# Season extension and frost protection

**To get the most out of a garden, you can extend the growing season by sheltering plants from cold weather both in early spring and during the fall.** There are many ways to lengthen the growing season, and your choice depends on the amount of time and money you want to invest.

### Cold frames and hotbeds

A cold frame can be a very simple structure – basically a box without a bottom set on the soil with a glass pane (glazing) set on top. Sizes vary depending on the layout of garden beds and available materials.

The cold frame captures the sun's energy, creating a warmer microclimate within. It keeps plants safe from cold winds and pounding rains while the high humidity inside the frame further protects against frost. This protected environment allows cool-weather crops to flourish in the very early spring, the fall, and even into the early winter months.

*A cold frame can provide a simple method of season extension for the small garden. ©Tracy Kittilsen, Dalhousie.*

The location of your cold frame will have an impact on how well it works. Consider the sun's path during the time of year that you plan to use the cold frame. The low angle sunrays of early spring and late fall are more easily blocked by trees and buildings. To be most effective at this time the glazing on the cold frame should angle slightly to the south or southeast, with minimal shading. Protect the cold frame from winter's north winds by placing it on the south side of a wall or hedge, or by piling soil up on the north side of the frame. Make sure you can easily access the cold frame from the front and leave room at the back to remove the glass top.

Cold frames are very versatile. In the early spring, cool weather crops can be seeded directly into the cold frame and then later transplanted into the garden or left to grow to maturity in the frame. Cold frames also provide a sheltered spot for hardening-off seedlings that were started indoors.

In late summer you can plant crops for late fall and early winter harvest. Leave the glass cover off the frame until the cool weather sets in. Under optimum conditions, some crops can even be overwintered for early spring harvest.

Cold frame design can be very simple, but it should be easy to work with. The dimensions of the frame will depend on the size of your garden beds, the crops to be grown, and the desired portability of the structure. You should be able to comfortably weed and harvest inside the frame, and 1 to 1.2 m (3-5') is a convenient width. Some gardeners make their cold frames small and lightweight enough to be moved from one section of the garden to another. Many gardeners use old storm windows for glazing; the dimensions of the frame would then have to match the size of the windows. A traditional design uses a rectangular box, 8 feet long and 4 feet wide, with a slight slope to the south.

Frames are usually made of wood. Rot resistant cedar is a good choice but pine or spruce will also do. A strip of scrap wood can be nailed to the bottom of the frame where it sits on the soil. This strip is easily replaced every few years as it rots. Cold frame kits are available for purchase, and some kits even come with automatic ventilation equipment.

Every cold frame should have a means of ventilation. Ventilation is most critical in the late winter, early spring, and early fall on clear, sunny days when temperatures rise above 7ºC. The glazed top should be propped up to allow excess heat to escape or removed entirely. Each day lower or replace the top early enough to conserve some heat for the night.

*The cold frame lid should be hinged to allow for control of ventilation and to facilitate heat conservation. © Tracy Kittilsen, Dalhousie.*

If very cold weather is expected, extra insulation may be needed to protect the plants from freezing. Insulate the cold frame by stacking straw bales against the sides and placing old blankets or sacks filled with leaves on top.

You might like to convert your cold frame to a hotbed. While cold frames depend on the sun for heat, hotbeds have a secondary heat source. Either fresh, strawy manure or a soil-heating cable is buried beneath the rooting zones of the plants. For a manure-heated bed, dig out to 60 cm (24") of soil (more if you need to add gravel for drainage), add a 45 cm (18") layer of strawy horse manure, and cover with 15 cm (6") of fertile soil. For an electric heated bed, dig out an area 20 cm (8") deep, lay down thermostatically-controlled electric cable in 15 to 20 cm (6 to 8") long loops, evenly spacing the cable, but never crossing over. Then, cover with 5 cm (2") of sand or soil, lay out hardware cloth to protect cable, and cover with 10 to 15 cm (4-6") of soil.

### Cloches and tunnels

The cloche (pronounced klosh) was originally a bell-shaped glass jar set over delicate plants to protect them from the elements. Many jar-like structures can be used for this purpose (e.g. plastic juice bottles), but the cloche must be large enough to completely cover the plant and also be able to trap the sun's energy and reduce the amount of moisture evaporating from the soil and plant. Ideally, they can be closed at night and opened or removed during the day for good air circulation. They should be portable, but heavy enough that they don't blow away. Lightweight cloches must be anchored.

Another option is to stretch a length of plastic over wire arches to make a plastic-covered tunnel. These 'low tunnels' are usually around 60 cm (2 ') high and can stretch the entire length of a garden bed.

To construct a low tunnel, use 9 gauge galvanized wire cut into 2 meter (6.5') lengths. Insert the ends of the wires into the ground on either side of the garden bed. Place these wire arches 1.2 -1.5 meters (4-5') apart. Stretch construction grade polyethylene (1.5 (5') wide, 1 mm weight) over the wire and secure on either side by burying the edges and ends under soil. Check books and on-line resources for innovative variations on the basic low tunnel design.

*This low tunnel skeleton is constructed from scrap metal that has been cut and bent to the required shape. It was then covered with fabric row cover. Note that soil is used to hold the material against the wind. © Tracy Kittilsen, Dalhousie..*

Low tunnels work well for starting spring crops. As temperatures warm, holes or slits are cut in the plastic to provide ventilation. However, the need for balance between ventilation and frost protection makes these tunnels less convenient for late fall crops.

### Floating row covers

Floating row covers are made of lightweight polyester or polypropylene materials. The fabric is light transmissive and porous to air, making it essentially self-venting. It is lightweight enough to be laid directly on the plants and as the plants grow, the fabric is lifted with them.

Floating row covers should be laid loosely over the garden bed and the edges secured with soil or rocks. They can be used on direct-seeded crops or over transplants. Row covers generally provide 2 to 3 degrees of frost protection, so cool-season crops can be planted in air temperatures as low as -2ºC. Covers should be removed from the crops when air temperatures beneath the cover reach 25ºC. Floating row covers are also helpful in protecting cole crops, vine crops, and carrots against insect pests. Treated with care, the fabric will last 2-3 seasons.


*Floating row covers can provide an effective method of season extension without the expense of a greenhouse or low tunnel construction.*
*© Tracy Kittilsen, Dalhousie.*

# Activity 1

**Build a low tunnel.**

Low tunnels are most useful for getting an early start on spring planting. Transplants can be set out 7-10 days ahead of the recommended date if protected by a tunnel. To build a low tunnel, first decide how long the structure will be, based on your garden bed size and space requirements. Use 9 gauge galvanized wire cut into 2 meter (6.5') lengths. Insert the ends of the wires into the ground on either side of the garden bed (arches should be around 60 cm (2 ') high). Place these wire arches 1.2 -1.5 meters (4-5') apart. Plant seeds or place transplants. Stretch construction grade polyethylene (1.5 (5') wide, 1 mm weight) over the wire and secure on either side by burying the edges and ends under soil. As weather warms, cut ever widening slits into the plastic to provide ventilation.

# Activity 2

**Build a cold frame.**

Check reference books and on-line resources for plans on how to build a cold frame. There are many variations! (If you plan on using old storm windows for glazing, get these first as the rest of the frame will have to be built to match.)

**HERE ARE SOME RESOURCES TO START WITH:**

Barley, Phil. Extend the growing season with a cold frame. Canadian Gardening. Available from: http://www.canadiangardening.com/how-to/projects/extend-the-growing-season-with-a-cold-frame/a/1966

Coleman, Eliot. 1999. Four-season harvest: how to harvest fresh organic vegetables from your home garden all year long. Chelsea Green Publishing Co., Vermont, USA.