High Tunnel Construction

High tunnels (HTs) are unheated, plastic-covered, solar structures usually with passive ventilation through roll-up or down side walls. Height might vary from 6 ft to more than 17 ft depending on the crop grown and equipment used. Typical HT dimensions range from 10-30’ width X 9-12’ height X any length (typically 96’ for 100’ long rolls of plastic).

Things to consider when designing your HT: Equipment height with operator  Trellis or Crop Support needs

HTs consist of: Frame, Sidewalls, End walls, and cover. Below is a brief explanation and tips for components and materials. Your budget may limit your choice of materials but you will avoid difficulties by not cutting the cost too much.

**Frame:**

Metal pipe is the strongest framing material for rib construction. Custom metal bending can be costly but there are do it yourself kits that can be purchased from a variety of sources, see Timely Information Sheet “High Tunnel Suppliers”.

Metal frames are heavy and difficult to maneuver, thus possibly restricting mobility of the structure.

PVC (polyvinylchloride) plastic pipe is an inexpensive material for rib construction. There are plans for HTs utilizing PVC with a construction budget in the neighborhood of $200+. Frames constructed with PVC are weak and vulnerable to wind damage and PVC tends to degrade rapidly in sun light.

Note: most HT framework is not constructed to support crops. You will need to reinforce the frame if you intend to utilize it as part of your crop support. Planning ahead will be the key for this to work; retrofitting the frame after the fact may not be cost efficient or structurally sound.

**End walls**

End walls offer additional support, access and ventilation. Hip board running along the ribs can be connected to the end walls to provide additional support. The openings must be wide enough for workers to walk through with tools, supplies, or produce. There is usually an opening at each end of the HT. On one end the opening is regular or larger door for workers with tools. The opening on the other end is larger for equipment access such as: tractors, roto-tiller, vehicle, etc.
Side Walls
Roll-up or down side walls offer a simple way to manage temperature and promote ventilation. Since the ventilation in HTs are passive (not power or fan driven) rolling up the sides allows warm air to exit. Temperature can be further manipulated by opening each side wall at different heights at different times of the day.

High tunnels with no or short sidewalls are stronger than structures with higher sidewalls. However, the determining factor for sidewall height should be the crop and equipment needs. If a tractor will be utilized you will need side walls at least the height of the tractor with ROPS (roll over protection structure) in the operating position. High tunnel structures with high side walls should be built strong enough to withstand severe weather.

Covers:
Greenhouse-grade polyethylene, a plastic film, is the most common material used for covering HTs. Typical greenhouse grade 4 to 6-mil poly can be used in a single layer covering or a double layer covering. The double layer is obviously twice the expense but the air between the two layer serve as an insulator and helps moderate temperatures and reduces moisture dripping from above onto the plants. Naturally this option requires a small electrical fan to inflate the plastic and is therefore not normally used with HTs.

Shade cloth is made from knitted polyethylene strands or woven polyester, and it is water permeable. Shade cloth is often used in combination with plastic covering but in some applications it is used as the sole covering for a HT. Knowledge of your crops light, temperature and season is necessary to determine shade cloth needs. Shade cloth is purchased by percent light blocked, 20-90% are commonly available.

References:
High Tunnel - http://www.hightunnels.org/
How to build a High Tunnel - http://www.uky.edu/Ag/NewCrops/hightunnel.pdf
American Society of Plasticulture - http://plasticulture.psu.edu/?q=node/2

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