

# Organic Vegetable Gardening

Compiled by Elaine Rude,  
Paintbrush Farm Calgary, AB

[elaine@luv2garden.ca](mailto:elaine@luv2garden.ca)

[www.luv2garden.ca](http://www.luv2garden.ca)

## Why go organic?

- Is sustainable as it works with the site and climate of each garden
- the use of harmful toxic chemical herbicides, pesticides and fertilizers can kill the soil's microbial life and leave persistent harmful salt and chemical residues
- healthy soil is full of life providing nutrient-rich produce
- strikes a balance between natural systems (harmful bugs and beneficial bugs)
- is more cost effective

## Soil

Everything starts with the soil. Healthy soils have an abundance of microbial life, insect life and earth worms all of which work to break down organic matter making nutrients available to plants and providing humus which improves soil texture and structure.

There are four properties to consider: texture, pH, fertility and life.

**Texture**-refers to the amount of clay, sand and silt particles in soil

- Clay soils- particles are very small, electrically charged so attract minerals and water, but have small air and water spaces. Hold water well.
- Sandy soils- large particles that allow water and minerals to flow through quickly thus tend to have low nutrient holding capacity, warm up faster in spring.
- Silt particles are intermediate sized. Water and nutrients move through quickly
- Adding organic matter improves soil structure, water holding capacity and drainage, moderates pH, adds humus and enhances beneficial microbial life
- Soil tests: 1)texture- rub a small amount of soil between your fingers
  - sandy soils feel gritty, silt feels like flour, clay feels slippery2) composition- add a handful of soil to two cups water and a tablespoon Calgonite and shake well
  - allow the different components to separate out and measure
  - this determines the percentage of each in the soil

**pH**-refers to the degree of alkalinity or acidity within a soil (scale of 1-14).

- most Calgary and area soils are alkaline with a pH around 6.5-8 (7 is neutral)
- pH affects the absorption of nutrients
- most plants prefer to grow between 6.0 and 7.5 which allows for the greatest range for nutrient availability

**Fertility**-refers to the amount of nutrients available in the soil

- major nutrients are nitrogen (N), phosphorus (P) and potassium (K)
  - nitrogen is used for leaf and stem growth
  - phosphorous is used for root growth, flower, fruit and seed production, hastens plant maturity and improves winter hardiness
  - potassium is used to improve overall plant health, ripen fruit, every cellular function relies on potassium
- micronutrients are used in small amounts include: calcium, magnesium, sulfur, boron, copper, iron, manganese, molybdenum, sodium and zinc
- compost, organic amendments and organic fertilizers can help improve soil fertility by making nutrients

available slowly and consistently

- soil tests are useful for nutrient profiles, good soils tend to have all that's needed

**Life-** refers to the bacteria, fungi, nematodes, protozoa, insects and their larva, earthworms and animals that inhabit the soil

- soil organisms capture and break down organic material making them available for plants
- bacteria and fungi build soil aggregates while the actions of other creatures through the soil build air spaces for air and water
- enhance roots abilities to obtain nutrients and mineral by manufacturing what the plant requires
- the balance of good and bad life help prevent disease organisms from taking hold providing the plant with increased disease resistance

**Soil Food Web is composed of all the creatures and microbes.**

- All soil life searches out food that is carbon rich
- Plant roots secrete a mixture of carbon rich carbohydrates that attracts bacteria and fungi. These guys are then eaten by bigger microbes, nematodes and protozoa, that take what they want and excrete the rest.
  - the bacteria act like small fertilizer packets that the bigger microbes dispense
- studies have shown that plants excrete certain carbohydrates throughout the seasons to attract different microbes to provide the plants with their nutritional needs
- insects and their larva eat the nematodes, protozoa and themselves. In their pursuit of food they aerate the soil.
- worms and larger animals serve to aerate the soil and in death will be decomposed by fungi and bacteria completing the cycle

**Organic matter** is the key to healthy soil. Organic matter can be compost, aged animal or mushroom manure, shredded or composted leaves, grass clippings, green manure crops, weed free straw or hay and kitchen wastes. If amendments are needed they can be mixed in directly to compost or mixed directly into soil. Available organic amendments include: bloodmeal (N), rock phosphate (P), greensand(K). Alfalfa meal provides N plus a wide array of micronutrients. Kelp meal and seaweed extracts are also a good source of micronutrients.

**Remember you are feeding the microbes not the plants!**

**Humus** is the result of decomposed organic matter. It has long hard to break chains of carbon that are highly convoluted. This increases its surface area immensely allowing numerous microbes to attach and live. The strands are also electrically charged so attract water and minerals keeping them from being drained out of the soil by gravity.

**Microbial Teas**

- Contain millions of microbes
- Spray on plants and soils to supercharge the microbial content of soils
- Increase disease resistance, improve nutrient uptake and soil structure
- Need to sprayed on in the cooler parts of the morning or evening as they require moisture to allow the microbes to become established
- Can be purchased or homemade using worm castings

**To Dig or Not to Dig, that is the Question**

Current thought on digging or rototilling soil is don't do it. Weed seeds lie dormant within the soil so every time it is disturbed seeds are brought to the surface. Also, deep digging destroys a soil's structure, pulverizing air and water spaces, and chasing earthworms away. Lightly ruffle any amendments into the top layer of soil or apply only on top and let worms and weather do the work for you.

## Designing a Garden

1. Location-as much sun as possible yields the best results
2. Size-make it only as large as you can care for
3. access and proximity to water
4. where will it be viewed from

## Styles: Raised Beds, English Cottage Gardens, French Potager and Square Foot Gardening, Garden Beds, Containers

- **raised beds** are made with non-treated timbers, rocks, or cement blocks
  - advantages include:
    - soil warms up quickly and drains quickly (this is a disadvantage too)
    - can control soil composition
    - easier to reach
    - utilizes space, garden loam and amendments more efficiently
- **English Cottage Gardens** are a mixture of edible flowers, herbs vegetables and fruit. Practices companion planting for best results. Pathways or stepping stones throughout prevent walking on the soil and allow access to produce
- **French Potager**- is basically an ornamental cottage garden. The garden is designed utilizing edible flowers, fruit, vegetables and herbs but more ornamental cultivars are used. Designs utilize the concepts of form, texture, colour and contrasting shapes. As crops are harvested others are seeded or added to maintain the design. More formal designs can be labour intensive to maintain.
- **Square Foot Gardening**-divides a garden into 12 inch squares with a plant or plants planted in each square. The benefits include:
  - utilizes space very efficiently
  - easy to practice companion planting
  - increased harvests in limited spaces
- **Bed system**-similar to raised beds but does not require materials to build. Top soil is raked into four foot wide beds with pathways in between.
  - The benefits include:
    - cheap to make
    - efficient use of space and top soil
    - soil warms quickly but holds moisture better and longer
    - can still practice intensive and companion planting
- **Containers**- need to be large and deep
  - especially good for growing warm weather crops
  - suitable for condo/apartment dwellers, children and seniors
  - use amended container mixes rather than straight garden soil

## Organic Growing Techniques

1. **Companion Planting** is the practice of planting particular plants near one another to enhance growth or repel pests and diseases or to attract beneficial insects to the garden. Not all plants are beneficial to each other.
2. **Rotation** of crops is a practice that prevents the depletion of minerals in the soil and decreases pest and disease infestations. Crops that are light feeders or are soil builders are grown after heavy feeding crops. A three to five year crop rotation is ideal. Crops belonging to the same family should not be grown in the same bed or area for this time which helps prevent increases in pest attacks or other diseases.
3. **Mulching** is very beneficial in short season, dry climates. Mulches can be organic ones such as compost, grass clippings, hay or shredded leaves; or can be inorganic such as black plastic, infrared plastic or clear plastic.

- The benefits of mulch are numerous:
  - conserves moisture and keeps roots cool
  - as it breaks down feeds the soil's microorganisms (preferred type)
  - helps prevent soil borne diseases splashing onto crop foliage
  - inorganic mulch (plastic) can help warm the soil earlier
  - prevents weed seeds from germinating
  - infrared mulches help to ripen some crops earlier
  - prevents topsoil from being blown away
  - mulching with aluminum foil is reputed to confuse aphids preventing them from landing
- Water Availability- water moves through the soil by gravity and capillary action
  - gravitational water** moves quickly through the larger pore spaces in the soil
  - it displaces air in the soil but as it moves through fresh air is brought in
  - capillary water** is attracted to small pores by the principles of adhesion and cohesion and is not affected by gravity
    - it creates a surface tension causing water to form a thick film on soil particles that is used by plant roots
  - hyroscopic water** is a very thin layer of water molecules that attaches itself to small particles.
    - its bonds are very strong so the water is not available to plant roots but is used extensively by soil life for all its activities
    - this type of water is extremely difficult to remove ex) very exposed, windy
- **Irrigating** is very important as most of the vegetables we grown require a lot of water. We also live in a semi-desert climate with an average rainfall of only 19inches/year and most of that occurs April-June. Collecting and using rainwater is the best. Rainwater is slightly acidic, contains atmospheric nitrogen and is soft.
 

Gray water can also be used as long as it doesn't contain harsh detergents and chemicals. Water barrels and tanks at all the downspouts are a good way to collect water.
- **Water Conservation Techniques:**
  - Water deeply either in the early morning or late afternoon/ early evening
  - use soaker hoses or drip irrigation so water is placed where needed
  - hand watering
  - use mulches or tight planting to keep soil cool and prevent evaporation
  - provide wind protection
  - control weeds as they compete for moisture.
- **Season Extenders** can help us get into the garden earlier and protect crops from early frosts so they can ripen. They also allow us to grow warm season crops that normally wouldn't be able to grow here.
  - Cloches, plastic tunnels, wall-o-water (cozy coats), floating row covers, cold frames
  - Row covers come in a variety of weights (degrees of frost protection) so can help warm up the environment and soil a few extra degrees, help protect exposed soil and new seedlings from dessicating winds, and keep pests away from susceptible crops. Permeable to rain and air.
  - Cloches or hot caps are placed over individual plants (mini greenhouse)
  - wall-o-water are plastic tepees that are filled with water and placed around tomatoes, peppers or eggplants, acts like a mini greenhouse. Heat is absorbed by the water during the day and released at night increasing the internal temperature surrounding the plants.
- **Weeds** are just plants that are growing in the wrong place. They are vigorous growers and can choke out slower growing crop seedlings, compete for limited moisture and minerals.
 

However, they do have benefits:

  - prevent soil erosion and help break up compacted soil
  - deep root systems bring minerals to the surface so can be used by crops
  - beneficial insects are attracted by the flowers of some

- are indicators of soil problems (ex. dandelions and thistles grow in high sodium low calcium compacted soils)
- some are edible and highly nutritious (chickweed, dandelion greens, sorrel).

Methods of weed control:

- using mulches to prevent weed seeds from germinating
- remove seedlings and mature weeds before they flower and set seed
- disturb the soil as little as possible
- never allow soil to be uncovered, grow cover crops to replace harvests
- there are organic herbicides available ex) vinegar, corn gluten meal.
- Increase calcium levels and microbial concentrations

## Pests and Diseases

- There is a direct relationship between a plant's growing conditions and its susceptibility to disease and pests. Pests and disease can be indicators of plant stress such as soil and nutrient problems, extremes of temperature and moisture levels.
- **Prevention is key.** The three U's of prevention are:
  1. make the habitat unacceptable
    - adjust pH, promote microbial life in soil
    - companion planting to confuse/repel pests
    - plant crops that have resistance and do well in your area
  2. make the habitat unavailable
    - use physical barriers such as row covers
    - plant crops at the correct time to avoid pesticides
    - interplanting a number of crops together
    - eliminate weeds that might attract pests
    - practice crop rotation
    - closer spacing can prevent pest infestations
  3. make the habitat unsurvivable
    - solarizing for a season will kill virus or soil borne diseases
    - attract beneficial insects by planting attractive plants
    - hand pick pests and destroy eggs before they hatch
    - destroy infested plants, never add to compost

**Prevention:** The key is to find out the cause and correct it. Healthy plants growing in healthy soils will be able to fight off most pests and diseases.

- weekly inspections
- correct problems within the growing environment above and below ground
- choose pest resistant varieties and varieties suited to your climate
- sanitation of containers, tools, gloves and hands
- barriers
- biological controls

**Homemade Pest Recipes**-these can help until the underlying problem can be corrected. There are many effective recipes out there. Here are a few:

- 1tsp baking soda mixed with a few drops of dish **soap** and 1L water
  - kills fungal spores, good for black spot on roses
- soak 1 part compost or worm castings in 5 parts water for one week, keep the mixture aerated, strain if needed, can be used full strength
  - acts as a foliar feed and helps prevent fungal diseases
- skim milk powder, few drops dish **soap** and 1L water

- kills fungal spores especially good for powdery mildew
- soak 85 grams minced garlic in 2 tsps mineral oil for 24 hrs, strain. Add to 600 ml water and 1 tsp dish **soap** and mix. Add 2 tbsp of garlic mixture to 600 mls of water and spray infested plants
  - kills insects on contact and repels insects with its scent
- Neem oil and Insecticidal Soap are good commercial organic pesticides
  - insecticidal soap needs to be washed off one hour after spraying

### **Seeding and Transplants**

- many cool season crops and some warm season ones can be direct seeded into the garden
- choose organic seeds as much as possible
- varieties with long maturities need to be started indoors and put out as transplants once the weather has warmed up
- transplants can be purchased but the variety of cultivars will be limited
- do not purchase root bound transplants as they are unlikely to perform well
- organically grown transplants are available but may require some searching.

### **Vegetable Types**

#### **Cool Season crops**

- are crops that prefer to germinate in cooler soil temperatures

Beet family includes beets, spinach, Swiss chard

- light feeder
- rotate after other light feeders and before soil builder crops

Onion family includes garlic, leeks, onions, and shallots

- light feeder
- after most heavy feeders and before soil improving crops
- seed in the garden as soon as the soil is workable
- can be planted as transplants or onion sets
- garlic needs to be planted in the fall
  - are two types -soft neck which stores well and hard neck

Pea family includes English, dry soup, snow and snap peas, alfalfas, clover and vetches

- light feeder and soil builder
- plant after moderate or heavy feeders
- taller varieties require support

Leafy crops includes lettuces, arugala, endive, kale, mesclun, mizuna and spinach

- moderate feeders
- especially likes onion family members as companions

Cabbage family includes broccoli, cabbages, kale, radishes, rutabaga, brussel sprouts and turnips

- heavy feeders
- follow after a soil building crop
- physical barriers will help keep out the cabbage moth caterpillars

Grass family includes sweet corn, wheat, rye and oats

- heavy feeders
- grain crops are useful as cover crops which bring nutrients to the surface
- corn can be started inside then planed outside in the spring
  - plant deeply until just an few centimeters of the leaves are showing
  - seedlings will tolerate some frost

### Warm Season Crops

- are crops that need warm soil temperatures to germinate or seeds tend to rot.

Bean family includes beans (snap and dried), broad beans and lentils

- are soil builders
- plant after moderate or heavy feeders
- black or tan seeds are a little more resistant to rotting in cool moist soils

Carrot family includes carrots, parsnips, celery and parsley.

- Light feeders
- good after most crops and before soil improving crops
- seeds can take a long time to germinate
  - carrots can't puncture soil crusts so plant with a few radish seeds

Squash family includes cucumbers, gourds, melons, pumpkins, summer and winter squash

- heavy feeders
- best after soil improving crops
- use cloches to warm soil prior to planting or start in coir/peat pots inside
- protect until weather is consistently warm and protect from wind
- need lots of water once flowering starts
  - melons need lots of water prior to fruit set then can taper back

Tomato family includes eggplants, tomatoes, tomatillos, ground cherries, peppers and potatoes

- heavy feeders and need lots of water once fruiting starts
- potatoes can be planted earlier than other family members
- protect until weather is consistently warm and protect from wind
- choose short season varieties to ensure enough time to ripen
- most should be planted as transplants
- if outside, remove all new flowers on tomatoes so that energy will go into ripening fruit, decreasing watering will encourage ripening

### Good Companion Plant Combinations

Vegetable	Good Companions	Bad Companions
Basil	Pepper, tomato	Beans, cabbage, cucumber
Bush Beans	Beet, cabbage, carrot, cauliflower. Celery, celery, chard, corn, cucumber, eggplant, leek, marigold, parsnip, pea, potato, radish, rosemary, strawberry, sunflower	Basil, fennel, kohlrabi, onion family
Pole Beans	Carrot, cauliflower, chard, corn, cucumber, eggplant, marigold, pea, potato, rosemary, strawberry	Basil, beet, cabbage, fennel, kohlrabi, onions,

		radish, sunflower
Beets	Bush beans, cabbage family, corn, leek, lettuce, onion radish	Mustard, pole beans
Broccoli	Bush beans, beet, carrot, celery, chard, cucumber, dill, lettuce, mint, nasturtium, onion family, oregano, potato, rosemary, sage, spinach, tomato	Pole beans, strawberry
Brussels Sprouts	Bush beans, beet, carrot, celery, cucumber, lettuce, nasturtium, onion family, pea, potato, radish, spinach, tomato	Kohlrabi, pole beans, strawberry
Cabbage	Bush beans, beet, carrot, celery, cucumber, dill, lettuce, mint, nasturtium, onion family, potato, rosemary, sage, spinach, thyme	Pole bean, strawberry, tomato
Carrots	Beans, Brussels sprouts, cabbage, chives, lettuce, leek, onions, pea, pepper, radish, rosemary, sage, tomato	Celery, dill, parsnip
Cauliflower	Bush bean, beet, carrot, celery, cucumber, dill, lettuce, mint, nasturtium, onion, pea, potato, rosemary, sage, spinach	Pole bean, strawberry
Celery	Almost everything	Carrot, parsley, parsnip
Chinese Cabbage	Beet, lettuce, onion, radish, spinach	Tomatoes
Chives	Carrot, tomato	Beans, peas
Corn	Bush bean, beet, cabbage, melons, cucumber, parsley, pea, potato, pumpkin, squash	tomato
Cucumber	Bush bean, broccoli, cabbage family, corn, dill, eggplant, lettuce, nasturtium, pea, radish, sunflower, tomato	Aromatic herbs, potato, melons
Dill	Cabbage family, potato	carrot
Eggplant	Bush bean, pea, pepper, potato	fennel
Fennel	Mints, sage and flowers	Just about everything
Garlic	Beets, lettuce	Bean, pea
Greens	Almost everything	Strawberry, pole bean,
Kale	Bush bean, beet, celery, cucumber, lettuce, onion, potato	Pole bean, tomato
Kohlrabi	Bush bean, beet, celery, cucumber, lettuce, nasturtium, onion, potato, tomato	Pole beans
Leeks	Bush bean, beet, carrot, celeriac, celery, garlic, onion, parsley, tomato	Beam. pea
Lettuce	Everything especially carrot, garlic, onion, radish	none
Marjoram	everything	nothing
Onions	Beets, cabbage family, carrot, kohlrabi, lettuce, parsnip, pepper, spinach, strawberry, tomato, turnip	Asparagus, bean, pea, sage
Oregano	everything	Nothing
Parsley	Asparagus, corn, pepper, tomato	none
Parsnip	Bush bean, garlic, onion, pea, pepper, potato, radish	Caraway, carrot, celery



Pea	Carrot, celery, corn, cucumber, eggplant, parsley, potato, radish, spinach, strawberry, pepper, turnip	onion
Pepper	Carrot, onion, parsnip, pea	Fennel, kohlrabi
Potatoes	Bush bean, cabbage family, corn, marigold, parsnip, pea	Cucumber, pumpkin, rutabaga, squash family, sunflower, tomato, turnip
Radish	Lettuce, bean, beet, carrot, nasturtium, parsnip, pea, spinach	fennel
Spinach	Cabbage family, celery, legumes, lettuce, onion, pea, radish, strawberry	Potatoes
Summer Squash	Celeriac, celery, corn, nasturtium, onion, radish	potato
Alpine Strawberry		Cabbage family
Sunflowers	Cucumber	Pole bean
Swiss chard	Cabbage family, legumes, lettuce	Beets, spinach
Tomatoes	Basil, bush bean, cabbage family, carrot, celery, chive, cucumber, garlic, lettuce, marigold, mint, nasturtium, onion, parsley, pepper	Pole bean, dill, fennel, potato
Turnip	Onion family, pea	potato

### Some Good Vegetable Varieties for the Calgary Climate

Bush Beans- Gold rush, Dragon Tongue, Jade, Maxibel, Tendergreen, Royalty, Nickel  
 Pole Beans-Kentucky Wonder or Kentucky Blue, Scarlet Emperor  
 Beets-Chioggia, Touchstone Gold, Rodina, Bull's Blood, Blankoma  
 Broccoli- Early Dividend, Nutri Bud, Green Goliath, Pacman  
 Cabbage-Super Red, Tenderheart, Red Express, Danish Ballhead  
 Cauliflower-Cheddar, Verdant, Snow Crown, Early Dawn Hyb  
 Carrots-Napoli, Nantes, Thumbelina, Dragon, Baby Spike  
 Cucumber-Morden Early, Burpless Bush, National Pickling  
 Corn-Little Indian baby corn, Fleet Bi-colour,  
 Kale-Winterbor, Westlandse Winter, Redbor  
 Lettuce-Black seeded Simpson, Red Sails, Deer Tongue, Brunia, Rouge d'Hiver  
 English Peas- Green Arrow, Homestead, Alaska, Tall Telephone, Paladio,  
 Snow Peas- Dwarf Sugar snow pea  
 Snap Peas- Super Snap, Sugar Lace snap pea  
 Pepper-Sweet Banana Supreme, Chocolate, Hungarian Yellow Hot Wax  
 (are hundreds of varieties to try)  
 Tomato-Tigerella, Gold Nugget, Tumbling Tom, Tumbler, Tom Thumb, Sungold, Purple  
 Prince, Black Cherry, Black Seaman (there are hundreds that can be tried)  
 Summer Squash- Eight Ball, Goldrush, Papaya Pear, Starship  
 Winter Squash- Early Butternut, Spaghetti, Waltham  
 Swiss Chard-Bright Lights, Silverado, Rhubarb, Fordhook Giant  
 Spinach-Tyee, Bordeaux, Bloomsdale Savoy, Olympia  
 Potato-Sangre, Banana, Yukon Gold, Roko, Alaska Sweetheart, German Butter ,  
 French Fingerling, Warba, Bintje (are many different varieties that can be tried)