Crop rotation and companion planting

Part of garden planning involves deciding where to plant certain crops in the garden each year. You will need to figure out which crops benefit from following other kinds of crops (crop rotation) and which crops make good neighbours (companion planting).

Crop rotation

The basic idea of crop rotation is to avoid planting the same vegetable in the same spot each year. There are several important reasons to do this, especially if you want to avoid using pesticides. By moving the crops, pests and diseases are less likely to be a problem. Planting in the same spot allows a build-up of pests and diseases, many of which overwinter in the soil. It's important also to understand that crops in the same family are subject to the same pests and diseases. So, when planning your rotation, make sure you are not putting a member of the same crop family into a less than desirable location. Ideally, wait three to five years before growing the same vegetable, or a closely related one, in the same location. (See Table 1 for vegetable families.)

Rotating crops also makes better use of soil nutrients. Each crop takes up a particular amount and combination of nutrients from the soil. Growing a crop in the same spot year after year can deplete the soil. A good guideline when starting a rotation is to bring your soil to the best possible condition, then grow a heavy-feeder in year one, followed by a medium-feeder, and then one or two years of light-feeders. Be sure to boost soil fertility (with extra compost or green manure) before returning to a heavy feeder (see Table 2).

Consider families of vegetables when planning rotations. © Lana Bos, Dalhousie.

TABLE 1. VEGETABLE FAMILIES

Brassicaceae	**Cucurbitaceae**
Broccoli Brussels Sprouts Cabbage Cauliflower Kale Kohlrabi Radish Rutabaga Turnip	Cucumber Gourds Muskmelon Pumpkin Squash Watermelon
Solanaceae	**Apiaceae**
Eggplant Pepper Potato Tomato	Carrot Celery Fennel Parsley Parsnip
Chenopodiaceae	**Fabaceae**
Beets Chard, Swiss Spinach	Beans Lentils Peas
Asteraceae	**Alliaceae**
Artichoke Endive Lettuce	Garlic Leek Onion
Poaceae	**Liliaceae**
Corn	Asparagus

Legume crops, like beans and peas, are especially good at boosting soil nitrogen fertility. Legumes form a symbiotic relationship with soil bacteria called "rhizobia". These bacteria are able to capture nitrogen from the air and feed it into the plant's roots. If you dig up a legume plant, you should see small balls or nodules on the roots. Rhizobia live in the nodules. It's a good idea to use a legume inoculant when planting legumes in soil where they have not been grown before. The inoculant contains various species of rhizobia and ensures a good population in the root zone.

TABLE 2. VEGETABLE NUTRIENT REQUIREMENTS

Heavy-feeder	Medium-feeder	Light-feeder
Asparagus (perennial)	Beans	Chard, Swiss
Broccoli	Beets	Herbs
Brussels Sprouts	Cabbage	Parsley
Cauliflower	Carrot	Peas
Celery	Garlic	Radish
Corn	Kohlrabi	Turnip
Cucumber	Leek	
Eggplant	Lettuce	
Kale	Parsnip	
Onion	Pepper	
Muskmelon	Potato	
Potato	Rutabaga	
Pumpkin	Spinach	
Rhubarb	Watermelon	
Squash		
Tomato		

In this simple arrangement broccoli has been planted inside the circles of leaf lettuce. After the lettuce season is over, the broccoli continues to grow in the space, making efficient use of available space in a multi-crop set-up. © Lana Bos, Dalhousie.

Companion planting

A gardener may use companion planting for various reasons. Pest control is often the main goal, but companion plants can also make more efficient use of space and nutrients and may add visual interest.

Companion plants can be used to attract beneficial insects, like parasitic wasps or predaceous flies. These help manage pests in the garden. Attractant plants usually have lots of small nectar-filled flowers. Examples include dill, fennel, Queen Anne's lace, yarrow, and zinnia. Other plants discourage pests by directly repelling them or by disguising your vegetables (because they have a similar scent or colour). Plants with repellant qualities include basil, coriander, mint, parsley, tansy, and thyme. Try planting dill or mint to keep white cabbage moth from your cabbage and broccoli. Scented marigolds are thought to repel nematodes - plant them thickly and work into the soil at the end of the season.

Some companion plants work well together because they make efficient use of space or nutrients. If you plant deep-rooted and shallow-rooted vegetables together, they will make the best use of nutrients in all layers of the soil. Think about combining sun-loving and shade-loving crops; heavy-feeders and light-feeders; slow-growing and fast-growing crops; and nitrogen-fixing crops (such as peas and beans) with nitrogen-hungry crops (such as corn).

Certain plants make bad neighbours. Avoid planting related crops close together because they attract the same pests. Avoid planting tall crops in a position that will shade sun-loving crops. And, be aware that some plants, such as sunflower and rye grass, secrete protective substances into the soil through their roots ("allelopathy"). Neighbouring plants may be sensitive to these substances.

Keep in mind that many of the suggestions on this type of companion planting are based on folklore. Consult a book or website on the subject and have fun conducting your own experiments and finding the best combination for your garden!

Activity 1

Design a three year rotation plan for your garden.

Draw a large rectangle on a piece of paper. This will represent your garden. Divide the rectangle into three equal parts. You now have a diagram of three beds that you can use to plan a simple rotation. For this exercise, we will divide vegetable crops into three groups based on the amount of nutrients they need:

1. Heavy-feeders
2. Medium-feeders
3. Light-feeders

List three heavy feeding crops in the first 'bed' of your diagram. List three medium-feeders in the middle bed and three light-feeders in the last bed. These are the crops you will plant in year 1.

Draw two more large rectangles and divide them into three equal parts. These rectangles will represent your garden in years 2 and 3.

Every year, rotate each group to the next bed; heavy-feeders go to the light-feeder's previous spot, moderate-feeders go to the heavy-feeder's previous spot, and light-feeders go to the moderate-feeder's previous spot.

Using different coloured markers, mark the crops on your diagrams that are in the same families. Are crops of the same family located in the same bed in subsequent years? You may have to do some juggling to best meet nutrient needs and to prevent build-up of pests and diseases!

Activity 2

Make a chart of garden friends and adversaries.

Look for a book or website on companion planting and make a chart of garden friends and adversaries. See how you can fit companion planting into your garden rotation plan.