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MONTANA STATE UNIVERSITY EXTENSION

MontGuide

Hotbeds and Cold Frames for Montana Gardeners

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Growing vegetables and flowers from seeds can be challenging in Montana's short growing season, but a full-size greenhouse isn't necessary to extend your season.

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THE USE OF COLD FRAMES AND hotbeds is an excellent way to extend the Montana growing season, providing a substitute for greenhouses. The gardener with limited space inside the home can use cold frames or hotbeds to start transplants from seed. These simple structures also allow Montana gardeners to plant small vegetable crops earlier in the spring and enjoy fresh vegetables later into the fall.

Cold frames are heated entirely by the sun's rays; hotbeds use the sun's rays and other sources of heat to maintain adequate temperatures. Consider the temperature and other climatic conditions of your location. When choosing between a cold frame and hotbed, consider the plants to be grown. Hardy plants such as cabbage need only simple, inexpensive facilities, but heat-loving plants such as peppers and eggplants should have more elaborate facilities for successful production in some of the colder areas of Montana.

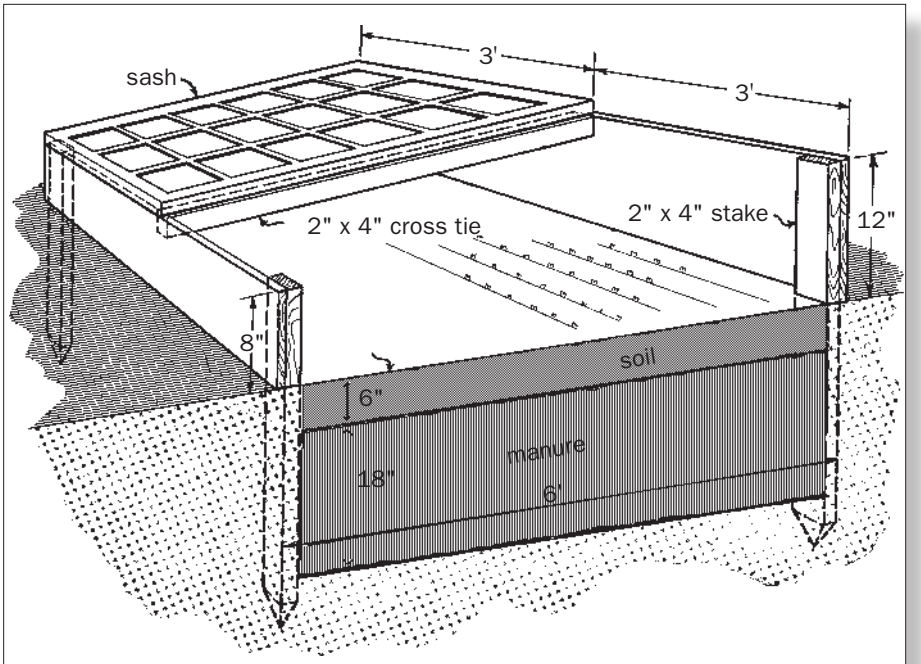

Figure 1. A typical structure design

Structure and design

Figure 1 illustrates a typical cold frame design. When selecting materials to construct your cold frame, keep in mind that the inside of the structure will be warm and humid. Wood is the primary structural component in most cold frames. Some manufactured cold frames use aluminum, plastic, and fiberglass.

Most home gardeners use the materials they have available. When selecting wood, consider its rot resistance qualities. The heartwoods from cedar and redwood provide excellent rot resistance as does pressure-treated lumber. Pine, fir and spruce need to be treated to increase rot resistance. Do not use creosote or pentachlorophenol preservatives because they release vapors that can be toxic to plants. Copper napthanate is non-toxic to plants when dry.

Old storm windows make an excellent cover for your structure. If you have none, there are many substitutes for glass. Heavy plastic film is an inexpensive covering but may last only one season. Plastic window pane, polycarbonate panels or ridged fiberglass panels will last for several years and hold up against wind.

Make sure all joints are tight against the weather. The structure should have a top lid that can be propped open at different heights to allow for ventilation, watering and easy planting. You must be able to secure the cover against wind gusts.

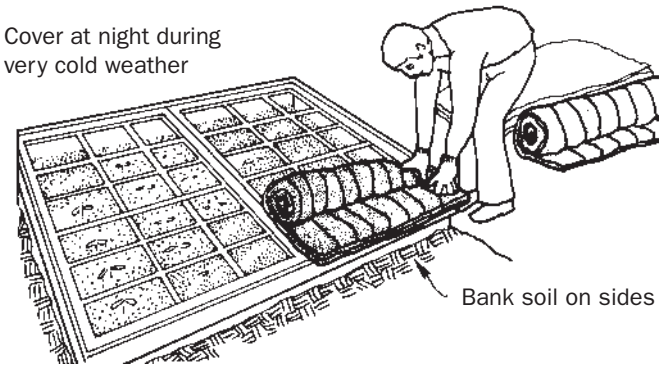

Figure 2. Night insulation for cold frames and hotbeds

Location

Locate hotbeds and cold frames on a well-drained sunny southern exposure. If you do not have a site with good soils, you may need to remove the soil inside the structure and replace it with sandy loam to a depth of 30 inches to provide good drainage. The back of the structure should face north and be built into a hillside, against a building, or banked to give protection. Use soil to bank the outside of your frame structure to increase heat holding capacity. Protect your frame from prevailing winds. Locating the structure near water and electricity is helpful.

Operation

You will need an easily-read thermometer for your hotbed or cold frame. Locate the thermometer so you can read it without removing the cover.

Cool season plants grow best at 55° to 65°F while warm season plants grow well at 65° to 75°F. If air temperature inside the frame goes above 85°F, ventilate by opening the top or install an automatic lifting device to maintain desired temperatures. Monitor the temperature to insure the structure does not cool down too much. While most gardeners worry about trying to heat the frame, there is much danger from the sun overheating and killing young plants in early spring.

You'll need a method of retaining heat during the night. Use old quilts as an insulating cover (Figure 2). Rigid foam board insulation also works well. Rocks, bricks and water-filled bottles placed inside the structure absorb heat during the day and give off heat during the night.

Heating methods for hotbeds

Electric heating cables placed directly under the soil work well in a hotbed (Figure 3). These cables, equipped with a thermostat at the soil surface, can provide gardeners with a reliable source of heat. Follow manufacturer recommendations when installing the cables.

Hotbeds can also be placed on the south side of a house next to a basement window which can be cracked open to allow heat to enter the hotbed.

Radiant heat from electric light bulbs has also been used with good success. Place eight 25-watt incandescent bulbs along a board directly under the cover. This will be enough to heat the standard 3 foot by 6-foot section of a hotbed. Take special precautions with this system to guard against electrical shorts. A thermostat measuring soil temperature will also be necessary.

Fresh animal manure can be an economical source of heat for a hotbed (Figure 4). Place fresh manure in a compact pile near the hotbed. The manure will begin to compost and release heat. When heating begins, place the manure giving off the most heat in the bottom of the frame, the rest over it. After each 3 or 4 inch layer has been added, tramp it down so that the bed will be evenly packed. The amount of manure used will depend on air temperature. Twenty-four to 30 inches of manure will be sufficient in most cold climates. When the temperature drops below 90°F in the frame, spread about 6 inches of good garden loam, sifted, over the manure. Do not sow seed for one week, or until the first strong heat is over and any weed seeds in the soil have had a chance to sprout. Remove these weed seedlings before planting.

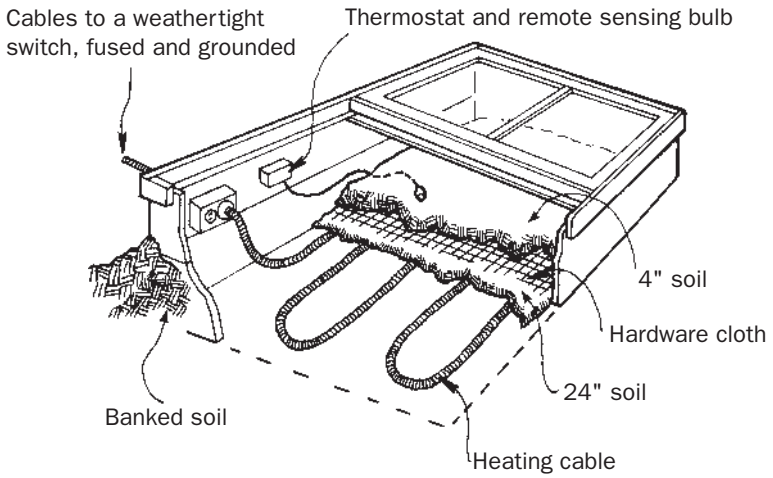

Figure 3. Hotbed with electric cable

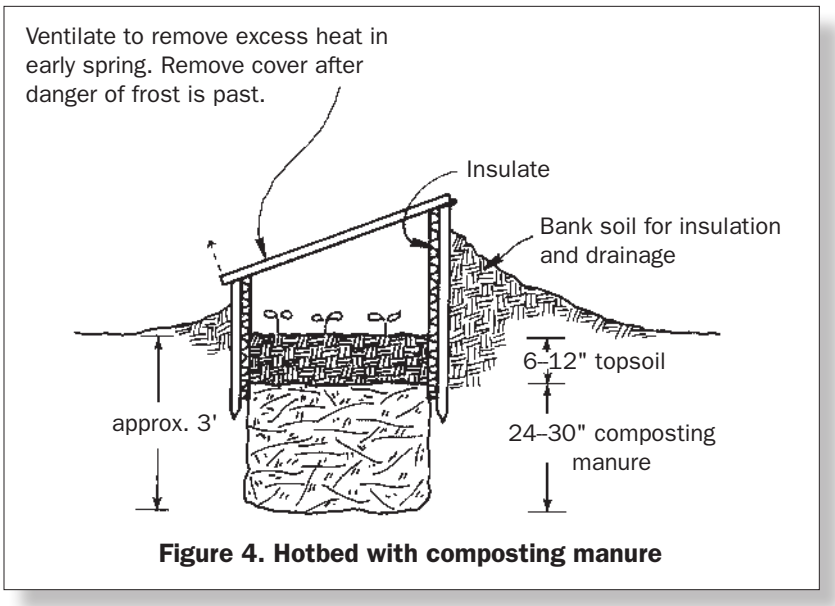

Figure 4. Hotbed with composting manure

The biggest drawback to using manure is that you cannot regulate the temperature in the hotbed easily. This method will also take some initial shovel work to dig a pit inside the frame 24 to 36 inches deep. Change the manure yearly.

Planting suggestions for transplants

To grow transplants successfully, sow seeds in rows spaced about 4 inches apart when the soil temperature at 1/2 inch is 70–75°F. Seeding depth should follow recommendations on the seed package. After seeding, tamp down soil firmly, water gently so that the small seeds are not washed out, cover with soil and leave until the seedlings break through the soil.

When seedlings appear, give them plenty of sun and good ventilation. Excessively high temperatures make plants weak and leggy and more prone to disease. Water thoroughly when necessary, but only on bright mornings.

Tomatoes and crucifers from six to eight weeks old are most desirable for transplanting into the garden. Vine crops take up to four weeks; peppers about 10 weeks. As conditions within the frame are nearly optimal, transplants must become adapted to the more harsh field environment. Reduce moisture 7 to 14 days prior to transplant and gradually expose plants to field conditions. Set the transplants out into the garden on a cool, cloudy day at the recommended time. Hardened cabbage, lettuce and broccoli will stand light frost. Tomatoes and peppers are frost tender.

Plants will not suffer many setbacks in growth during transplanting if they are moved with a block of moist soil around their roots. Set transplants a little deeper than they grew in the flat or seedbed (Figure 5). Shade plants if possible to help newly set transplants get a better start, especially if planted on a hot day or in a windy spot.

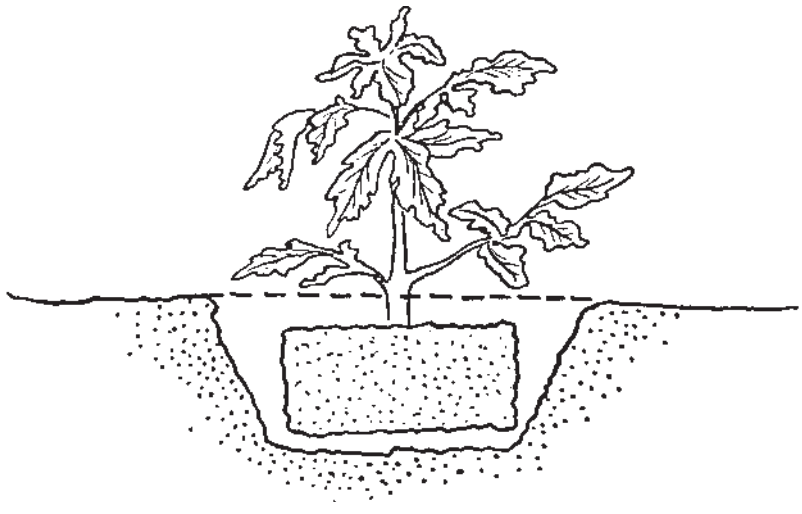

Figure 5. Set transplants a little deeper than they grew in seedbed

Planting suggestions for extending the season

The home gardener wishing to harvest fresh vegetables earlier in the spring may also harvest into the fall using cold frames or hotbeds. The height of your structure will limit the vegetables you choose to plant. Sow seeds in rows spaced 6 to 8 inches apart. Seeding depth should follow recommendations on the seed package. After seeding, tamp down soil firmly, water gently so that the small seeds are not washed out, cover with soil and leave until the seedlings break though the soil. Operate your structure as mentioned in the operations portion of this bulletin. You will want to prop the cover wide open during the heat of summer. Keep the soil moist, but do not over water.

For more information on home gardening contact your local MSU County Extension Agent.

http://www.montana.edu/wwwpb/pubs/mt199803AG.pdf

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