

Extending the Growing Season

Grow with USask



Saskatchewan has a relatively short growing season. Typically, there are approximately 120 frost free days during the Saskatchewan growing season. However, these frost free days are sometimes not very conducive to vegetable growing, with lower temperatures and lack of sunlight. Long season crops like celery, leeks, Brussels sprouts, Spanish onions and warm season crops like tomatoes, peppers, squash, cantaloupe, watermelon, eggplant and okra benefit from benefit from various methods of extending the growing season.

Transplants

- Generally, it is difficult to grow any vegetable cultivar in a Saskatchewan growing season that requires more than 75-80 days to maturity (according to the seed packet). These 'days to maturity' are often based on growing that crop in warmer climates like California or the US mid-west.
- Cool-season crops that require a longer growing season (100-120 days) must be transplanted. Celery, leeks, Brussels sprouts, Spanish onions and some late season cabbage must all be started indoors to reach maturity during our growing season.
- Warm-season crops must be started indoors and planted out as transplants. Providing extra protection outdoors is sometimes necessary and usually beneficial to warm season crops that prefer warm temperatures and a longer growing season. Warm season crops that benefit from extending the growing season include tomatoes, peppers, winter squash, pumpkins, cantaloupe, watermelon, eggplant, sweet corn and okra.

Milk Cartons and Bedsheets

- Milk cartons around tender transplants in spring along with grandma's bedsheets covering the prized unharvested fall tomatoes are some of the more traditional ways of extending the vegetable gardening season on the prairies (and airing out grandma's sheets). More recent technology has developed an entire science around the concept of extending the growing season and making the most of the sun and warm temperatures during the growing season.



Mini-tunnels in a variety of colors and materials

What is Plasticulture?

- Plasticulture is that science that uses plastics, drip irrigation and spun bonded polyester fabrics to modify the plant's environment and optimize its potential.
- While plasticulture is used extensively in commercial vegetable production throughout the United States and Canada, the concepts behind plasticulture can be applied to the smallest backyard garden. Even the most experienced backyard gardener can improve yields, quality and earliness.

Cloches, Hot Caps and Wall-O-Water®

- Hot caps (usually made from paper) and cloches (made from glass or rigid plastic) are small domes that are placed over single plants. They are similar to wall-o-waters in that they provide shelter and protection from frost and wind however, unlike wall-o-waters, they only provide 1-2°C of frost protection.
- Wall-o-water® is a trade name that refers to an open ended cylinder, 30-45 cm wide and approximately 45cm high. The cylinder is made up of plastic or vinyl tubes that are fused side by side in a circle. These fused tubes provide a wall of water between the tender transplant and cool outdoor air.
- The wall-o-water® is placed on the ground in the spot where the transplant is to be planted. Wall-o-waters® enable plants to be placed outdoors up to 3 weeks earlier than average in spring.



The wall-o-water® surrounded by snow.

- If the plastic sleeves are completely filled with water, the wall-o-water® will be open at the top. If the top third of the plastic sleeves do not have water, the wall-o-water® will collapse at the top and seal warm air inside. The wall-o-water® provides 3-4°C of frost protection. As the water is freezing, heat from the water is released inside the wall-o-water®. The top of the wall-o-water® should collapse at night for good frost protection.
- The wall-o-water® must be set in place for at least one week prior to transplanting in order to warm up the soil.
- Once daytime temperatures rise above 12-15°C, the top of the wall-o-water® should be opened during the day to allow hot air to escape and prevent heat damage to plants.
- When all danger of frost is passed, the top of the wall-o-water® can be left open during the night.
- Wall-o-waters® can remain in place around the plant to provide a warm sheltered space for the plant to flourish. As plants become larger, wall-o-waters® should be removed by slipping over the top of the plant. Wall-o-waters are reusable.
- The limiting factor with wall-o-waters®, hot caps and cloches is that plants must be covered individually and plant space is limited. Consequently, the benefits of a protected environment are short lived. Using crop covers in combination with plastic mulch solves the problem of limited space.
- Crop cover refers to any woven cloth cover that is used to cover an agriculture crop. Crop covers come in various weights (heavier covers are used for frost protection) and sizes. Crop covers come in widths ranging from as little as 2 m to as much as 40 m.

Crop Covers

- Crop covers are used to protect crops early in spring and late in fall from light frosts or to increase the air and soil temperature under the cloth throughout the growing season. This increase in air temperature during the growing season encourages vegetables under the cover to grow and mature more quickly than outside the cover.



Unsupported crop covers

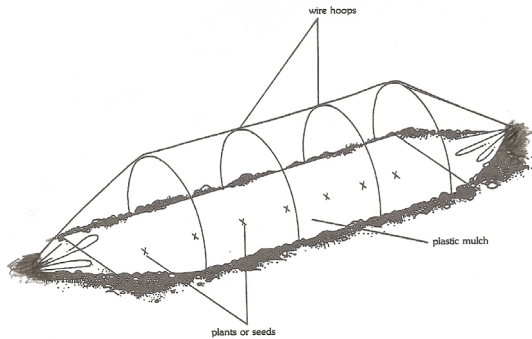
- Vegetables that will benefit from crop covers throughout the season include: cantaloupe, cucumbers, peppers, eggplant, okra, watermelon.
- Tomatoes will benefit from 1-2 weeks of covers in the early spring; avoid covering tomatoes throughout the season as these covers tend to encourage the tomato plants to become vegetative rather than produce flowers and set fruit. Tomatoes should be covered in fall to protect the plants and fruit from fall frost.
- Unlike wall-o-waters®, cloches and hot caps, crop covers have better light transmission properties and are permeable to allow rain or overhead irrigation to pass through to the plant.
- Crop covers do not limit the amount of space that a plant can grow. Covers can remain in place throughout the entire season for most vegetable crops as long as they are removed for weeding, flower pollination or if outdoor temperatures are extremely hot (35°C+).
- Self pollinating crops, like peppers, can be covered throughout the season as long as weeds are kept under control and plant size remains within the limits of the cover.
- Cloth crop covers can be laid directly on top of prostrate crops like cucumbers, cantaloupe, watermelon, or pumpkins. Upright growing vegetables like peppers, eggplant, okra and tomatoes must have the crop cover supported by wire hoops. Unsupported crop covers will rub off the growing point of these plants.



Supported crop covers

■ Mini-Tunnels

- A mini-tunnel may be defined as a mini greenhouse (.75m wide by 0.5m high and unlimited length). The base of the tunnel is usually a strip of plastic mulch approximately 1.2m wide with a drip irrigation tube running under the plastic mulch. The covering on the mini tunnel would be 1.8m wide perforated clear plastic or a woven or spun bonded polypropylene cover. The covering is supported by hoops constructed of 1.5m lengths of galvanized 9 gauge wire. Hoops are spaced 1m apart. At the end of each of the tunnel rows, two wires should cross over each other for extra cover support. Edges of the cover are anchored by soil.
- Mini-tunnels are used to increase air and soil temperature throughout the season, thereby speeding up the growing process for warm season crops.
- Mini-tunnels provide 1-2°C of frost protection in early spring or fall.
- Mini-tunnels must be replaced on an annual basis.



Mini-tunnel structure (source: Alberta Agriculture)

■ Tips for Constructing a Mini-Tunnel

- Consider using drip irrigation to water plants inside your mini-tunnel. Drip irrigation is a system of irrigation that minimizes water use by using a series of tubes with tiny holes that allow water to drip out slowly
- Lay drip tape along the length of the row and secure the drip tape to the soil with small wire hoops.
- Lay plastic mulch over the drip tape (ensure drip tape is near the centre of the plastic mulch) and secure the edges of the mulch with soil. The plastic mulch should be tight against the soil for optimal enhancement of soil temperatures and weed control benefits.
- Cut slits in the plastic mulch where the transplants are to be planted. Be careful not to puncture the drip tape!!!
- Using a hand trowel to dig holes into the soil at the slits and plant transplants. Make planting holes in the plastic mulch as small as possible. Ensure the root ball of the transplant is completely covered.

■ Crops Recommended for Mini-Tunnels

- Warm season crops like peppers, cantaloupe, watermelon, cucumbers, eggplants, okra, pumpkins or winter squash do well in mini-tunnels. Tomatoes benefit from a very limited period of mini-tunnel covering (1-2 weeks).

■ Mini-Tunnel Coverings

- Clear perforated plastic provides the highest air temperatures in the mini-tunnels and is the best covering for heat loving crops like cantaloupe, cucumbers and watermelon. Clear plastic covering **MUST** be perforated. Unperforated plastic covers can result in air temperatures in excess of 60°C : plants will die in this extreme heat. Clear perforated tunnel coverings must always be supported by hoops as unsupported plastic will burn leaves on contact.
- Woven coverings (Reemay or polypropylene) are more suitable for crops like peppers, tomato and eggplant. Tomatoes will benefit from cloth covers however, if mini-tunnels remain on tomatoes for longer than 2 weeks, the tomato plants tend to become excessively vegetative. Fruit set and maturity will be delayed. The woven type covers must be supported if used on plants with growing points at top of the plant (ex. peppers and tomatoes). Woven covers do not need to be supported with a wire hoop if they are being used to cover prostrate plants like cucumbers and cantaloupe

■ High Tunnels

- High tunnels are low-tech green-house-like structures, consisting of a single layer of polyethylene draped over metal or plastic arches. High tunnels are usually shaped like a quonset. A typical size is 15' x 95', but size can vary according to the grower's needs.
- High tunnels require some type of irrigation system: usually drip irrigation is installed.
- The ends of a high tunnel are usually easily removed so that a small tractor or hand roto-tiller can fit inside to work the soil.
- Crops are grown directly in the soil at ground level.
- High tunnel structures usually remain in one place for 5-6 years, but eventually problems with disease and soil quality require the tunnels to be moved.



■ How Does a High Tunnel Work?

- Unlike greenhouses, high tunnels are not heated and they are only cooled by rolling up the sides or opening the end walls. Temperatures inside the high tunnels are typically warmer than outside during the daytime, but at night there is little difference in temperature inside versus outside a high tunnel.

■ Crops Recommended for High Tunnels

- Warm season crops like peppers, tomatoes, cucumbers, winter squash, cantaloupe and water-melon benefit from the higher daytime temperatures achieved within high tunnels.
- Cool season crops like lettuce, spinach, radishes and broccoli can be planted earlier in the spring or grown later in the fall inside the high tunnels. However mid-summer temperatures inside the high tunnels are too hot for these crops.
- Strawberries in high tunnels are harvested earlier and yields are typically higher than for a crop grown outside the high tunnel. Strawberries overwintered in a high tunnel must be mulched with straw or wood chips.

■ Crops Not Recommended for High Tunnels

- Sweet corn tends to be too tall and has poor pollination in high tunnels. Tomatoes tend to delay flowering and fruit set when grown in a high tunnel. Cool season crops like cauliflower, cabbage, broccoli, radishes and celery do not do well in the heat of summer in a high tunnel.

■ Advantages of Using High Tunnels

- Soil and air temperatures warm up earlier in spring and stay warmer later in the fall inside a high tunnel compared to outside the high tunnel. If crop covers are used in conjunction with high tunnels, crops can be planted up to 10 days earlier than without covers and high tunnels. Late season lettuce has survived -8°C temperatures in fall when also covered with crop covers inside the high tunnel.
- Higher air and soil temperatures during the growing season (especially on cool, cloudy days) enable crops in high tunnels to mature faster.
- Some longer season crops like red peppers, watermelon and cantaloupe have a greater chance of reaching full maturity inside a high tunnel as compared to outside a high tunnel.
- Several plantings of shorter season crops like spinach, lettuce and even transplanted broccoli are possible in a high tunnel.

■ What is Plastic Mulch?

- Plastic mulch is a thin sheet of plastic that is laid on the soil and secured tightly to the soil by covering the edges of the plastic with soil. Plastic mulch used for vegetables is usually 1mil thick, 4' wide and is usually used for only a single season. Plastic mulch used in tree fruit production can be up to 6mil thick and is made to last for many growing seasons.

■ Why Should I Use Plastic Mulch?

- Plastic mulch increases soil temperature, provides water conservation and weed control.
- Plastic mulch comes in many colors:
 - 1. White:** commonly used in California where growers are trying to reduce their soil temperature. In Saskatchewan, the U of S found that Spanish onions thrived on white plastic mulch.
 - 2. Clear plastic mulch:** provides the greatest increase in soil temperature however, weed control is poor under clear mulch.
 - 3. Black plastic mulch:** provides excellent weed control and a slight increase in soil temperatures.
 - 4. IRT (wavelength selective) plastic mulch:** is brown or green in color and provides excellent weed control along with higher soil temperatures than black. IRT plastic mulch is usually more expensive than black or clear but is the best option for vegetable crops in Saskatchewan.
 - 5. Yellow:** is used for insect control in the field. The idea is that insects will be attracted to plants on the yellow mulch. This row is then sprayed with chemicals to control insects while other rows are left unsprayed. Food harvested from the unsprayed rows can be sold as 'Pesticide free'.
 - 6. Red, Blue or silver:** Some studies have shown increased yields of certain crops grown on colored mulches. However, studies conducted at the University of Saskatchewan (Vegetable Program) have not shown any consistent effect of mulch colour on these crops.

■ What's the Problem with Plastic Mulch?

- Plastic mulch has become one of the biggest worldwide environmental concerns in the vegetable industry. Each year, 30 million acres of plastic mulch is used worldwide. (Washington State University) That's a lot of plastic for our landfills!
- Recently biodegradable plastic mulches made from corn starch have become available. Trials conducted by the U of S demonstrated that black and green biodegradable plastic mulch provided all of the weed control and soil temperature enhancing effects of standard plastics – and then just dissolved into the soil at the end of the growing season.