Hightunnel design, construction & management

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Why?

- Manipulate harvest season
- Improve growth
  - Temperature
  - Light diffusion and reduction
- Exclude pests
- Reduce diseases

What for?

Crops:

- Berries
- Tomatoes
- Peppers
- Greens
- Flowers

How?
Higtunnel design

- Rule: purpose driven design
  - Different designs have different impacts on inside microclimate
  - Choose your design according to the use you intend to give it

Components

- Anchors
- Frame shape
- Frame reinforcement
- Skin
- Size
- Ease and cost of construction
- Total cost per ft^2

Anchors

- Screw paddle
- Tube
- Do you need cement?

Frame Design

- Quonset (hoop)
  - Simple
  - Vertical wall
    - Better ground space utilization
- Gothic arch
  - Claimed to be better in snow

Reinforcement

- Purlins
  - Parallel
    - Connects hoops so they shift together
  - Perpendicular
    - Keeps hoop stable from shifting side-to-side

Extra reinforcement

- Truss/brace
- Tubing gauge
  - 17-14 gauge
- Square or round tubing
- End reinforcement

Wind preparedness

- End wall strength
- Venting height
- Seal

Skin

- Thickness mils (usually 4-6 mils)
- Many chemistries, 2 basic important properites
  - Transmittance
  - Diffusion
- Effects on plants:
  - Basic light requirements
  - Balance with the seasonal daylight hours
  - Diffuse light = more efficient photosynthesis

Skin attachment

- Wiggle wire (spring wire, channel wire)
  - Semipermanent
  - Stable
  - Seals
- Rope
  - Easily adjustable
  - Requires adjustment
  - Holds plastic down, doesn't seal

Double-skinning

- Two layers of poly seal and air pump inflates the space between them.
- Superior insulation
- Higher cost
  - Initial
  - Maintenance

Size

- Larger size = more stable temperature
- Larger size is less flexible in small diversified farm
- Larger = lower $/ft^2

Construction

- Ease
  - Number of people required at once
  - How much time
- Cost
  - Tools and machinery
  - Materials
  - Labor

Total Cost

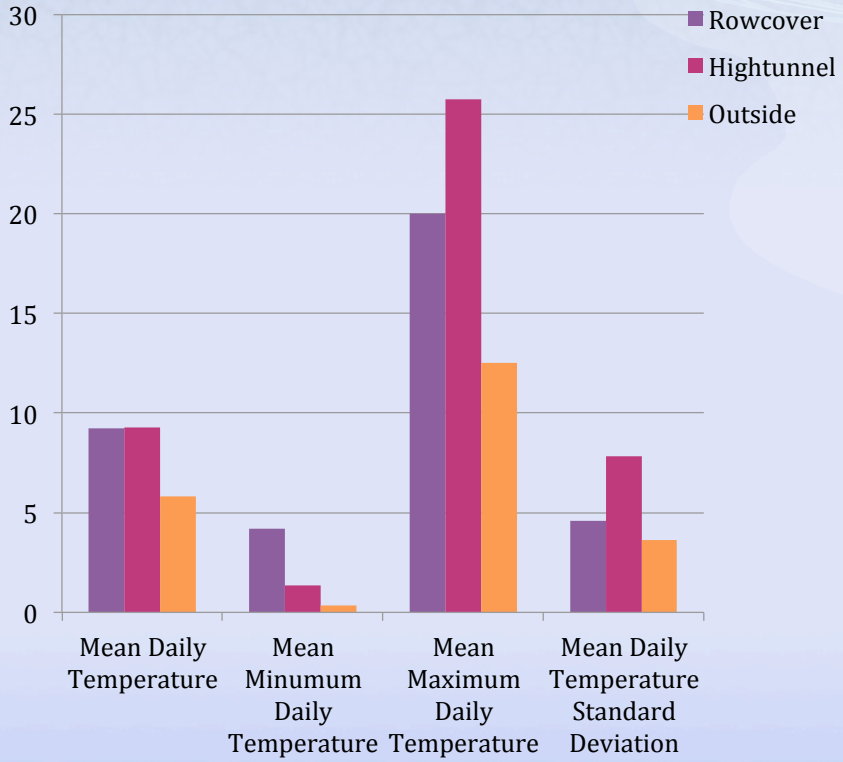
- Materials
- Tools
- Labor
  - Construction
  - Management

Management

- Temperature
  - Warmth
  - Cooling
  - Frost, freeze protection
- Pest management
  - Relative humidity
  - Exclusion
- Soil Fertility

Temperature – Degree Days

- Average temperature: help plants grow and develop more quickly
- Vent! high temps can cook your crop

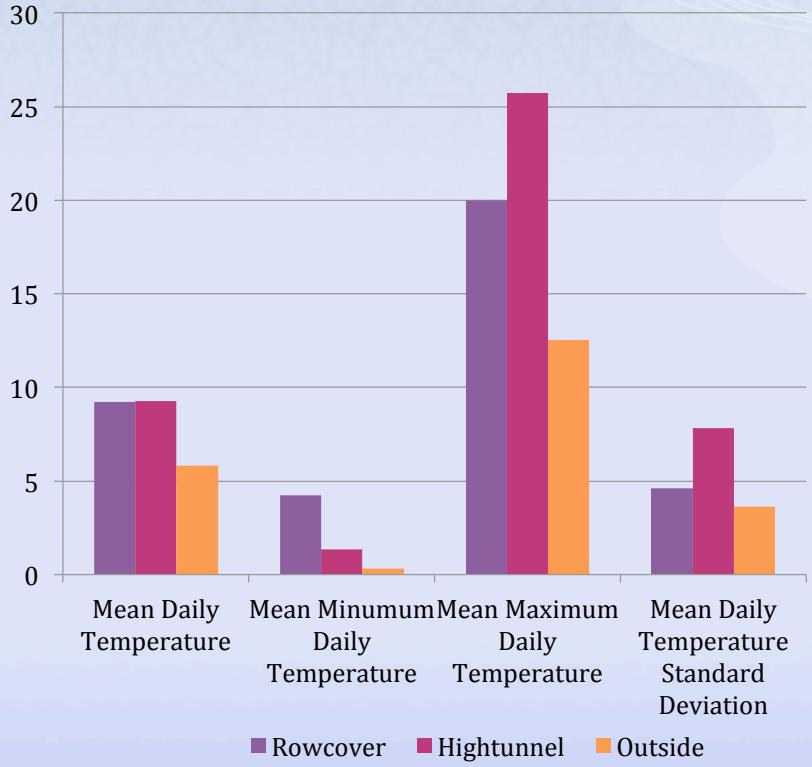


Surprise!

- A hightunnel can be cooler than outside
- 10% shade keeps plants from overheating in summer
- Air temperature about the same, plant temperature cooler
- Lower relative humidity

Frost and Freeze protection

- Hightunnel only offers a few degrees of protection
- Small amounts of heat make a big different
- HT slow down mass flow rowcovers



Relative humidity

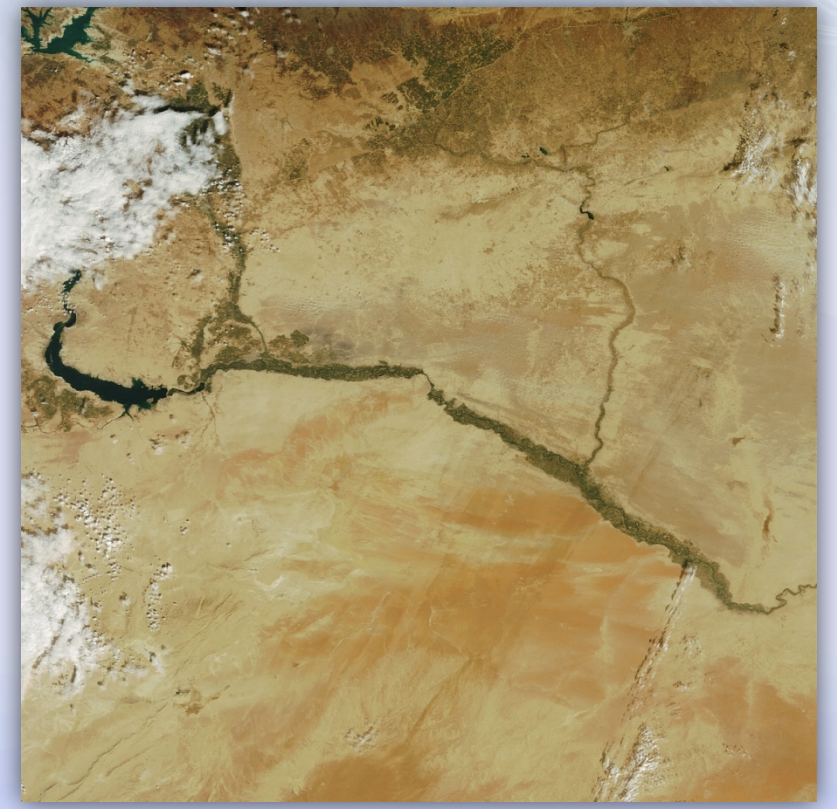
- Relative humidity is the fuel of fungi
- It does rain in the hightunnel
- Vent!
- Ground cover

Pest Exclusion

- Some pests can be kept out, including vermin
- Screens
- Ground cover selection

Fertility

- Salt buildup
  - Flooding
  - Skin “wintering”
- It doesn’t rain in the hightunnel
- Fertigation



Thanks.