

Extending the Growing Season



Structures to protect plants

- Frost protection for summer veggies & flowers
- Use for fall crops (herbs, greens, root crops)
- Start annual plants in spring
- Harden off seedlings
- Overwinter sensitive plants



Trinity: 90-120 day frost-free season



Frost & freeze damage on summer vegetables

Blankets & Sheets



- Goal – trap heat coming out of soil
- Fabric has to remain dry
- If wet, evaporative cooling makes it colder
- Remove during day to reheat soil

Microstructures

- Wall of water?
 - Works on principle of heat retention by water
 - Need to stake well
 - Use black plastic mulch
 - Or just choose early-ripening tomato variety



- Cloche
 - The idea is to trap heat from the soil (warmed by the sun during the day) around a plant at night
 - Try 5 gallon water jugs



Lightweight Row Covers

- Short term (flimsy, will tear)
- Fabric (not plastic) laid directly over crop
- Some frost & wind protection
- More for insect protection
- 2-4°F frost protection



Heavier Fabric Row Covers

- i.e. Agribon 30-70
- Provides ~4°F of frost protection
- Need some sort of support (PVC, wire hoops or concrete reinforcing wire)
- Still allow water & light to penetrate, don't overheat as much



Tunnel Rows

- Plastic on wire hoops or mesh
- Plants freeze where plastic touches
- Can be left on, need ventilation on hot days
- 2-4° additional frost protection, can place over top of fabric row cover or add aluminum space blanket at night



Cold Frames



- Location, location, location!
- Sunny, facing south, sheltered from wind & SNOW
- Against heated wall
- Good drainage, but with water supply
- Easy to access

Cold Frame Construction



- Good way to use old windows & shower doors
 - Double paned is best
 - Be careful with non-safety glass
- Frame of wood, concrete blocks or straw bales
- Wood frame on top to attach hinged window
- Need prop for ventilation, cover for freezing (space blanket?)



Strawbale Cold Frame



- Use discarded windows
- Added heat via decay
- Harder to open for ventilation - wood frame?
- Manure-heated hotbed
 - need good drainage
 - about 18" of manure
 - don't use for RTE crops

Hoop Houses (High Tunnels)

- PVC or galvanized steel tube frame
- Heavy duty (6 mil) plastic sheeting
- Seeds planted directly in ground
- Consider SNOW!



Greenhouses

- Reclaimed materials or kit?
 - Some really bad kits out there
- Location. Attached to house or stand-alone?
- Consider:
 - Passive solar (10-12° F) or heated? Double layers?
 - Water supply for irrigation
- Is it going to end up as a tool shed? Or are you really going to use it?



Passive Solar Greenhouse Design

- Orientation: long side facing S, avoid facing west, small or no windows on north side (against house)
- Solar Gain & glazing: unshaded in winter between 10 am-2 pm, double pane glass or double-extruded plastic (needs UV inhibitor to prevent breakdown)
- Limit direct solar gain in summer by overhang or cover/shading

Passive Solar Greenhouse Design

- Thermal mass of water (4 Gal/sq ft of S-facing glass) or dark-colored concrete/gravel (1 cu ft/ sq ft glass)
- Reflect light where sun does not hit
- Have to insulate S-facing glass in winter at night, can use bubble wrap
- Need ventilation in spring/summer/fall! >10% of glazing, but not air leakage in winter

YFR Greenhouse

- Poor placement
 - Long side faces mostly west
- Poor kit design
 - Leaks air, sun-warped ribs, not insulated, doesn't retain heat
 - No shade in spring & summer, limited ventilation, cooks every plant
- Needs supplemental heat
 - Thermal mass not enough





Carol's Greenhouse

Plus: added bins of decomposing leaves or straw bales behind 32 gallon water cans



Heated Greenhouses

- Electric
 - Heater
 - Lights (old-fashioned incandescent)
 - Plant mats
- Propane
- Wood stove



What are you trying to do?

- Get early crop, late crop, overwinter sensitive plants?
- Protect against frost?
 - Maybe 2-6°F warmer than outside
 - Minimal passive system can work
 - Sun warms soil during day, warm soil is heat source at night, cover helps warm soil and slows heat loss
 - Cloche, row cover, uninsulated cold frame
- Protect against freeze?
 - Maybe 8-12°F warmer than outside
 - Passive can work but need to consider thermal mass & every heat loss
 - Insulated cold frame, hot box, well-built passive greenhouse
- Protect against serious freeze?
 - Heated greenhouse, cold-tolerant crops

Other considerations....

- Microclimate (i.e. cold air slides downhill)
- What you're planting (warm vs cold crops)
- Daylength and pollination
- Moist soil warms faster & retains heat, but waterlogged soil stays cold
- Snow load
- Passive takes a lot of work!

- Questions?
- Your experience?

