Winter Gardening with Low Tunnels

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I. What is a low tunnel?
   A. A small, row-specific greenhouse
   B. A series of wire hoops set over a garden row and covered with plastic
   C. A simple, inexpensive, and low-tech means of expanding your growing season
II. Why garden in the winter?
   A. You can have fresh, organic food from your garden year round – no loss of nutrients and flavor in transit from a farm to your house.
   B. Provident living – you can be independent of the "grid" for your fresh winter food.
   C. No GMOs, glyphosate, or pesticides
   D. Winter produce is DELICIOUS!
      1. Spinach – thick and sweet
      2. Turnips – creamy and sweet
      3. Lettuce – tender and sweet
      4. Carrots – like candy!
   E. How do I set up a low tunnel?
      1. Materials
         a. Frame: Smooth 9-gauge wire for tunnel frame – 6 feet per hoop, assuming a 30" wide row OR ½" metal electrical conduit
         b. Cover: 10 foot wide 4 mil clear or white plastic sheeting or 8' wide heavyweight Agribon.
         c. Weights: 4 8 foot long 2 x 4 boards, assuming a 20 foot row.
         d. Binder Clips, if using Agribon, at least 9 per row, for holding Agrigon to the frame.
         e. Fencing Pliers – to cut wire
         f. Work Gloves – to protect your hands
      2. Procedure
         a. Till and prepare the row you want to cover.
            i. Remove visible weeds.
            ii. Add 2" compost, 1" peat moss, and ½" composted manure.
            iii. Plant a cold-hardy vegetable.
            iv. Cut 6-foot sections of 9-guage wire, 7 to 10 sections per 20 foot row.
         b. Bend the wire sections into hoops.
         c. Stick the ends of each hoop into the ground, one end on each side of the row.
            i. The legs of the hoop should be about 32" apart
            ii. IMPORTANT: The top of the hoop should not be more than 15 to 16" above the ground.

iii. Use a tape measure to do this.
d. Cut clear plastic sheeting or floating row cover so that it is 4 to 5 feet longer than the row.
e. Spread the cover over the row. (This is easier done with 2 people.)
f. Weight the cover down on either side of the row with the 2x4's.
i. We use 2 8-foot-long boards per side, for a total of 4 boards per tunnel for our 20 foot rows.
ii. Roll up extra cover on the sides of the tunnel on the board.
g. If using Agribon, clip the Agribon to the hoops on each end and in the middle with binder clips.
h. Ends can be closed with
i. A smaller section of 2x4.
ii. Stake, twine, and clothespins.
iii. Binder clips
3. Maintenance
a. Watering
i. Tunnels will retain moisture due to decreased temperatures and evaporation and increased condensation, but rainwater and sprinkling will not get inside covered tunnels
ii. Rows must, therefore, be watered periodically.
(a) Frequency depends upon temperature and soil moisture.
(b) During freezing temperatures, hand water with a watering can.
(c) When warmer, water with sprinkler or drip system.
b. Weeding
i. Weed during fall and spring, when plants germinate.
ii. Weed growth slows down as days shorten and plant growth slows.
c. Uncovering the Row
i. Uncover the row to harvest, week, water and on warm days so that the plants don't burn (not a problem with Agribon.).
ii. Cover again before the air cools down for the evening.
iii. Check tunnels periodically to ensure that all is well.
iv. Brush snow off tunnels so that they do not collapse and so that icy plastic does not contact plant leaves.
v. Exception: Single digit and sub-zero temperatures!
(a) Snow acts as an insulation.
(b) Some plants will do better if snow is allowed to accumulate as an insulation, even if the tunnels collapse, than if the snow is cleared and the insulation layer does not exist.
vi. If you use floating row covers (Agribon), start with the covers at the first frost (October) and end with them in the spring (March or April). They are automatically vented due to the nature of the fabric.
vii. If you use floating row covers, cover them with 4 mil plastic or high tunnels from mid-November through mid-April.

F. What about high tunnels?
1. Advantages

a. Protects low tunnels from snow damage; keeps low tunnels from being smashed by heavy snow.
b. Provides some additional thermal protection for plants.
c. Can easily be removed once the cold part of the winter has passed.
d. They can be disassembled and stacked up against your shed when you don't need them during the summer.

2. Main advantage: It is much, much easier to access the row for harvesting, weeding, and watering because you do not have to clear snow off the tunnel.
3. Challenges
   a. Tunnels can blow away in high winds. We had some blow over our fence into our neighbors' yard during a microburst.
   b. They will keep moisture off the low tunnels, requiring you to hand water the tunnels (but you have to do this anyway).
4. Materials
   a. ½" electrical conduit, 10' sections – 7 for one 10 foot unit (4 hoops, 2 bases, 1 purlin (top pipe)). You can get this at Home Depot or Lowe's.
   b. Pipe bender – available at www.hoopbenders.net. Be sure that you get the right one for your conduit diameter.
   c. Pipe connectors kit from www.hoopbenders.net - 1 kit per 10-foot unit. Be sure you get them in the proper size for your conduit.
   d. UV resistant 6 mil clear greenhouse plastic, 15 feet x 12 feet wide per 10-foot unit, cut into a 10.5 foot piece and 2 4.5 foot x 5 foot pieces. There are multiple sources for this online.
   e. Snap Clamps (approx 15) – to hold plastic onto conduit – There are multiple sources on the Internet for these clamps. One source is www.hoopbenders.net. Be sure you get them in the correct size for your conduit.
   f. Rebar – 6 to 8 units per 10 foot unit to clamp unit onto the ground. You can get this at Home Depot or Lowe's.
5. Procedure
   a. View video on www.hoopbenders.net.
   b. Follow instructions on video.
   c. When you get the connector kit, it is immediately obvious how it goes together.
      i. Bend hoops from 4 pipes. See video on www.hoopbenders.net for the method of doing this.
      ii. Another video on this site shows how to put the hoops together with the connectors.
      iii. Cut plastic into 1 10 x 12' piece and 2 5 x 5' pieces for the ends. Mark the center point of the plastic to make it easy to center over the purlin.
      iv. Clamp the 10x12 piece onto the frame.
      v. Clamp the 2 5x5 pieces onto the ends.
      vi. Your tunnel is now complete.
6. Use

a. Place over your low tunnel.

7. Anchoring
   a. Bend the top 5" to 6" of 18" rebar at a 90° angle.
   b. Stomp or hammer the rebar into the ground, placed so that the bent portion of the rebar hooks over the base of the high tunnel.

G. What should I plant?
   1. Plant cold-hardy green leafy and root vegetables
      a. Leafy green vegetables
         i. Arugula
         ii. Chard (Lucullus)
         iii. Chickory
         iv. Claytonia
         v. Collards
         vi. Endive
         vii. Kale
         viii. Lettuce (cold hardy varieties)
         ix. Mache (corn salad)
         x. Parsley
         xi. Peas
         xii. Radicchio
         xiii. Sorrel
         xiv. Spinach
      b. Root Vegetables
         i. Beets
         ii. Carrots
         iii. Kohlrabi
         iv. Leeks
         v. Green onions
         vi. Radishes
         vii. Turnips
      c. DO NOT PLANT any cold-tender vegetable, including
         i. Corn
         ii. Tomatoes
         iii. Peppers
         iv. Beans
         v. Squash
         vi. Melons
         vii. Note: There are a few exceptional heirloom varieties of beans and melons that are cold-hardy.
      d. When do I plant?
         i. Spring
            (a) As soon as the soil can be worked (snow is not on the ground and the soil can be worked)
            (b) This varies from year to year
               (1) 2012- February 15
               (2) 2013 - March 3

(3) 2014 – February 15

ii. Fall
   (a) Plant early enough so that crops are mature or nearly mature by November 15 (Central Utah latitude).
   (b) Plant growth slows drastically between November 15 and February 15 at this latitude due to the shortness of the days.
   (c) Under a single tunnel, both green leafy and root vegetables grow very slowly between February 15 and November 15. They grow slightly faster under a double tunnel.
   (d) Implications:
      (1) Because plants will not be replacing harvested leaves quickly, plant 3 to 4 times more than you think you will need. For example, if you only use 5 feet of chard during the summer, consider planting 20 feet for the winter.
   (e) At the Springville latitude and altitude, as a general rule, plant:
      (1) Root vegetables in the spring and early summer for winter use.
         (a) Beets
            i. Plant May through August (NO LATER!)
            ii. Harvest through May
         (b) Carrots
            i. Plant May through July
            ii. Harvest through mid-April
         (c) Leeks
            i. Plant May through August
            ii. Harvest through April
         (d) Radishes
            i. Plant September through October
            ii. Harvest through mid-December
            iii. Plant March and April
            iv. Harvest through May and June
      (2) Green leafy vegetables during the first two weeks of August for fall and winter use.
      (3) Green leafy vegetables during September and early October for late winter and early spring use.
         (a) Chicory
            i. Plant August/September
            ii. Harvest through May
         (b) Corn Salad (mache)
            i. Plant August/September
            ii. Harvest through mid-April
         (c) Endive and Escarole
            i. Plant August/September
            ii. Harvest through May
         (d) Spinach
            i. Plant August through September

ii. Harvest through May
(e) Turnips
i. Plant August through September
ii. Harvest through mid-May
(f) Earlier planted plants that can have their seasons extended (plan ahead on these):
(1) Arugula
(a) Plant June through September
(b) Harvest through May
(2) Broccoli and Brussels Sprouts
(a) Plant in June
(b) Harvest through January
(3) Chard
(a) Plant May/June through September
(b) Harvest through May
(c) Lucullus is very cold hardy; Bright Lights is not!
(4) Collards
(a) Plant May/June
(b) Harvest though April
(5) Kale
(a) Plant in May/June
(b) Harvest through May
(6) Kohlrabi
(a) Plant in June
(b) Harvest through March
(7) Green onions
(a) Plant in May
(b) Harvest through May
(8) Parsley
(a) Plant in May/June
(b) Harvest through May
(9) Parsnips
(a) Plant in May
(b) Harvest through May

2. What results can I expect?
   a. After planting in late summer, early fall, your seeds should germinate in a week or two, depending upon variety. Keep seedlings watered and weeded.
   b. When you stick your hand inside a tunnel on a cold day, you will notice that the air inside the tunnel fees warmer than the ambient temperature, and that the air is moist.
   c. Mature plants properly protected by tunnels do well.
   d. Plants planted by mid-August are available for harvest by mid-November.

e. Plants planted by mid-September to late September are not available for harvest by mid-November, but become available for harvest by early to mid February.
f. Plants planted after late September generally do not grow or do not mature properly, even after February 15.
g. Unlike summer, do not harvest more of winter green leafy plants than you need at the time because the plants do not quickly replace what has been harvested. Harvest only what you need at any given time.
h. The exception to this rule is root vegetables. Harvest up to two or three weeks' worth at a time, especially during December and January, so that you have some available to use even if the ground is frozen and you cannot dig them.
i. No summer vegetable is as good as winter spinach, carrots, beets, and turnips!

3. Learn from our disasters!
   a. Use proper materials:
      i. My friend used lighter gauge wire (10-gauge). This was not strong enough and collapsed during a snow storm, allowing the freezing plastic to contact the growing plants. Note that this alone will not destroy truly cold-hardy plants. Ours have weathered similar storms.
      ii. Rather than 2x4's, she used rocks to weight down the plastic. The wind blew these away and she ended up with frozen plants.
      iii. She did not check the plants for problems after the storm. This undoubtedly contributed to the loss of her plants.
   b. Don't get lazy:
      i. Deer come down from the mountains during the winter and eat anything that grows, especially your garden!
      ii. If it is covered by a tunnel, it does not get eaten.
      iii. If it is covered by a cardboard computer box which can be blown or kicked out of the way, it gets eaten!
   c. Anchor your high tunnels:
      i. We had to chase our unanchored and inadequately anchored high tunnels to Oz and back! And they got a bit ripped up in the process!
   d. Keep your low tunnels low!
      i. Tunnels no higher than 15 to 18" above the ground retain ground heat well and keep cold hardy plants from freezing.
      ii. Tunnels higher than this do not keep even the hardiest from freezing; we lost our collards and kale in the first snowstorm last year (single digit temps, though) because they were in an A-frame tunnel supported by a 5 ½ foot high trellis rather than a low tunnel. Conversely, collards and kale in another row that were covered with plastic that sat directly on top of them survived the same storm.
   e. Resources

i. Eliot Coleman, “The Winter Garden Handbook: Year Round Vegetable Production Using Deep Organic Techniques and Unheated Greenhouses”
ii. Eliot Coleman, “Four Season Harvest: Organic Vegetables from Your Home Garden All Year Long”
iii. Video Presentation: www.planandpreparenow.com
(a) Short version is free
(b) Long version costs $5.00

III. Seed Sources:

Johnny's Selected Seeds
http://www.johnnyseeds.com/
(request their catalog)

Weeks Seed Company
http://www.weeksseeds.com/
(2x4 Giant Carrot seeds)

Caleb Warnock's Renaissance Seeds
http://www.mcssl.com/store/calebwarnock
Important almost-extinct historical heirloom varieties
His block is:
http://calebwarnock.blogspot.com/

Baker Creek Heirloom Seeds
http://www.rareseeds.com/
(Chioggia beets)
(request their catalog)

My Patriot Supply
http://www.mypatriotsupply.com
Look under "Heirloom Seeds", "Vegetable Seeds"
Use the search bar at the top to find what you're looking for
They have non-GMO sugar beet seeds

Seed Savers Exchange
http://www.seedsavers.org/
(request a catalog)

Eden Brothers
http://www.edenbrothers.com
They have non-GMO sugar beet seeds.
Use the search bar at the top to find them.

Native Seeds
https://shop.nativeseeds.org/
Native seeds from the Southwest U.S.

Including seeds the Native Americans used
Many of these seeds will grow well in arid climates
This is where we get our Tepary Bean seeds