</td>
<td>36</td>
<td>transplant</td>
<td>50 plts</td>
<td>10' row</td>
<td></td>
</tr>
<tr>
<td>Pumpkin</td>
<td>T</td>
<td>36</td>
<td>60-72</td>
<td>2</td>
<td>1 pkt</td>
<td>2-3 plts</td>
<td></td>
</tr>
<tr>
<td>Radish</td>
<td>H Y</td>
<td>1</td>
<td>18</td>
<td>1/2</td>
<td>1/2 oz.</td>
<td>5' row</td>
<td></td>
</tr>
<tr>
<td>Rhubarb</td>
<td>H perennial</td>
<td>36</td>
<td>48</td>
<td>14 plts</td>
<td>1 pkt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rutabaga</td>
<td>H</td>
<td>4</td>
<td>18-24</td>
<td>1/4 - 1/2</td>
<td>1 pkt</td>
<td>5' row</td>
<td></td>
</tr>
<tr>
<td>Salsify</td>
<td>T</td>
<td>2</td>
<td>18-24</td>
<td>1/2 - 3/4</td>
<td>1/2 oz.</td>
<td>3-5' row</td>
<td></td>
</tr>
<tr>
<td>Spinach</td>
<td>H Y</td>
<td>4</td>
<td>18</td>
<td>1/2</td>
<td>1/2 oz.</td>
<td>8' row</td>
<td></td>
</tr>
<tr>
<td>Spinach, New Zealand</td>
<td></td>
<td>T</td>
<td>12</td>
<td>36</td>
<td>1 oz.</td>
<td>3-5' row</td>
<td></td>
</tr>
<tr>
<td>Squash, summer</td>
<td>VT</td>
<td>24</td>
<td>48</td>
<td>1 - 2</td>
<td>1/8 - 1/4 oz.</td>
<td>2-3 plts</td>
<td></td>
</tr>
<tr>
<td>Squash, winter</td>
<td>VT</td>
<td>36</td>
<td>60-72</td>
<td>1 - 2</td>
<td>1/4 - 1/2 oz.</td>
<td>4 plts</td>
<td></td>
</tr>
<tr>
<td>Swiss Chard</td>
<td>HH Y</td>
<td>6</td>
<td>24</td>
<td>1</td>
<td>1 oz.</td>
<td>3-5' row</td>
<td></td>
</tr>
<tr>
<td>Tomato, staked or caged</td>
<td></td>
<td>24-36</td>
<td>48</td>
<td>1/4 - 1/2</td>
<td>5 - 25</td>
<td>4 plts</td>
<td></td>
</tr>
<tr>
<td>Tomato, unsupported</td>
<td>T</td>
<td>36</td>
<td>72</td>
<td>1/4 - 1/2</td>
<td>8 plts</td>
<td>1plt</td>
<td></td>
</tr>
<tr>
<td>Turnips</td>
<td>H Y</td>
<td>4</td>
<td>24</td>
<td>1/4 - 1/2</td>
<td>1/8 - 1/4 oz.</td>
<td>5' row</td>
<td></td>
</tr>
<tr>
<td>Watermelon</td>
<td>VT</td>
<td>24</td>
<td>72</td>
<td>1-1 1/2</td>
<td>1/2 oz.</td>
<td>2-3 plts</td>
<td></td>
</tr>
</tbody>
</table>

**H = Hardy** - tolerate freezing temperatures; sow seed or transplant hardened plants as early as ground can be worked in spring.

**HH = Half-hardy** - tolerate light frosts; sow seed or transplant hardened plants a week or two before average date of last killing frost in your area.

**T = Tender** - sow seed or transplant hardened plants when soil is warm and after average date or danger of last killing frost in your area.

**VT = Very Tender** - sow one to two weeks after the last average 32° F freeze.

* Garlic should be planted in late September to mid-October for best production in Nebraska.
**Activity - Plan your garden on paper**

It’s a good idea to plan your garden on paper first. To do that you’ll need graph paper, ruler, tape measure, pencil, colored pencils and tape.

Measure the length and width of your garden. Make a scale for your garden such as 1 square of graph paper equals 1 foot in your garden.

Look at Table 1 or the seed packets to see how much room each type of vegetable will need. Many vegetables are similar in size from cultivar to cultivar. Others may vary, such as bush pumpkins and regular vining pumpkins or bush and vine type tomatoes.

“Plant” your garden on the graph paper. Remember the space-saving ideas such as companion planting, wide rows, intercropping, succession planting and plant supports. You can use tracing paper to plan successive plantings over the whole season. Draw your garden outline first on graph paper and note which way is north. It’s a good idea to plant the rows going east and west so the sun reaches all plants equally.

Draw in any permanent plantings already in the garden, such as rhubarb and asparagus. If you plan to plant rhubarb, asparagus or other perennial crops, plant them to one side of the garden so you won’t have to work around them when preparing the soil. Also, plant long season crops such as parsnips near the perennial crops so you won’t have to work around them when planting succeeding crops.

Plan to plant tall crops such as corn, asparagus, sunflowers, staked or caged tomatoes and pole beans on the north side of the garden so they won’t shade the short plants. An exception is on exposed sites where a windbreak is needed. Sunflowers or corn planted on the south or west side can provide a windbreak. Be sure to plant shade tolerant crops next to the tall crops.

Your finished garden plan should indicate (1) what crops you’re going to grow, (2) approximate planting dates, (3) where each row will be, and (4) the distance between crop rows. You can show all planned plantings on one sheet or do a separate plan for a fall garden. Late July to September is an ideal time to plant vegetables for a fall crop in Nebraska. As the days grow cooler in the fall the same vegetables you planted in early spring can be planted again. See your local Extension office for more information on planting a fall garden.

Include a plan of your garden in your 4-H record book.
**Activity - Seeds, seeds, seeds...**

If you or your parents do not receive seed catalogs in the mail each year, visit your local library and look in garden magazines for seed companies. Most seed companies will send you their catalog for free. Write to several companies and request a catalog.

When you receive the catalogs compare the cultivars they offer to those seeds available locally. Who has more? Are any the same? How do the prices compare?

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**Preparing Your Garden for Planting**

Before spading or rototilling your garden you will want to consider adding fertilizer and/or organic matter to the soil.

Plants use mineral nutrients from the soil as they grow. Some nutrients are leached out of the soil by rain or irrigation water; others are lost each time you harvest a crop. There are many different fertilizers you can use to help replace the lost nutrients.

Granular fertilizers are the most commonly used in home gardens. They can be spread on the soil and worked in when you spade the garden. A complete fertilizer contains nitrogen, phosphorus and potassium, the nutrients most commonly needed in a garden. An analysis, or percentage of the nutrients in the fertilizer, will always be on the container. The analysis will be three numbers such as 5-10-5, 20-20-20 or 4-10-6. (Sometimes there will be a fourth number if the fertilizer contains a special nutrient.)

The first number in the analysis always indicates the percentage of nitrogen; the second the percentage of phosphorus as phosphorus pentoxide (P$_2$O$_5$), and the third the percentage of potassium as potash (K$_2$O).

The amount and type of fertilizer you should add depends on many factors such as past fertilizer use, previous crops and soil type.

To know which nutrients and how much you need have the soil in your garden tested. Local Extension offices can tell you what you’ll need to do.

If you can’t have your soil tested, it is usually safe to use a 10-10-10 fertilizer at a rate of two pounds per 100 square feet.

Organic matter such as animal manure, compost, grass clippings and tree leaves also can add nutrients to the soil. Organic matter can 1) improve soil structure, 2) improve drainage, and 3) help hold nutrients in the soil so they are not leached away.

Cow, sheep, horse, pig and chicken manures all can be used to add organic matter and nutrients.

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**Fertilizer**

The numbers on the fertilizer bag tell what percentage of each nutrient is in the bag. Of the bags above, each has a different proportion of N, P and K. Knowing the percentage of nutrients can help you decide which is the best buy.
to the soil. Never use cat or dog manure because they may harbor parasites that can be transmitted to humans. If you’re planting immediately after applying manure, use composted manure. Composted manure will not burn the plant roots with excess nitrogen and doesn’t smell as much as fresh manure. Apply non-composted manure and organic material in the fall and incorporate in the soil so they will decompose before spring.

Buying manure by the bag from a store is expensive. Check the classified ads in your newspapers because some farmers advertise and sell it cheaply.

Compost is partially decomposed organic material such as yard and food waste. Many home gardeners start a compost pile so microorganisms such as bacteria and fungi can breakdown lawn clippings, leaves, kitchen scraps, etc. into humus. As compost decomposes in the soil, nutrients are released slowly. Compost will generally not supply all the nutrients required for optimum growth but usually will supply most of the plant nutrients required in very small amounts (micronutrients).

To make sure your plants get all the nutrients they need, use a combination of organic (manure, compost) and inorganic (fertilizer) sources.

Before spading your garden spread compost, manure and/or fertilizer over the garden so it can be worked into the soil. Your garden should be spaded or rototilled to a depth of 6 to 10 inches. Deeper is better because it loosens the soil so plant roots can grow more easily.

Don’t work the soil when it is wet. If you do the soil will compact and form large clods. The clods are hard to break up and compacted soil can keep plant roots from growing well. To see if the soil is too wet, take a handful of soil and try to form a ball with it. If it forms a ball that won’t crumble apart when pressed, it’s too wet. If the ball crumbles when pressed, it’s dry enough to work. Use a rake or hoe to break soil clumps into a relatively fine seedbed. Don’t make the soil too fine or it will form a crust that’s hard for seeds to sprout through.

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**Activity - Test your soil**

Soil Fertility - Learn how to get your soil tested, find out what the results mean, and follow the recommendations so you can improve your garden’s soil.

What you need: Clean bucket, trowel, soil sample box (from local Extension office), and information form.

There is a fee for each test.

1. Take a good sample. Use a soil probe or trowel to take a small sample or core of soil from at least 10 different places in your garden. Each time you take a sample, scrape away the litter on top of the soil, then take a sample from the plow layer (the first 6-8 inches) and put it in a bucket. You can dig out a shovelful of soil and then slice off a sample from the side of the hole.
2. Mix all of the samples together in the bucket.
3. Place one cup of the soil sample in the soil test box.
4. Complete the information form.
5. Mail the soil sample, information form, and required fee to the soil testing laboratory at the University of Nebraska - Lincoln.

When the test results get back, your local Extension office can use the test results to help you determine how much fertilizer your soil needs.
**Activity - Compost in a bag**

The soil in your garden contains billions of bacteria and fungi that continuously break down dead plants and animals into humus. When people use these decomposers in the soil to break down food or yard waste, they call the material **compost**. Compost is made of decomposed organic matter just like humus.

Compost adds nutrients to the soil. It also makes soil light and airy, which allows water and air to reach the roots of your vegetables.

This experiment will help you see how plant materials are broken down, and how periodic turning of your compost pile can help speed decomposition.

**Materials:**
- Two heavy duty, 1-gallon zipper top freezer bags
- 2 quarts dry, slightly crumbed leaves or chopped straw (or both)
- 2 quarts fresh grass clippings
- 2 cups garden soil
- vegetable scraps
- fruit scraps
- water to moisten

**Method:**
Label one freezer bag “Bag #1 - do not disturb” and the other bag “Bag #2 - mix as scheduled.”

Divide all the ingredients in half so you have equal quantities of each. Assemble the compost in layers, making each bag identical:

1. Put 2 cups of straw or leaves into each bag.
2. Sprinkle 1/4 cup of soil over the leaves or straw in each bag. Sprinkle each with 3 tablespoons of water.
3. Add 2 cups of fresh grass clippings to each bag, sprinkle with 1/4 cup of soil and then with 2 tablespoons of water.
4. Add 1 more cup of straw or leaves followed by 1 cup of fruit and vegetable scraps (identical types for each bag). Sprinkle 1/4 cup of soil over the scraps in each bag.
5. Add 2 cups of grass clippings to each bag and 1 cup of leaves or straw on top of the grass. Sprinkle 1/4 cup of soil over the top of each bag, followed by 3 tablespoons of water.

Do not shake either bag. Close the zip top and set the bags in a warm place away from direct sun. Do not open the bag marked “#1 - do not disturb.” This bag will show you how compost turns out when a pile is not turned. This is called **anaerobic** decomposition. Anaerobic means without oxygen.

Open bag #2 after three days to let in fresh air. Reseal the bag and shake it so the ingredients are well-mixed. Then, three times each week, open the bag to let in fresh air, reseal and shake to remix the ingredients. This bag demonstrates **aerobic** decomposition. Aerobic means with oxygen.

For your records.
1. Record what day you begin and what ingredients you use. Record what you do to bag #2 and on what days.
2. Describe what happens in each of the bags. Do you see mold or fungi? What happens to the layers in bag #1? What happens to the layers in bag #2? How long does it take before you can’t recognize the different ingredients (how long does everything take to decompose?)
3. Which bag made compost first? Finished compost should be dark brown and crumbly. Do you think it would be faster to make compost in a pile that was turned regularly or not turned?
4. When your compost in the bags is complete you can add it to your garden or mulch some plants with it.
**Activity - Make a compost pile**

Adding organic matter to your garden will improve the soil and add nutrients, making it easier to work. A compost pile also serves as your garden’s garbage disposal.

All plant and animal material will decay eventually if it is exposed to warm, moist conditions. A compost pile creates these conditions, allowing microorganisms to rapidly decompose organic materials.

**Supplies and Materials:** You’ll need a contained area such as snowfence, wooden pallets, cement blocks, or similar materials to hold the compost pile. You also can purchase composting units at garden stores.

**How to build it:** Build the compost pile in layers of dry and green materials. A compost pile built mainly of dry materials, such as corn stalks and dry tree leaves, will decompose very slowly because there is little nitrogen and water. Moist, green matter will supply the nitrogen and moisture that microorganisms need to live.

Compost made of only fresh, green matter, such as fresh grass clippings and vegetable and fruit scraps, will decompose very rapidly and may smell bad. Since green materials lack bulk, the pile will shrink as water is lost.

Alternate layers of moist or green materials with dry, brown materials. Each layer should be no more than 6 to 8 inches deep to allow proper mixing. Sprinkle one cup of granular fertilizer or some fresh manure over the dry materials, then a 1-inch layer of garden soil. The microbes living in the soil are required for decomposition. The nitrogen in the fertilizer or manure will speed up decay and will increase the fertility of the compost.

Sprinkle each layer with water. The materials should feel as damp as a moistened squeezed out sponge. The pile should begin to heat up in a few days. This means decomposition has begun. Turn the pile two to three weeks after you build it and then once each month during the growing season. Two bins constructed side by side can make turning and mixing easier. As the layers mix together, air gets into the pile and decomposition continues. If the pile is dry, sprinkle it with water as you mix the layers. Shape the pile so there is a depression in the center to catch rain water so it can percolate through the pile.

Many gardeners don’t have enough ingredients to make a large compost pile right away. Therefore, most piles are built up as materials become available. Whenever you add a new material, mix it in. Turn the pile completely once a month. When constructing the pile gradually, you can continually add the remains and trimmings of any vegetables or fruits, as well yard wastes and animal manures (except from dogs or cats).

The compost is finished when, after being turned several times, it doesn’t heat up after a few days. The compost should be dark brown, crumbly and have an “earthy” smell. It can now be incorporated into the garden, used as mulch or added to potting mixes for houseplants and container gardens.

Check with your local Extension office for more information about making a compost pile.

For your 4-H project records take pictures of your composting efforts from start to finish. Tell how you built your compost pile and what you put in it. How often did you turn it? How long until it heated up? How long did it take everything to decompose? How did you use the finished compost?

Write down what you see happening to your compost pile.
Planting your Garden

Now that you've planned your garden on paper, learned about soil improvement and acquired your seeds, it's time for the fun part — planting your garden.

For best results, plant vegetables at the recommended time. Cool season vegetables should be planted early in the spring and warm season vegetables should be planted after danger of frost has past. Remember, you can also plan to plant cool season vegetables again in the fall.

With your garden plan in hand, measure and mark the rows so they are straight and the plants in each row will have adequate space. See Table 1 to determine how much space to leave between the rows.

A garden with straight, well-spaced rows looks better, allows plenty of room for plants to grow and is easier to maintain.

Many crops can be seeded directly in the ground but some crops start best as transplants, slips, sets, bulbs, tubers, etc.

Planting Seeds

Single-row planting. This is the most widely used method in agriculture and gardening but it isn't the most efficient. In single-row planting, seeds are planted in a single line in a furrow or trench.

To make each furrow, mark the row with twine tied tightly between two end stakes. Use a hoe to dig the furrow to the depth recommended on the seed package. Most seed packages have directions for seeding depths. Follow these directions because seeds planted too deeply may not emerge. In general, don't cover seeds more than four times their diameter. Don't plant radishes, lettuce and carrots deeper than 1/4 inch. You can plant larger seeds such as peas, beans, and zucchini 1-1/2 inches deep. As you sow the seeds in the furrow, try to space them properly to reduce the amount of thinning you'll have to do later.

Although single-row planting is quite popular in the home garden, it is not nearly as efficient as wide-row planting or other planting methods describes on page 8.

Vine crops and pole beans can be planted in rows or planted in hills and thinned to three plants per hill. A "hill" is a group of plants growing in a cluster. Sometimes a mound of soil 3 to 6 inches high is formed for better drainage. Yields from hill planted crops are usually not as large as from those planted in rows.

After planting, be sure to label the rows with the date planted, the kind of vegetable and the cultivar. And re-draw your plan to show what you planted if it is different from your original plan.

If the soil is dry, water gently when you have finished seeding.

Planting Methods

Single rows can be made with the end of a hoe handle.

A well around each transplant holds water so the plant gets off to a good start.

Use a garden rake to make wide rows. Sprinkle seeds uniformly across the row and cover with soil.
### Activity - Gardening efficiency, wide or single rows?

Plant two single rows of radishes 3 feet long with 1 foot between. Later, thin the radishes to 1 inch apart.

Make a second row 1 feet wide (or the width of a garden rake) and 3 feet long. Plant the radish seeds across the whole row, spacing the seeds about an inch apart. Later, thin the radishes to 1 inch apart.

Count the number of radish plants in each section. Which has more? Which planting method uses your garden space more efficiently?

### Planting Transplants

When you buy transplants, select short stocky plants of recommended cultivars from your local garden center. Transplants should already have been hardened-off and be ready to plant.

Plant seedlings the recommended distance apart. They shouldn't need any thinning if you plant them where they are supposed to grow. (See Table 1 for recommended spacings.)

Most plants should be planted at the same level they were growing in the pot. Tomatoes can be set deeper since they root easily along the stem.

If plants are in peat pots be sure to break off the top edges and remove the bottoms of the pots so the roots can grow. If you leave the top edges on and they stick above the soil, they will draw water out of the soil like a wick and the plants may die.

Remove all other pots completely before planting. Lightly firm the soil around the transplants and water them. A water soluble starter fertilizer solution will give the plants a boost. A fertilizer high in phosphorus (the middle number in the analysis) will help seedlings grow more vigorously.

To make a starter fertilizer solution dissolve 1 or 2 tablespoons of a complete water-soluble commercial fertilizer such as 8-32-16 in 1 gallon of water. Water each plant at transplanting time with 1 cup of the liquid. Be sure the fertilizer is dissolved and the solution is well mixed to avoid injuring the plant. DO NOT USE more than the rate recommended above or you may injure or kill your plants.

Keep transplants well-watered and protected from harsh winds and bright sun until they are well established. Seeds also must be kept moist to ensure proper germination. Once a seed has taken up water, you can't let it dry out or it will die.

Remember to try some of the space-saving techniques mentioned on page 8 for more efficient use of your garden space.

### Caring for Your Garden

#### Watering Your Garden

Seeds need water to germinate and grow well. A vegetable garden needs about 1-1 1/2 inches of water a week to yield well. If your soil is sandy, or if it is very hot and dry, the garden may need even more water.

Water thoroughly. The soil should be soaked to a depth of 6 to 8 inches. Frequent shallow watering causes roots to grow shallow making them more sensitive to drought.

When you're using a sprinkler, place several empty tin cans throughout the garden to catch water. Keep track of how long it takes to collect 1 inch of water in the cans. This will tell you how long it takes to put one inch of water on the garden. You'll also see the sprinkler pattern so you can adjust it for equal water coverage.

Watering with a hand-held hose is probably the least efficient way to water your garden. Without a sprinkler nozzle, water from a hose flows fast and with high pressure. The soil can be washed away leaving the roots exposed to the sun and wind. Watering with a hose also can pack the soil so it seals over and water runs off instead of soaking into the soil. Finally, even if you hand water with a sprinkler nozzle, it takes so long to thoroughly water the entire garden, there is a tendency to water too little.

Water early in the morning. Early watering allows the foliage to dry before night reducing fungal diseases. It is also more efficient because the weather is cooler so less water evaporates and winds are usually calm so less water is blown away.
Mulching Your Garden

Mulching can reduce the amount of water your garden needs. There are two kinds of mulches. Inorganic mulches include clear and black plastic. Organic mulches include grass clippings, dry leaves, straw and newspapers. They are the most commonly used mulches in home gardens.

Caution: If your lawn has been treated with a herbicide wait until your lawn has been mowed four times before using the grass clippings as mulch. Otherwise your plants may be severely injured by any herbicide residue.

Other advantages of mulches are they:
- help smother weeds,
- lessen soil compaction,
- reduce soil erosion,
- help keep fruit (such as tomatoes and cucumbers) clean, and
- can increase yields.

Organic mulches also insulate the soil from heat and cold and, when incorporated into the soil at the end of the season, add organic matter to the soil. This organic matter will help the soil hold more water.

Mulches insulate the soil from the heat and cold like the insulation in your house. Therefore, they should be applied at different times for different crops. If the soil is cool when the mulch is applied, the soil will remain cool. In the summer mulches keep the soil from getting too hot.

Cool season crops will appreciate mulch before the soil gets too warm. Apply one to two inches after the plants are up and established. Warm season crops, such as tomatoes, peppers and squash, like their roots to be warm. If you mulch too early the soil will stay too cool for good growth. Wait until the soil has warmed before mulching warm season crops.

Some mulches on leafy crops can be a nuisance, too. For example, grass clippings as mulch tend to stick to lettuce and spinach leaves and take forever to remove when washing the produce. On the other hand, mulches will keep dirt from splashing garden plants so the produce is not as dirty when harvested.

Controlling Weeds

Weed control begins soon after your garden is planted. Weeds are easiest to control just as the seedlings emerge. At this stage, scraping the soil with a hoe will cut off the weeds so they dry out and die.

Once weeds get a foothold, they are hard to control. If you let the weeds grow, they will crowd and shade your vegetables reducing their yield. Shallow hoeing a day or two after watering or a rain is a good time to stop weeds. Hoe in the morning before it gets hot, then the afternoon sun will dry out and kill the uprooted weeds. Controlling weeds also will prevent disease and insect infestations.

Some weeds harbor pests which may then be transferred to your garden plants.

Pulling or hoeing a few weeds each time you harvest vegetables will help you keep ahead and maintain a weed-free garden all summer long.

A small weed-free garden can out-produce a large unkept one, both in quality and quantity of vegetables. If you can’t keep ahead of the weeds in a large garden, try gardening a smaller plot.

Thinning Seedlings

Most people plant their seeds too thick. When seedlings emerge too crowded you need to thin them. Like weeds in a garden, crowded seedlings rob each other of space, food, water and sunlight. Overcrowded plants often are misshapen and have reduced yields.

Thin your seedlings when they are 1 to 2 inches tall and the soil is moist. Hold the soil firmly with one hand while pulling the neighboring plant with the other hand. This helps prevent damage to the roots of the plants that remain.

Some people prefer to snip the

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Hoeing weeds

Shallow hoeing removes weed seedlings without damaging transplant roots.

Proper thinning gives individual root crops room to grow.
excess plants off with scissors so the roots aren’t disturbed. Try both ways and see which you prefer.

Do double-duty and pull any weeds at the same time you thin seedlings. This saves extra work later on.

Lettuce and spinach can be thinned several times. The first time you thin, remove seedlings until those remaining are 1 to 2 inches apart. As the plants grow continue to thin and use what you pick in salads and sandwiches.

Managing Insects in Your Garden

Insect pests can be a nuisance in the garden because damaged plants produce fewer vegetables. By carefully monitoring and watching your garden, you can keep ahead of insect problems. Before you can deal with insect pests, it helps to know a little about insects and how they eat.

If you look at how your plants are being damaged, you may be able to find out what kind of pest is causing the trouble.

Insects get food in several ways, depending on the type of mouthparts they have. Therefore, the type of damage they do to plants also depends on their mouthparts. For example, insects with piercing-sucking mouthparts feed on plant sap by sucking it through their “beaks,” similar to the way a mosquito sucks blood when it “bites.” Insect pests that feed on sap can cause stunted growth, wilted leaves, yellowing, speckling and browning. These insects also can spread diseases from plant to plant. Common sap-feeding insect pests include aphids, spider mites, thrips, whiteflies and leafhoppers.

Insect pests with chewing mouthparts chew on leaves, stems, fruits, or roots. Plants damaged by chewing insects will have some parts missing. Also, some insects may damage plants by tunneling into the roots or stem. Leaf-feeding insect pests include grasshoppers, caterpillars, and beetle adults and larvae. These insects also can carry diseases from plant to plant.

To better control insects, it helps to know about insect life cycles. There are two types of life cycles in the insect kingdom. Most insects develop from the complete life cycle. This life cycle has four stages of development: egg, larva, pupa and adult. Common insects that have this type of life cycle are moths, butterflies, flies, beetles and wasps.

The other life cycle is called an incomplete (gradual) life cycle. Insects produced from the eggs have the same general appearance as the adult, only smaller, and can’t use their wings. As the insect grows it molts or sheds its exoskeleton. After each molt the insect looks more like the adult. Some insects with this type of development include grasshoppers, crickets, praying mantises and thrips.

To raise high-quality vegetables, you need to try to prevent or reduce insect damage. Many gardeners deal with insects through a pest management program. Pest management is different from pest eradication and pest control. Over the years, we have learned that we'll never completely win the war against insect pests. We can, however, deal with or manage insect pests for a short time so we can have a productive garden.

Cultural Control

Cultural practices can help reduce the number of insect pests in your garden. Healthy, vigorously growing plants usually are less subject to attack by insects. However, certain vegetables are naturally more vulnerable than others.

Here are some ideas to help you prevent insect damage in your garden.

1) Use plant “collars” around transplants to prevent cutworm damage. Recycle juice cans, milk cartons or other similar containers and place them around the stem of the plant to prevent insect attack.

Praying Mantis

Lady Bird Beetle

Beneficial Insects

Bean Leaf Beetle

Aphid

Insect Pests
Be sure the container is large enough to allow the stem to grow. Cutworms like to hide in the soil around the base of plants during the day. Make sure there is not one hidden inside the perimeter of the collar.

2) Rotate your vegetable crops. Many insects overwinter in the soil. Don’t grow the same family of vegetables in the same place as the year before.

3) Remove or turn under all garden plants in the fall. Plants left in the garden can be overwintering sites for insects. Remove heavily infested plants and put them in the trash or compost pile. A well-constructed compost pile should heat up enough to kill many insects and diseases.

4) Purchase healthy, insect-free transplants. Some crops are easier to grow without serious pest problems than others. Leaf lettuce, asparagus, peas, rhubarb, okra, onions, and, in spite of vine borers, summer squash are easy to grow. Easy to grow herbs include basil, parsley, chives and thyme.

**Biological Control**

Insect pests have natural enemies such as predators, parasites and insect diseases.

For example, cole crops such as broccoli, cabbage and cauliflower are bothered by cabbage loopers and imported cabbage worms. However, these pests are easily controlled with a naturally occurring bacteria *Bacillus thuringiensis* (Bt). As an insecticide, Bt kills the larva (caterpillars) of the Lepidoptera family of butterflies and moths. It also can control other insect pests like Colorado Potato Beetle and bean beetles, but is not as effective as on caterpillars.

Some common beneficial insects that are predators of other insects include: lady bird beetles (lady bugs), praying mantises, dragon flies, predaceous flower bugs and spined soldier bugs. Wasps and flies are common parasites that live on or in other insects. And, just like people, insects can get sick and die from diseases caused by viruses, bacteria and fungi.

The honey bee is probably the most beneficial of all insects. Without honeybees to pollinate many of our crops there wouldn’t be any fruit. If you apply pesticides to your garden, be very careful they don’t hurt bees and other beneficial insects.

**Mechanical Control**

Mechanical control refers to actions or devices used directly against insect pests. Mechanical control can be as simple as picking insects or their eggs off plants or hitting them with a fly swatter. Other examples of mechanical control include insect traps and barriers and screens that keep insects from reaching plants.

Lightweight row covers such as Reemay® can keep insects off of plants. You place row covers over rows after planting. Air, water and sunlight pass through the fabric but insects cannot. The covers also help hold in heat so plants grow quickly. On insect-pollinated crops, such as squash and melons, the row covers have to be removed for pollination and fruit set.

**Chemical Control**

At some point you may need to use chemical insecticides on your garden to control heavy infestations of pests. Check with your local Extension office for current recommendations. Ask your parents to help you with any insect or disease controls. Chemical control can be safe and efficient if you apply it properly and follow the label directions.

When using any product for pest control, always read and follow the directions on the product label carefully. Do not use more than the label recommends.

Your best approach to dealing with insect pests may differ every time you have a pest problem. Each time that you need to deal with insect pest think about the choices you have for taking care of the problem. For a good pest management program, follow these steps:

1. Check your plants often. Look at them closely and try to identify any problems.

2. If the problem is an insect, identify the insect pest. You may need to ask your Extension agent or project leader to help you identify the problem insect.

3. Decide how much damage the insect pest could cause.

4. List the various ways you could control the pest and the pros and cons of each.

5. Use the “best” combination of ways to control the insect pests.

The “best” pest management program will vary with each crop, season, gardener, soil type, etc.

Consider enrolling in the 4-H Entomology projects to learn more about insects.

**Controlling Disease in Your Garden**

Diseases are caused by bacteria, fungi, viruses and other organisms too small to see with the naked eye. As with insect pests, there are cultural practices that can help reduce disease in your garden.

1) Select disease resistant cultivars. Plant breeders work hard to develop plants that need fewer pesticides. Read descriptions in seed catalogs or on seed packages to find out which cultivars are tolerant of or resistant to disease.

2) Water your plants early in the morning so the foliage will have all day to dry. Nighttime is usually
more humid so foliage doesn’t dry well and diseases grow more easily.

3) Water your plants at the base to keep foliage dry. Soil splashed on the plant foliage can carry and spread disease organisms.

4) Use mulch. Mulching reduces soil splashing when you water. It also helps keep soil moist and temperatures even.

5) Rotate your vegetable crops. Diseases can overwinter in the soil and attack next year’s plantings.

6) Remove all diseased plant parts before they can infect other plants in your garden. Don’t put diseased plant material on the compost pile, as the pile may not get hot enough to kill the disease organisms.

7) Check with your local Extension office for up-to-date information on fungicides. Ask your parents to help with any spraying you have to do. Always read and follow label directions.

Harvesting and Storing Your Garden Produce

If you have not grown a particular vegetable before and aren’t sure when to harvest it, check the produce at your grocery store. Commercial growers harvest their produce at its peak so comparing those vegetables with yours can help you decide.

The publication 4-H 226, Selecting and Preparing Vegetables, Fruits and Herbs for Exhibit, gives lists sizes for exhibiting produce. Whether picking produce to eat or exhibit at the fair, the instructions in 4-H 226 will help you pick prime produce.

Storing your vegetables properly will help to preserve the quality for the longest period of time. For example, tomatoes and squash were originally from the tropics. They do not like cold temperatures and will show chilling injury when stored below their minimum recommended temperature. Symptoms of chilling injury are decay, pitting, discoloration, softening and poor flavor.

If you have extra garden produce, check the list below to find out the storage requirements. Does your refrigerator have special drawers for produce? If so, they usually help keep vegetables and fruits fresh longer.

Recommended Storage Temperatures and Relative Humidities for Selected Vegetables:

32°F, 95-100% humidity
- Beet
- Broccoli
- Cabbage
- Carrot
- Cauliflower
- Leek
- Onion, green
- Pea
- Radish
- Rhubarb
- Sweet corn

40-45°F, 95% humidity
- Bean, snap
- Bean, lima
- Summer squash

45-55°F, 90-98% humidity
- Eggplant
- Cucumber
- Melons
- Okra
- Pepper, sweet
- Pepper, hot (fresh)
- Tomato, ripe

55-75°F, 90-95% humidity
- Tomato, green

33-35°F, 95-98% humidity
- Marjoram
- Mint
- Oregano
- Parsley
- Rosemary
- Sage
- Savory
- Thyme

40-42°F, 95-98% humidity
- Basil

You may want to enroll in 4-H Food Preservation projects to learn how to preserve your produce for the winter months.

Fall Garden Cleanup

To get a head start on next year’s garden start preparing the ground this fall. After you have harvested your produce and there have been several hard freezes, spade, rototill or plow under your garden. If you wait until after several hard freezes, many insects will be killed before you till. Remove any severely infested or infected plants and throw them away. If you’re spading by hand, mowing the dead plants first will make it easier to incorporate them into the soil or put them on your compost pile.

Don’t cultivate and work the soil into a seedbed condition in the fall. Rough soil will collect snow and rain for moisture next spring. Freezing and thawing over the winter months will help break the soil apart so it is easier to work next spring.
Activity - Planting and Harvest Record

Keep an accurate record, so you will know the value of your garden's produce at harvest and have a plan for next year's garden.

Fill out the garden record sheet. Use a separate line for each cultivar or variety growing in your garden. Add additional pages if necessary.

As you harvest the produce, record the amount or weight on your record sheet. At the end of the season total the amount of each crop harvested and complete the rest of the sheet.
**Glossary**

**Annual** - a plant which completes its life cycle (from seed to seed) in one growing season (zinnia, marigold, tomato, bean).

**Biennial** - a plant that requires parts of two growing seasons to complete its life cycle. Vegetative growth occurs during the first year, with flowers and fruits produced during the second year, followed by the death of the plant (carrots, parsley and onions).

**Cold frame** - a bottomless, box-like structure with a removable transparent top used for protecting, propagating or growing plants.

**Compost** - a mixture of organic materials such as leaves, grass clippings, straw, and manure that are decomposed to a dark crumbly material. Used as fertilizer, mulch and a soil amendment.

**Cool season** - refers to plants that will grow best in cool weather — spring or fall. Most cool season plants can withstand some frost and can be planted in the spring before frost-free weather.

**Crucifer** - a member of the mustard family including: broccoli, cabbage, cauliflower, brussels sprouts, mustard kale, etc. Commonly called cole crops.

**Cultivar** - a contraction of "cultivated variety." It refers to a plant within a particular cultivated species that has been developed for its specific characteristics. For example ‘Sugar Snap’ and ‘Sugar Bon’ are two cultivars of edible pod peas.

**Cultivate** - to loosen or break up the soil around growing plants in order to kill weeds and let air and water enter the soil more easily.

**Cultivator** - a gardening hand tool used to loosen the soil and destroy weeds. Or a small powered tiller used to loosen the soil.

**e.g.** - Latin for *exempli gratia* meaning “for example.”

**Exoskeleton** - the body wall of insects that serves as a protective covering and a rigid attachment spot for muscles.

**Fertilizer** - a substance that provides nutrients for plant growth. Fertilizers may be organic (compost, livestock manure) or inorganic (commercially produced fertilizer).

**Germinate** - to begin to grow or sprout (as with seeds or spores).

**Harden-off** - to increase the stress resistance of plants grown indoors to the more severe conditions outside (sun, wind and cooler temperature) by gradually exposing them to cooler outdoor temperatures and winds.

**Interplanting** - method used to maximize production in a vegetable garden when a faster maturing crop (e.g. leaf lettuce) is planted between a slower maturing crop (e.g. tomatoes).

**Lime** (limestone) - a compound made of calcium and/or magnesium oxides, carbonates and/or hydroxides used to neutralize soil acidity.

**Macronutrient** - nutrients used by plants in the greatest quantity. They are nitrogen, phosphorus, potassium, calcium, magnesium and sulfur.
Micronutrient - nutrients used by plants in very small amounts. They are boron, iron, manganese, copper, zinc, molybdenum, chlorine, cobalt, vanadium, sodium and silicon. Not all plants require all of the micronutrients.

Nutrient - the mineral elements necessary for plant growth. The three nutrients used in largest quantities are nitrogen (N), phosphorus (P), and potassium (K). There are 16 essential nutrients.

Perennial - a plant which lives for more than two years. Herbaceous plants have stems and/or leaves that are produced and die back annually while underground stems and/or roots stay alive, e.g. asparagus, rhubarb, chrysanthemums. Woody perennials, e.g. trees and shrubs, have aerial stems that may live for many years.

Pesticide - a general term for any chemical used to kill or control plant pests, e.g. fungicide, herbicide, insecticide, etc.

Pheromone - a chemical substance secreted by an animal or plant that influences the behavior and/or morphological development of other animals of the same species; pheromones also may be used as a means of communication between organisms.

Photoperiod - day length; often used specifically as the length of exposure to light required for some developmental functioning of an organism.

Photosynthesis - the process whereby light energy is converted into chemical energy in the presence of chlorophyll. It involves the production of a carbohydrate from carbon dioxide and water with the release of oxygen.

Plant pests - a general term for all life forms that are destructive to plants, including diseases, predators and weeds.

Side dressing - method of fertilizing the flower or vegetable garden where granular fertilizer is applied in bands 6-8" away from the base of the plants along a row, raked in and watered thoroughly.

Soil pH - measurement used to express the acidity or alkalinity of a solution (including soil). Ph values range from 0-14, pH 7 is neutral, less than 7 acidic and greater than 7 alkaline. Optimum soil pH for most vegetables is 6.5-6.8.

Succession planting - a method used to maximize production in the vegetable garden. As one crop is harvested it is followed immediately by another crop in the same location.

Starter solution - a fertilizer solution applied to the soil around plants when they are transplanted to the garden. Generally high in phosphorus to help seedlings get off to a vigorous start.

Transplant - a small seedling started indoors or other protected location that will eventually be potted or moved to the garden.

Variety - a group of closely related plants of the same species, all which share certain characteristics. For example, edible pod peas vs. English peas, and red skinned potatoes vs. russet potatoes. Each variety may contain several cultivars.

Warm Season - refers to plants that grow best in warm weather and that are injured by frost. Most warm season crops should be planted after all danger of frost has passed.