Water-challenged High-Value Production

The Southern Ogallala region of the High Plains stretches from the northern border of Kansas to just south of Lubbock, encompassing 97,000 square miles. This region has 19.7 million acres of cropland, of which 7.3 million acres are irrigated. Because of high-water requirements for maximum yields and the declining Ogallala water table, traditional crop production in the High Plains, especially in parts of the Texas Panhandle, may be unsustainable. For this reason, farmers are considering vegetables that could be produced on less acreage with less total water but still potentially provide significant income.

Tips for High Tunnel Construction in Windy Environments

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BACKGROUND: Vegetable production in Texas is not a new concept. In 1960, more than 32,000 acres of fresh market tomatoes were planted in Texas, but by 2009 this number was reduced to less than 1,000 acres. The majority of this lost acreage went to Mexico and Florida, and at today's yields and prices it represents approximately $250 million per year in lost revenue. With the recent upsurge in consumer demand for high quality, locally grown produce, Texas farmers in the High Plains have an unprecedented opportunity to regain a significant portion of the fresh vegetable market share. However, to accomplish this, growers will need to take advantage of recent advances in vegetable production techniques, such as protected agricultural systems, which can extend the growing season, maximize yield and quality, and optimize water-use efficiency.

ISSUE: Because of the highly erratic environmental conditions common in the Texas Panhandle, protected agriculture systems such as High Tunnels are of special interest to farmers considering vegetable production. High tunnels, often referred to as hoop houses, are plastic covered, passively heated, walk-in, semi-permanent structures. They not only provide season extension, but also offer farmers more control over extreme environmental conditions. High tunnels create a sheltered microclimate that can provide crop growth and quality benefits, but high tunnel vegetable production in the Texas Panhandle has unique challenges, especially with the extremely high winds that are common to the area.

RESEARCH: In 2015, researchers with Texas A&M AgriLife Research initiated a program to evaluate the feasibility of high value vegetable production in the Texas Panhandle. Four high tunnels were purchased and built according to manufacturer's instructions. However, it quickly became obvious the high winds that are so prevalent in the region posed an immediate threat to successful high tunnel vegetable production. Within weeks of completion of the first high tunnel, severe straight-line winds nearly blew one completely out of the ground and

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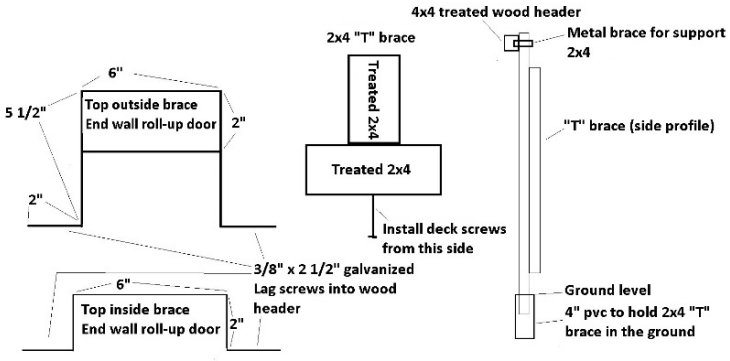
within a few months, the reinforced plastic covering had totally blown off two others. Through trial and error, our research team identified techniques to help secure the high tunnels, and they have now survived continuous winds of 60 mph and gusts near 90 mph. This fact sheet provides information to help farmers in windy environments build high tunnels that have improved chances of surviving the harsh Panhandle winds.

CONSTRUCTION TIPS:

The following "tips" are those we believe to be the most important for securing your new high tunnel. For a more comprehensive look at steps we have taken and hints for success, view our step-by-step videos at https://agrilife.org/amarillo/amarillo-center-programs/plant-pathology/hightunnels/ :

1. Concrete and anchors: On each long side of the high tunnel we dug four holes large enough for two 80-pound bags of concrete, spaced evenly amongst the ground post. After each hole is dug, we drilled a half inch hole through the bottom of a 2" x 6" board and ground post. With a 5" x 1/2" galvanized carriage bolt, washer and an earth anchor, place an anchor in the hole, making sure it is close to the middle while tightening the nut. Pour both bags of concrete in the hole making sure the anchor is still placed close to the middle. Pour a 5-gallon bucket of water in the hole and use a piece of rebar to stir the mixture evenly and let set-up.



2. Roll-up door supports: We fabricated brackets using 2" x 1/8" strapping to hold the wooden posts in place on both the inside and outside of the doors. The strapping was heated with a torch and bent using a vice. The wooden supports are made of treated 2" x 4" x 12' lumber. The posts are supported in the ground by a 4" PVC pipe about 12" long and buried flush to the top of the soil.

3. Doors: We use 1/8" braided metal stainless coated wire and extra big lag screws to secure the sides of the door, as well as put the screws every 6" across the top when attaching the plastic to the frame.

4. Extra strapping: We installed 2" nylon strapping over the main cover between each rafter. To secure each end of the strapping, we cut 2" x 1/8" steel to a length of 3", then drilled two 1/8" holes evenly spaced to secure the 2" strap. Using 1½" deck screws and rubber backed washers, roll the nylon strap over metal bracket and screw it into the wooden ribbon board, making sure the screw is through the nylon strap on both the front and back of the metal bracket. This will ensure the strapping does not pull though the screws causing slack in the strap.

5. Anti-billow wire: We used 3/8" braided, stainless steel wire with a nylon coating to reinforce the roll-up sides. It is suggested to only run your wire through 5-6 eyelets before starting another run. This will help keep the sides secure, and limit any damage to only a short section. Also, place a t-post at the end of each side and using wire to secure the roll-up pipe in place. (Note: wire will need to be taken off to operate vent.)

6. Tape: Using a high-quality utility tape on pipe joints, wire ends, wire connectors, or any sharp edge will increase the life of the cover. After cover installation, you may start to notice rub marks where the galvanized metal is in contact with the cover. Some marks are from normal wear, and some will be from a sharp or rough edge. Be sure to inspect your cover often and check for sharp edges. Usually, a few wraps of tape will take care of the issue.