Site Selection

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Since a grower will be producing a high quality product and using a high level of management, the site and soil should be considered with great care. Even though, by definition, a high tunnel is not a permanent structure and should not be considered such, site selection is important in the success of the high tunnel. What often is not considered permanent becomes so after a few years.

The most important aspect of site selection should be good soil drainage and an elevation above the surrounding area. The location should be slightly higher than the surrounding area so water will not drain into the high tunnel or flow through it if heavy rains occur. The site should be level so that tillage such as bed making is easier. In addition, a level site is important for irrigation so more uniform water distribution can occur. Problems with elevation should be corrected before any construction occurs. At Grand Rapids, the location we chose to put our high tunnels was slightly lower than the surrounding area (see Figures 1 and 2 before and after site preparation).

Figure 1. Beginning site preparation

Figure 2. After site preparation.

We removed the top 12 inches of soil, backfilled with 8 inches of washed sand, and then put the original soil back. As each layer was put back it was incorporated and mixed by tilling with the layer below it. In all operations, care was taken to minimize compaction of the soil. The result was an elevation that was several inches above the surrounding area and a site that was level for the high tunnel frame. While this preparation took considerable time initially, it has provided a location that has produced good crops with no drainage problems.

Soil type is limited to the soil type on your farm. Internal soil water drainage should be a consideration; but since all of the water will have to be provided by irrigation, the grower can control the water needs of the plants for the most part. Lighter textured soils like sandy loams or loamy sands are most desirable because they will warm up more quickly in the spring, are easily worked, provide a good media for root development and respond more readily to irrigation and fertilizer applications. Returning organic matter to the soil should be an important consideration when long-term use in the same location occurs. With the intense management and heavy crop nutrient use in high tunnels, soil organic matter can be depleted more quickly than under traditional field production systems. Because of the potential of diseases and insects, crop residue from high tunnel crops should not be incorporated back into the soil.

Orientation of high tunnels is often a matter of personal preference. Successful production has been obtained with east–west or north-south orientation. Everything else being equal, a north-south orientation is probably best for optimum sun exposure and less shading, particularly with close row spacing and the use of a trellis system that results in tall plants. A north-south orientation will warm up more quickly on a sunny morning, but typically by 9:00 AM high tunnels have to be opened because they are too hot anyway.

While high tunnels can be shut down during strong winds, a windbreak on the windward side of the tunnel may be helpful in reducing the effect of strong winds. Since most of our strong winds come from the southwest or northwest, a windbreak on the west side of the tunnel may be beneficial. A deciduous windbreak on the west side of a high tunnel will provide wind protection and slight shade from hot afternoon sun during the summer. In the fall, the deciduous windbreak will lose its leaves to create less shade when the sun angle is lower and more heat is needed in the tunnel. Since some light air movement is advantageous in the high tunnel to assist in pollination, a deciduous windbreak, which allows more wind through than an evergreen windbreak, is more desirable.

Construction Aspects

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The Penn State University 2003 High tunnel Production Manual is an excellent reference for all aspects of high tunnel production. (The Center for Plasticulture Web: http://plasticulture.cas.psu.edu). It is particularly good for high tunnel construction and maintenance. The aspects discussed below are a few hints that we have found useful during the two years that we have used our high tunnels at NCROC.

Upon completion of the high tunnels, particularly when there needs to be any soil preparation work done, the area surrounding the high tunnel can be muddy. Sand spread on the ground at both gable ends can help reduce mud being carried in and out of the tunnel or into vehicles during rainy periods. Over time, sanding any roadways near the high tunnels helps keep the area cleaner until more permanent grass can become established.

After applying the plastic to the high tunnel frame, a small piece of duct tape was applied wherever there was a connection or wherever an exposed screw from the frame was in contact with the plastic. This practice has reduced plastic damage from rubbing and should allow for the longer use of plastic on the tunnel.

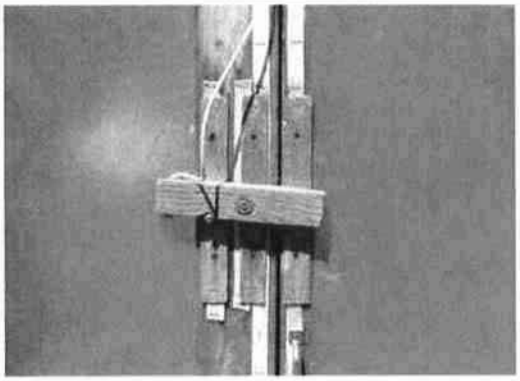
Shortly after construction, it was noticed that when even a slight wind would blow through the corners of the roll-up sides of the high tunnel the plastic would stretch and eventually create an open area that never was fully closed. This opening allowed cold air into the tunnel at night. While visiting the Penn State High Tunnel Facility, it was found that their solution to the problem was to put a second sheet of plastic over each corner on the inside for a distance of five to eight feet. This completely eliminated the problem and made the roll-up sides more airtight (see Figures 1 and 2 before and after plastic was attached).

Figure 1. Before corner plastic was attached.

Figure 2. After corner plastic was attached.

Another problem was that, during windy conditions, the wind sometimes caught these roll-up sides and occasionally pulled the eyehooks out of the top board or the baseboard. Rubber straps or bungee cords connected to both eyehooks on the outside of the roll up sides helped stabilize them in windy conditions. These rubber straps would stretch but not enough to pull the eye hooks out.

During the first few months of use with a hook and latch door device, it became apparent that some other system was needed. Slight door warping sometimes prevented easy latching. Hooks were sometimes latched from the outside, and this required having to walk to the other end of the tunnel to get out. A better system needed be found. Devising a simple door latch system that worked from either side and yet kept the doors from opening on their own was very helpful in getting in and out of the high tunnels without a lot of difficulty. Penn State has a good system, and NCROC adapted an easy solution for this purpose too *(see Figures 3 and 4 door latch systems).*



Fiqure 3. Penn State Door Latch.

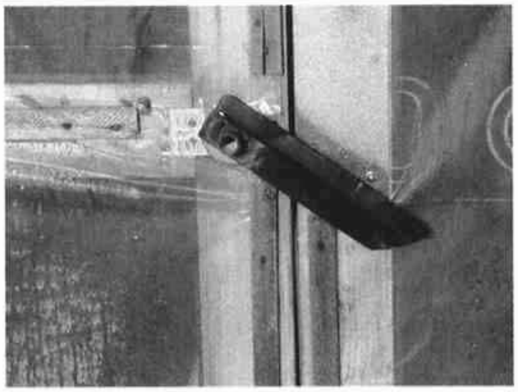


Figure 4. Minnesota Door Latch.

For the two high tunnels that NCROC built in 2003, the end wall construction suggestions provided in the Penn State high tunnel manual were used. We also used overhead trellis wires that were fastened into these end walls. By mid-August of 2003, the end walls of both tunnels were being pulled inward by the heavy plant load on the trellis wires. While this problem should have been anticipated, it was not noticed until it was almost too late. Before the 2004 growing season, a 2x6 board and angle iron reinforcing were added above the doors at each end of the tunnel (see Figures 5 and 6 for end wall before and after reinforcement).

Figure 5. End wall before reinforcement.

Figure 6. End wall after reinforcement.

This additional reinforcement solved the problem and allowed our trellis system to resist sagging from the additional weight of the plants on the end walls.