

Choosing the right greenhouse

David Blanchard, Pleasant Hill Farm, Lunenburg County NS

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Grows vegetables in greenhouses year round

Trade-off between light admission and heat retention...there's no perfect greenhouse for all uses

Which crops do I want to grow?

- Consider vertical (trellised) vs. Horizontal crops
- Vertical eg tomatoes (4 months from seed to fruit)
 - Largest profit potential but also largest risk (ie pests)
- Horizontal eg salad greens and herbs
 - Labour intensive (harvesting)
 - Good cash flow crop
- For best results with trellised crops, your greenhouse should have:
 - Height 11-12 feet (ground to peak)
 - Cross-ties: 8ft or more above ground (to distribute weight across greenhouse structure)
 - A sturdy trellis at the ends to anchor support cables
- Harnois cold frame 20' x 60'
 - 9' ground to peak
 - Good for greens but short for tomatoes
 - Trouble with having trellis wires to close to ground: fruit ripen on ground
 - Good for transplants
- Harnois Ovaltech II 30' x 96'
 - Cross-ties 9' challenging for working if you're short
 - Gets pounded by winds
- Multi Shelter Solutions 20' x 60'

- A nice compromise
- Good for tomatoes
- Steeper than Harnois cold frame, good for shedding snow
- Cables anchored at ends with through bolts and turnbuckles

What stresses will the greenhouse need to withstand?

- Climate change is real and means more frequent and severe storms
- Stresses:
 - Heavy snow loads (passive load) and
 - high winds (active load)

Which covering should I use?

- single or double covering? It's all about trade-offs
 - → single poly allows for maximum light transmission and maximum heat loss
 - single poly
 - transmits 10 more light than double
 - loses 35-40% more heat than double
 - double poly
 - requires a small blower running continuously
 - sheds snow better than single
 - stiffens the whole structure by distributing forces
 - costs twice as much
 - Double poly distributes stress along whole building (eg wind hitting one corner)
 - Inflating endwalls also allow a lot of light in (eg in an east west oriented greenhouse, they would let in the early morning and late evening light...especially important in winter)
 - In blowers, the manufacturer supplied plastic often fails...dryer type hose is better
- Design considerations for strength
 - Diameter, cross-sectional shape, and thickness of structure members; bigger is stronger
 - Spacing of arches: closer is stronger, but shading is also a consideration
 - Cross-ties help resist arch collapse
 - Inflated double poly stiffens the structure and helps it to shed snow – at the cost of some light
 - Deep, strong ground anchors in undisturbed soil are ABSOLUTELY CRITICAL
 - Polylock track should be through-bolted every 4-6' with screws every 18"
 - Don't use wooden battens...they may be cheaper in the short run but more expensive in the long run (you'll have to replace them almost as often as you'll have to replace the plastic)
- Movable greenhouse
 - Think long and hard about how you're going to anchor it down

How much do I want to spend?

- Harnois 30' x 90'

- Cost of kit in 2007: \$13500
- Sq feet: 2880
- Cost/ sqft: \$4.69
- Strong, well-engineered, somewhat pricey
- Massive, widely spaced arches (6')
- Side roll ups
- Passive ventilation
- Multi Shelter Solutions 20'x60'
 - Cost of kit in 2011 \$3950
 - Square feet 1200
 - Cost. Sqft \$3.29
 - Lighter arches, closely spaced (3'), structurally very rigid

USDA NRCS to get information on how to build a good external windbreak

Do I want to heat?

- Setting up to heat with wood will add at least \$1000 To \$3000 to the cost of the greenhouse
- You can probably recover this in the first year
- Insulating the perimeter
 - 1.5" insulating board, buried 14" deep (don't get the stuff that will break up into beads)
 - A 1" board on the **outside** to support the polylock track
 - The whole sandwich is held together with through bolts
 - Treat wood with multiple treatments of linseed oil to slow rotting (they'll be good for 10 yrs or more)...use wood such as hemlock etc to extend it's life

A few big greenhouses or many small ones?

- Bigger greenhouses are inherently more energy efficient than smaller ones because their surface to volume ratio is smaller
- Multiple small greenhouses make crop rotation easier
- The wider a greenhouse is, the taller it must be to maintain a given roof pitch. Taller greenhouses catch more wind
- Smaller (especially narrower) greenhouses are easier to passively ventilate (<30ft)
- Smaller greenhouses are easier to build
- Smaller greenhouses can be heated with house-sized woodstoves or furnaces (~150000BTUs)
- Big greenhouses require multiple small furnaces or a single large furnace (~350000-500000 BTUs –expensive)
- It's all about finding the best compromise for your situation
- Our present compromise: Multi Shelter Solutions 20' x 60'

Useful references – all free!

- Greenhouse Engineering now available as a free pdf: [http://host31.Spidergraphics.Com/nra/doc/Fair%20Use%20Web%20PDFs/NRAES-33 Web.pdf](http://host31.Spidergraphics.Com/nra/doc/Fair%20Use%20Web%20PDFs/NRAES-33%20Web.pdf)
- SARE has several free ebooks on soil management, pest management, **cover crops**, and business management www.sare.org/publications.handbooks.htm

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