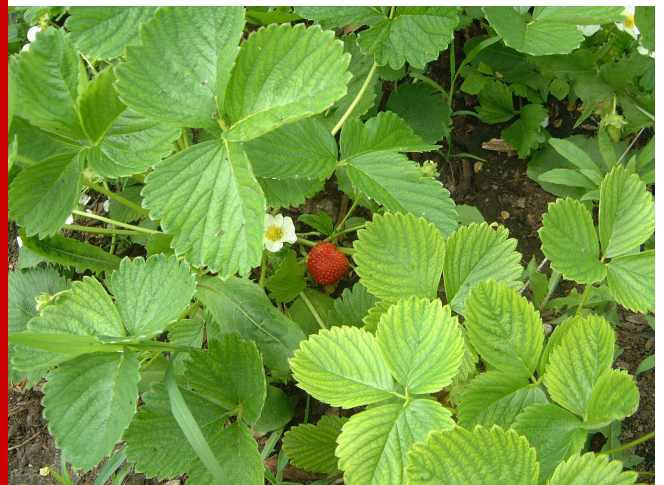


# Is a High Tunnel Right for Your Farm?



**UW**  
**Extension**  
Cooperative Extension





## Introduction

This manual is designed to help you make an informed decision as to whether or not a high tunnel will benefit your business operation. We will examine marketing, human resources, site requirements, and the initial costs associated with a high tunnel. This manual may not provide all of the answers, but it will assist you in determining the questions you need to ask yourself and others. Only after examining the whole picture can a decision be made regarding the addition of a high tunnel on your farm.

This manual should be used with the following marketing manuals, which can be downloaded from The Learning Store at:

<http://learningstore.uwex.edu>.

- ♦ A3811-20 *Are Farmers' Markets a Good Fit for Your Business*
- ♦ A3811-4 *What is Community Supported Agriculture?*
- ♦ A3811-5 *Selling to Restaurants*
- ♦ A3811-19 *Selling to Institutions*



### The Beginning

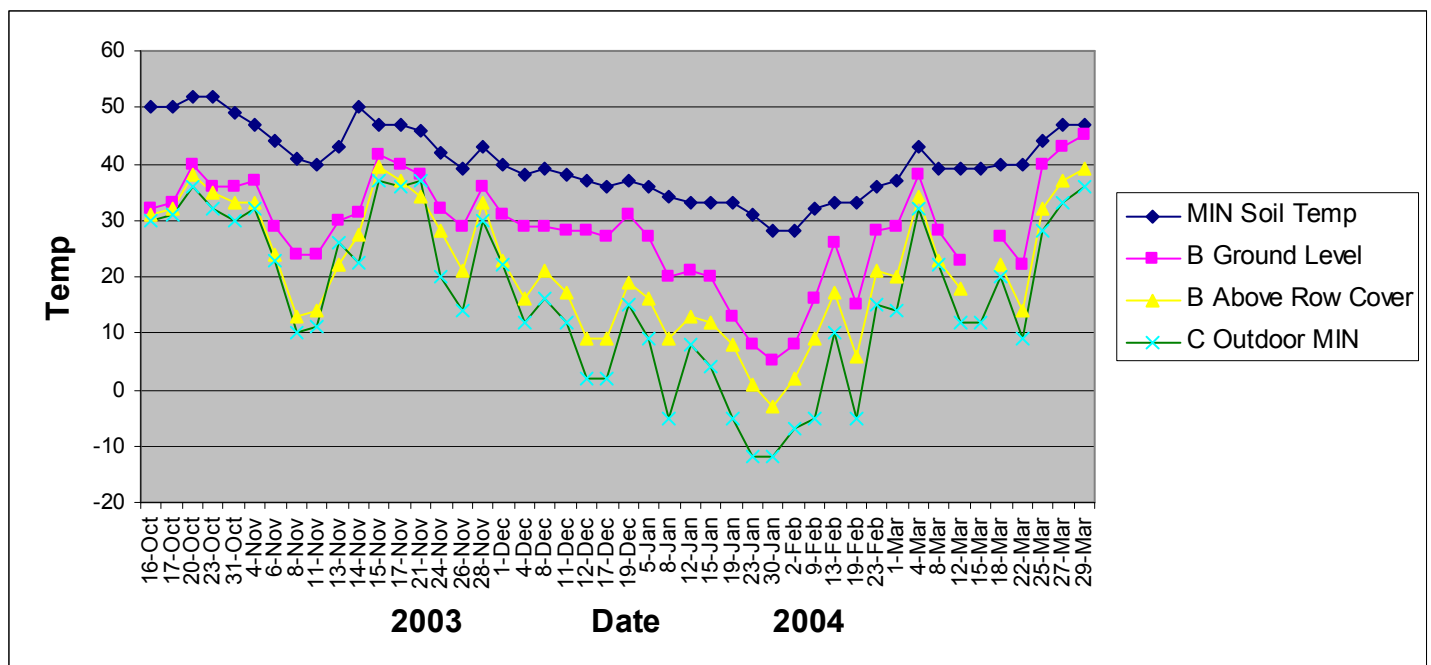
Brown County UW-Extension began high tunnel trials in 2003. The first tunnel was 12'x44' and provided data for two years. The current unit was erected in the Organic Learning Center in 2008.



## What is a high tunnel?

High tunnels are unheated, plastic-covered structures that provide an intermediate level of environmental protection and control compared to open field conditions and heated greenhouses. In high tunnels, seeds and transplants are planted directly into the soil rather than in pots or flats, or on benches or tables. Since there is no cement slab or heating system, construction costs are lower with a high tunnel.

In order to determine the effectiveness of a high tunnel in our area, temperatures were monitored at various locations both inside and outside of the high tunnel during the winter of 2003-2004. The chart shows that while outdoor temperatures dropped to  $-12^{\circ}\text{F}$  on several occasions, soil temperatures inside the tunnel under the row cover remained at or above  $28^{\circ}\text{F}$  (early February). By early March, soil temperatures were above  $40^{\circ}\text{F}$ , the minimum soil temperature necessary for germination of some “cool season” vegetables. Air temperatures under the row covers remained above  $20^{\circ}\text{F}$  until early January. As a result, we harvested salad greens until that time and gained a very early start to our spring planting.





### **A High Tunnel Can Provide:**

- ♦ An early start for vegetables
- ♦ Protected environment for growing salad greens in winter
- ♦ Premium prices at early farmers' markets
- ♦ Additional income

## **Why consider a high tunnel?**

Due to its ability to provide a protected growing environment without the cost of fossil fuels, the high tunnel can provide several opportunities for the grower. In spring, the high tunnel can allow an early start for tomatoes, cucumbers, or other vegetables, thus allowing growers to be “first to market”. During the early weeks of the farmers’ market season, competition is often limited, allowing growers to charge a premium.

The high tunnel can also provide a protected environment for the production of salad greens. Depending on a farm’s location in Wisconsin, salad greens grown in a high tunnel can be harvested for 10-12 months of the year. In either case, the high tunnel has the potential to produce additional income for the grower.

## **Every Farm is Different**

Since every grower’s situation is unique, he or she must look at the overall operation in order to make an informed decision. Market opportunities, availability of labor, costs, and the physical aspects of the farm must all be taken into consideration.

## Marketing

### Farmers' Markets

Produce grown in a high tunnel will be of little value if it cannot be converted to cash. Therefore, markets will be the first area to examine.

A farmers' market can be a good sales option for producers and can be a primary source of income for farmers who attend a number of markets throughout the week. For those just getting involved in direct marketing, farmers' markets are a great way to test the market and determine what customers want.

Farmers' markets usually charge a nominal weekly or annual fee. In addition, you will need a canopy, tables, and signage. This allows the grower to utilize this avenue for marketing with very little initial investment.



The farmers' market offers exposure to a number of potential customers in a short time period. If you attend these markets on a regular basis, you will also have the opportunity to establish relationships with customers – a good way to secure repeat business.

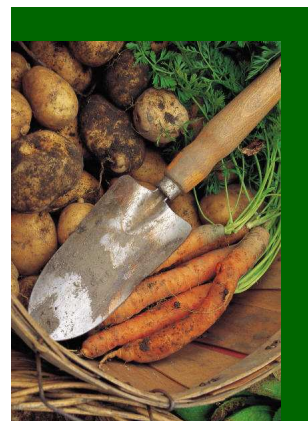
One strategy for growers is to be “first to market” with vegetables such as tomatoes and cucumbers, thus having the opportunity to charge premium prices. In order to take advantage of this opportunity, check to see when farmers' markets in your area begin operation.

Additional information can be found in UW-Extension publication no. A3811-20 *Are Farmers' Markets a Good Fit for Your Business*.



## Community Supported Agriculture (CSA)

Community supported agriculture (CSA) refers to a partnership between a farmer and a community of supporters. At the beginning of the year, supporters purchase a “share” of the farm’s production. The farmer uses this money to cover the cost of seeds, fertilizer, equipment maintenance, and labor in order to produce a healthy supply of fresh produce throughout the season (usually May through October in Wisconsin).



When CSA members make this commitment, they are supporting the farm through the season and are sharing the costs, risks and bounty of growing food along with the farmer. This mutually supportive relationship between local farmers and community members helps to create economically stable farm operations in which members are assured the highest quality produce. In return, farmers are assured a reliable market for a variety of crops.

The high tunnel can offer the CSA operator several opportunities:



- ♦ It’s a great way to mitigate risk by preselling shares early in the year.
- ♦ The high tunnel may allow a grower to offer a greater number of “share” weeks and thus charge more per share.
- ♦ The grower could offer a separate share for spring salad greens, thus increasing income.
- ♦ Another possibility is to offer a winter share and combine with stored vegetables such as potatoes, carrots, etc.

However, the CSA also has its own unique costs such as boxes for delivery, weekly newsletters, packaging, etc. All of these costs must be taken into consideration.

For a more complete analysis of things to consider, see UW-Extension publication no. A3811-4 *What is Community Supported Agriculture?*

## Restaurants and Specialty Shops

As competition increases among restaurants, chefs at many “white linen” style restaurants are more interested in buying directly from farmers. This allows them to cook with field-ripened vegetables and tree-ripened fruits difficult to find through food brokers. In addition, by purchasing directly from growers, they can often find specialty items such as fingerling potatoes, heirloom tomatoes, and much more.

For farmers, there are several advantages to selling directly to restaurants. First, restaurants provide a steady market throughout the production season. If you are selling a quality product, restaurants are willing to pay top dollar, especially for those items that they cannot find elsewhere.



Another advantage of selling directly to restaurants is the personal relationships you can build with owners, managers and chefs.

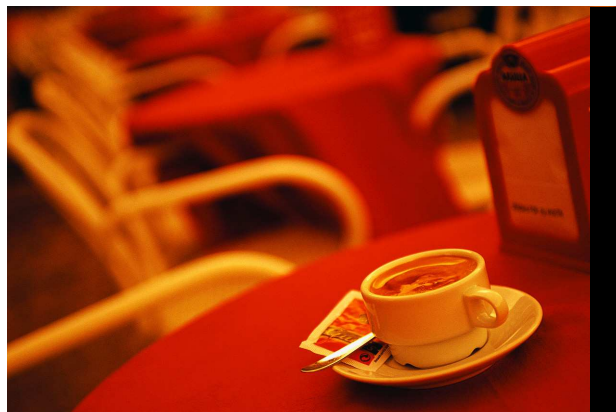
## Restaurants and Specialty Shops *(continued)*

As with every marketing niche, there are certain challenges. Most restaurants have limited cooler space and therefore may require deliveries several times per week. This can mean more time spent driving, invoicing, completing paper work and more time spent away from the farm.

Another point to consider is the restaurant's normal payment schedule. Unlike a farmers' market where you leave each day with cash in hand, you may wait anywhere from two weeks to 45 days or more before receiving payment. Therefore, product liability insurance will be another cost to consider.

By working directly with chefs, you can gain a marketing edge by becoming acquainted with the latest ideas and trends in the restaurant industry, allowing you to tailor your product to specifically fit their needs.

Additional information can be found in UW-Extension publication no. A3811-5 *Selling to Restaurants*.





## Wholesaling

Selling your farm products to institutions such as schools, hospitals and nursing homes can be a very challenging—yet rewarding—experience. This market gives you the opportunity to sell large quantities to a few customers, thus reducing labor and delivery costs. Sales to institutions may also help to increase your sales at other marketing outlets due to your increased exposure in the community.



Keep in mind that institutions typically purchase products wholesale and, in general, expect lower prices than you would receive at farmers' markets. Selling to institutions also requires time and effort to establish and maintain business relationships with food service managers. When dealing with institutions, farmers generally do not receive payment on delivery and may need to wait as long as 30 to 90 days before invoices are paid.

Farmers who wish to sell to institutions will also be required to carry general liability insurance. The amount of coverage varies from \$1 million to \$5 million. You will need to consider this cost, as well as delivery, production and related expenses when looking at institutional markets and your pricing structure. Before entering this arena, take the time to understand the institutional market's unique dynamics.

## Gathering Additional Information

In addition to meeting the food service director and providing samples and other information, you will also be on a fact-finding mission during your visit. The information that you want to gather includes:

- ♦ What is the ordering cycle?
- ♦ What are the receiving hours?
- ♦ What are the receiving days?
- ♦ What are the invoicing procedures?
- ♦ How must the product be packaged?
- ♦ What are the quality standards?
- ♦ Do they currently buy locally?
- ♦ What types of products would they be interested in purchasing?
- ♦ What are the quantities they use per week?



Having a thorough understanding of the facility's operating procedures will give you a greater ability to successfully serve the account, build a lasting relationship, and price your product at a level that will assure profitability.

More details are available in UW-Extension publication no. A3811-19 *Selling to Institutions*.

## Marketing Costs

Depending on which marketing option(s) you choose, each will have its own associated costs.

In order to determine pricing and potential profit, all of these costs must be investigated and taken into consideration.

### Marketing Options:

- Farmers' Markets
- CSA's
- Restaurants
- Specialty Shops
- Schools
- Hospitals
- Nursing Homes

## Human Resources

What you are growing, as well as the marketing opportunities you pursue, will determine labor requirements. Will you be able to do the work yourself or will additional help be needed? If needed, will labor be available at the time of year you will be using the tunnel?



If using outside labor, what amount of training and direct supervision will be needed? Will there be any change in your current work force in the next few years (i.e. if family members are currently helping, will any of them be leaving to attend college in the next few years?). Costs of outside labor, as well as the cost of your time, must be factored into your decision as to whether a high tunnel is right for your operation.



## Operations

### Site Selection

Numerous factors will determine the initial cost of site preparation for your tunnel. The site you select must be level and have fertile, well-drained soil. Access to water will be a necessity since plants will need to be irrigated throughout the growing season. If you will be growing early in the season, an underground line with a frost-proof hydrant may be necessary.

Another consideration will be power. If utilizing a double-layer cover, then electricity will be needed for the inflation fan. Larger tunnels may also require power for ventilation fans. The site selected will need to be accessible in the winter so that accumulated snow can be removed from the top and sides of the structure. All of these costs must be factored into your decision.



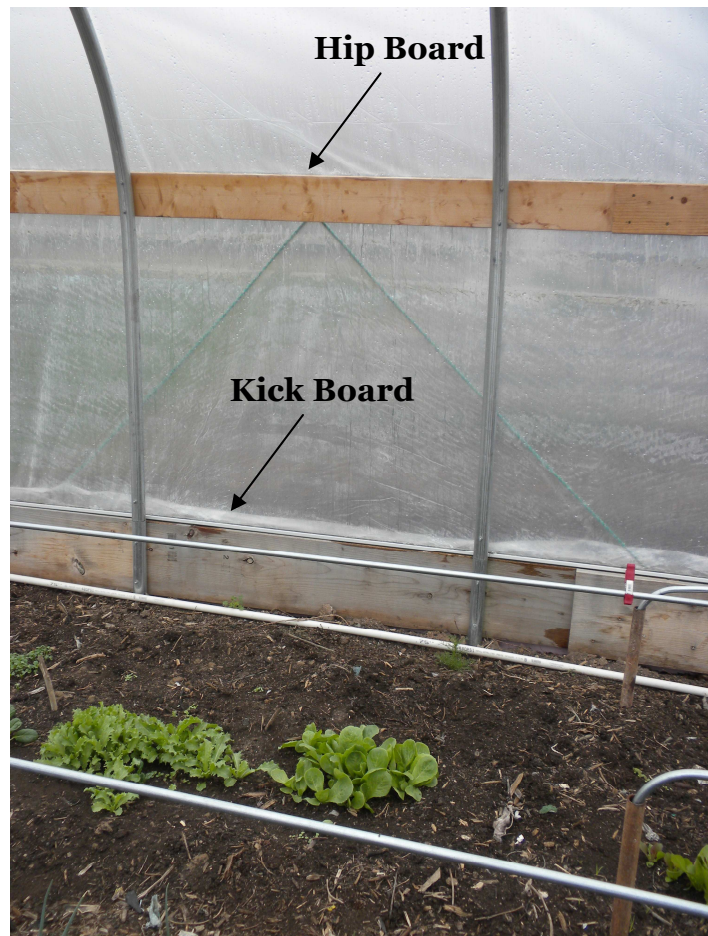
### Site Selection is Important:

- ♦ Area must be level
- ♦ Fertile soil
- ♦ Good drainage
- ♦ Water
- ♦ Power
- ♦ Accessible in winter

## Cost of Tunnel

Many high tunnel vendors offer only the frame of the structure. In addition to the frame and its related shipping cost, many other costs, such as end walls, doors, etc. must be taken into consideration. The cost of the end walls will be determined by the size of the structure as well as the type of material used. End walls can be covered relatively inexpensively with 6 mil greenhouse plastic, or more expensive (and more permanent) options such as exterior grade plywood or clear polycarbonate panels.

End walls are often framed with 2x4's using 24" centers since they are not load bearing walls. Many growers use 4x4's on either side of the doorways. The cost of the lumber to frame the end walls will be dependent upon the width and height of the tunnel.



Other Lumber costs: 2x12 lumber (or two 2x6's stacked side by side) will also be needed for kickboards at the base of the frame. This lumber will be in constant contact with the soil. Therefore, this must be taken into consideration when selecting the type of wood to use. Cedar lumber will last longer but at a much higher cost. The hip boards on the sides of the tunnel can be constructed with 2x6 lumber since they will not be in contact with the ground.

Doors: The type of doors you install will be determined by the type of equipment you plan to use in the tunnel. A small tractor may require an overhead door or large double doors while a much smaller door can accommodate a rototiller. Therefore, cost of doors will vary from grower to grower.

## Other Cost Considerations



### Insulation

Many high tunnel operators who focus on winter production insulate the base of their structure with 2" foam insulation. This allows soil temperatures to be maintained at an elevated level inside the tunnel longer into the winter. The insulation is attached to the ground posts and extends 2-4 feet below the soil surface.

### Poly Cover

The high tunnel is usually covered with a 6 mil greenhouse poly that contains a UV-inhibitor. Most greenhouse plastics are guaranteed for four years but can last longer if properly installed. Many growers who use a two-layer poly with an inflation fan see five years of use before the poly must be replaced.



Solar powered vent fan

### Ventilation

Ventilation is very important to prevent death of your plants due to high temperatures or increased chance of disease due to high humidity levels. Ventilation will be especially critical in the early spring. Outdoor temperatures can fluctuate between the 40's and 70's while temperatures inside an unventilated tunnel could exceed 120°F.



## Ventilation

*(continued)*

There are a variety of methods available to provide ventilation to your high tunnel. The size of the tunnel, the amount of time you are available on site, and the amount of money you want to invest will determine the method chosen.

The simplest method of ventilation is the use of manually-operated vents in the end walls and by opening and closing the high tunnel's doors.

Many high tunnel owners install roll-up sides in order to provide ventilation. Most roll-up sides can be raised either partially or up to the "hip board". Automatic roll-up sides, which are thermostatically controlled, can also be installed at a greater cost.

In smaller tunnels, thermostatically controlled solar powered attic fans or temperature activated openers, such as Univents® attached to louvered vents or windows, can provide ventilation. The advantage of these devices is that the tunnel will be automatically ventilated when no one is available to open doors.

Ventilation fans can be used to increase air circulation around plants. However, this will result in higher initial costs as well as higher operating costs.



Roll-up sides



Louvers with Univent®



Hinged window with Univent®



## Bracing and Support

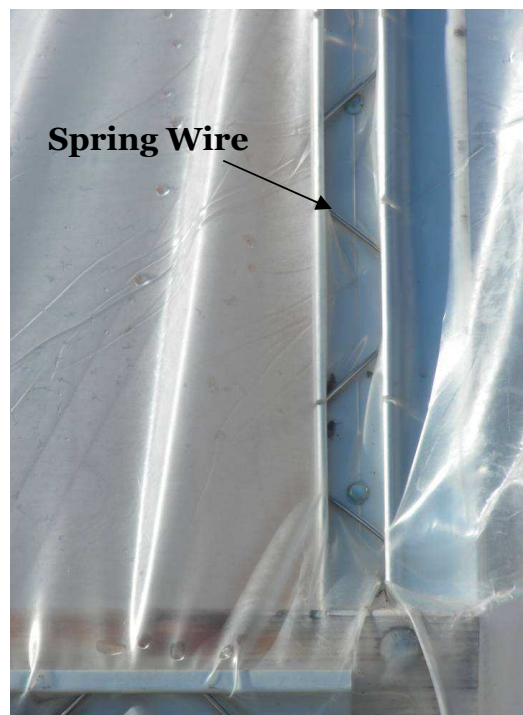
Check with the manufacturer of the high tunnel frame, but most tunnels wider than 20 feet will require some type of internal bracing.

Many manufacturers suggest cross bracing on every other rib. However, if you plan to trellis plants such as tomatoes and cucumbers, you may want to consider installing cross braces on every rib. This will allow more places to attach your trellis material.

## Fastening Poly to Frame

Another cost is the channel used to secure the poly to the frame. This channel usually has a “spring wire,” which secures the poly to the channel. If used, the channel will be attached to the entire length of each of the end ribs as well as the length of each kick board.

If roll-up sides are being installed, then a double row of channel must be attached to the hip board. The upper channel keeps the cover taut while the lower channel allows you to replace only the side plastic if it is damaged by tools or the wind.



Poly can also be attached to the kick board and end walls (depending on material selected) using wooden lathe strips and screws. However, care must be taken that the poly does not “pull” from the screws during high winds.

## Other Costs

We've covered many of the major material costs, but there will be other costs such as floating row covers, supports for row covers, hardware, thermometers, etc.

While most growers are "do-it-yourselfers," extra labor may be required when erecting a tunnel. If so, this cost must also be taken into consideration.

Calculate all costs to get the true picture. The worksheet on page 19 will help you to estimate the total cost of erecting a tunnel.



## Putting it All Together

Now it's time to analyze all of the variables:

- ♦ What market(s) did you decide to pursue?
- ♦ What price can you reasonably expect to receive for your product in that market and what quantity of vegetables do you anticipate selling?
- ♦ What will be the gross income (quantity x price)?
- ♦ What operating costs will be incurred (delivery, labor, etc.)?
- ♦ What anticipated amount of annual income will the high tunnel generate?

## Compare

How does this compare to the investment you will make to purchase and erect a tunnel? Is it worth it? Like any other addition to your farm, it needs to create a return on your investment of time and money.





## Resources

Here are some other sources that may prove valuable in evaluating the addition of a high tunnel to your farm.

Cornell High Tunnels

<http://blogs.cornell.edu/hightunnels/>

High Tunnels.ORG

<http://www.hightunnels.org/>

High Tunnel Raspberries and Blackberries <http://www.fruit.cornell.edu/Berries/bramblepdf/hightunnelsrasp.pdf>

Greenhouse Raspberry Production

<http://www.fruit.cornell.edu/Berries/ghrasp.pdf>

Penn State Center for Plasticulture

<http://plasticulture.psu.edu/?q=node/2>

Midwest Season Extension

<http://midwestseasonextension.org/default.htm>

The Hoophouse Blog

<http://hoophouse.msu.edu/blog/index.php>

Undercover Research: Growing Sweet Cherries Under High Tunnels in Michigan

<http://www.cherries.msu.edu/pdf/OrchardShow09G-Lang.pdf>

Michigan State Student Organic Farm

<http://www.msuorganicfarm.org/home.php/>

## Work Sheet

Cost of site improvement:

Water

\_\_\_\_\_

Power

\_\_\_\_\_

Site Prep

\_\_\_\_\_

Cost of high tunnel kit

\_\_\_\_\_

Delivery

\_\_\_\_\_

Insulation for base (optional)

\_\_\_\_\_

End walls:

\_\_\_\_ 2x4 @ \_\_\_\_\_ each

\_\_\_\_\_

\_\_\_\_ 2x6 @ \_\_\_\_\_ each

\_\_\_\_\_

\_\_\_\_ 4x4 @ \_\_\_\_\_ each

\_\_\_\_\_

Doors

\_\_\_\_\_

Ventilation fans (optional)

\_\_\_\_\_

Vent openings, etc.

\_\_\_\_\_

Roll-up sides

\_\_\_\_\_

6 mil poly cover (single or double layer)

\_\_\_\_\_

Channel to attach poly

\_\_\_\_\_

Hip board \_\_\_\_ 2x6 @ \_\_\_\_\_ each

\_\_\_\_\_

Kick board \_\_\_\_ 2x12 @ \_\_\_\_\_ each

\_\_\_\_\_

Cross braces \_\_\_\_ @ \_\_\_\_\_ each

\_\_\_\_\_

Miscellaneous:

Row covers

\_\_\_\_\_

Row cover supports

\_\_\_\_\_

Hardware (strapping, screens, nails)

\_\_\_\_\_

Labor to erect structure

\_\_\_\_\_

**Total Cost**

\_\_\_\_\_



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