Intro to Hoophouses and High Tunnels.
- Presented by Matt Kleinhenz, OSU
- Types of Hoophouses, Considerations before Purchasing, Installation
- Presented by Adam Montri, MSU
Maximizing Production to Meet Market Needs.
- Presented by Susan Houghton, Michigan
Using High Tunnels to Meet Market Needs of Institutional Kitchens
- Presented by Mike Roney, Indiana

March 20, 2008
North Central Region Organic and Sustainable Ag Video Series
Design and Construction
- Greenhouse Components:
  - Ground Posts
  - Rafters or Bows
  - Purlins and Ridge Cap

Email Questions to: ipevents@purdue.edu

Purdue University is an Equal Opportunity/Equal Access institution.
Design Options

Stone Barns Center, NY

If you’re not the Rockefellers

3-Season

Hightunnel
Passive Solar Greenhouse

Site

Shading-Winter vs. Summer

Figure 1: Select location carefully. Note where the shade line occurs in both the winter and summer.

Shading and Spacing

Drainage
Water and Electric

Moveable vs. Stationary
- West: Warm Season Crops
- East: Cool Season Crops
- Warm Season Crops overlap at center
- Water Supply, Utilities
- Room for tractors or winches
- Rotation switches over years

Orientation

Determining Size
- Width

Determining Size
- Length

Altering Height
Soil Preparation - Cover Crops

Soil Preparation - Compost

Interior Considerations - Bed Layout

Percent Space Usage - 60%-85% Range

- 30’ x 96’ = 2880 sq ft
- 8 beds x 2.5’ wide x 90’ long = 1800 sq ft
- 1800 / 2880 = 63% space use
- 8 x 2.5’ = 20’ for beds and 9, 1’ aisles
- or
- 5 beds x 5’ wide x 95’ long = 2375 sq ft
- 2375 / 2880 = 85%
- 5 x 5’ = 25’ for beds and 5, 1’ aisles

Interior Considerations - Inside Tent

Putting it Together
14 Steps to a Better Greenhouse

1) Check Elevation and Drainage

2) Square the Foundation

A Place to Start
3) Space and Pound Ground Posts

Leveling Ground Posts

Possible Sidetracks

Possible Sidetracks

Possible Sidetracks

4) Assemble Rafters
5) Place Rafters

6) Add Cross-Bracing (if needed)

7) Attach Purlins

8) Plumb the Structure and Ends

9) Attach Baseboards

10) Attach Hipboards
11) Build Endwalls, Doors, and Vents
   - Attaching Endwalls
   - Door Options
   - Vents
12) Install Wirelock or Lathe for Plastic
13) Cover with Plastic and Install Fan
14) Install Roll-up Sides

Review

• Be sure to know your:
  – greenhouse parts
  – production techniques
  – site selection and preparation requirements
  – Pythagorean theorem
  – 14 steps
  – physical and mental limits

Thank You!

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High Tunnels: Are They for You?

Matt Kleinhenz
Extension Vegetable Specialist
Horticulture and Crop Science
High Tunnels: Are They for You?

Background Information
• high tunnel structures
• high tunnel versus other techniques, systems
• specific opportunities, requirements

Major HT Characteristics
• metal, wood, and/or PVC frame
• clear plastic cover (1-2 layers)
• soil floor (not required)
• peak height at least 8 ft
Plasticulture in China

High Tunnel Costs
• depend strongly on size, design, features

will continue to change

High Tunnel "Chassis"

chassis = frame, plastic, irrigation
High Tunnel Costs

- chassis
- repair/replace
- climate control
- labor

High Tunnel Costs

- climate control
  - ventilation
  - raised beds, row covers
  - sensors
  - heating (temporary, permanent)

Major HT Materials Costs

- frame (material, durability, portability, number braces)
- film (number layers, type)
- end-, side-wall design
- climate control

High Tunnel Costs

- depend strongly on size, design, features
  - in OH, new materials cost $2.38-7.24 (avg. $3.95/ft²)

High Tunnel Costs

- cannot be insured
- usually not taxed (depends on local ordinances)
"Do not remove a fly from your friend's head with a hammer."
- Chinese Proverb

HIGH TUNNEL VERSUS OTHER TECHNIQUES, SYSTEMS

Season Extension Techniques
• transplanting
• raised beds
• mulches, row covers
• protected culture
What makes high tunnels work?
Light carries heat. Enters, but does not leave HT. When dark, plastic limits heat loss to sky.

Natural Law

Q10
\[
\frac{\text{rate at } X + 10 \text{ temp}}{\text{rate at } X \text{ temp}} = 2
\]
OPPORTUNITIES

High Tunnel Use: ... can extend the season (help farmers "sell high")

DISEASES

INSECTS

WEEDS
High Tunnels:

- protect crops
- save days

Most Current HT Users …

… also farm open fields
… grow vegetables
(use for other crops increasing)

RURAL, URBAN HT USERS

OH population density
254 people/mi²
High Tunnel Users

- CONVENTIONAL
- ORGANIC
- SUSTAINABLE

Approach has implications for high tunnel users.

High Tunnel Users

- LOW
- HIGH
  - FARM SIZE, INCOME
  - HT EXPERIENCE

Also vary in market approach (direct, wholesale, etc.) and location.

High Tunnels: Are They for You?

BASIC REQUIREMENTS

Success with High Tunnels Requires …

- system thinking, action
Success with High Tunnels Requires …

- system thinking, action
- money (build, maintain)
- fewer days off
- "babysitting": ventilate, irrigate
- specific equipment
- specific varieties, ICM practices

OTHER COMMENTS

Most high tunnel crops are grown in soil. Still, hydroponic and container production are options.

Many crops can be grown in a high tunnel. Some tend to be better suited for the system and more profitable.
Use of Grafted Plants may Enhance High Tunnel Production.

Grafting can:
- overcome breeding barriers
  ... time, money, technology

**Goal**: improve vigor, stress resistance, yield, quality
**Grafting Application**
- greenhouse vegetables
- field-based vegetable production in Asia, areas of Europe

**For Wider Application ...**
- post-grafting environment ("take", shipment)
- economics (price, seedling-plant management)

**For Wider Application ...**
- rootstock-scion compatibility
- trait retention, enhancement under varying environments

**SUMMARY**
**High Tunnels 101**

**Goal**
- balanced, introductory view of the pros and cons of high tunnel production of vegetable, fruit, flower and herb crops

**Content – 25 FAQs**
1. Factors to consider before buying a high tunnel
2. Preparing to build and building a high tunnel
3. Preparing to grow in a high tunnel

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**Market Planning**

**First Things First**

- Set your goals! How much do you want to sell? What do you want your income to be? How much can you grow?
- Market survey
  - What is our product?
  - Who/Which Market/Advantages/Disadvantage
  - Where
  - When
  - How much
  - Other marketers? How much competition? What kind?
  - Increasing business?
  - Price vs Quality
- Opportunities? What is my niche?

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**THANK-YOU**
and **GOOD LUCK!**

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### Planning, cont.

- What are our strengths?
  - How to maximize
- How close are we to markets?
- What are weaknesses
  - How to minimize?
- Will labor force change – more or less
- What skills do we have now
  - What skills do we need to add/learn

### Labor

- Who?
  - Family?
  - Long term
  - Year round?

### Specific Plan

- Space (available?) Can I Add more?
  - What is cost?
- Crop rotation
- Succession planting
- What my soil does well
- Labor
- Cost/Break even point

### Equipment

- Hand tools vs mechanical
- Hoes, shovels, harvester, water, sinks,
  - Seeders, rototiller, broadfork
- Packaging

### Options

- Restaurants
- CSA
- Co-ops
- Farmer’s Markets
- Wholesale

### CSA

- Advantage
  - Prepay
  - Planning/cost
  - No backing out
  - Product doesn’t have to be “perfect”
  - Minimal packaging
- Disadvantage
  - Keeping happy
  - Working with
  - exclusivity/other markets
  - Education “volunteers”
Restaurants

- **Advantage**
  - Price
  - Dependability
  - Timing
  - Delivery
  - Quality must be perfect
  - Invoicing

- **Disadvantage**
  - "Perfect"
  - Dependability/Flexibility
  - Risk of not paying

Co-op

- **Advantage**
  - Ready market
  - Little time spent to market/just deliver
  - Half wholesale – planning easier

- **Disadvantage**
  - Packaging
  - Wholesale pricing
  - Dependability

Farmer’s Market

- **Advantage**
  - As crop is available
  - Retail price
  - Consumer recognition/education

- **Disadvantage**
  - Display cost
  - Labor cost
  - No guaranteed sales/whim of weather

Restaurants

- **Advantage**
  - High end – or local food
  - Relationship with owner/chef
  - Market/Advertise together

- **Disadvantage**
  - "Perfect"
  - Dependability/Flexibility
  - Risk of not paying

What to grow

- What is market? Will the market take more?
- What can I do better than current distribution?
- How much does it cost? What is return?
- Do the crops I am passionate about.
  - Easier for me to market
  - Easier for me to grow

High Tunnel

- **Season extension**
- **Crops to maximize income**
  - Depends on market
  - Tomato, cucumber, onion, summer squash, melons, strawberries, raspberries, carrots
  - Head Lettuce, Mixed greens, spinach..!
Crops

• Routine –
  – Spinach, lettuce, mixed greens
  • Local is “in”

• Specialty
  – Carrots, beets, potatoes
  – Lettuce
  – Herbs
  – Edible flowers

Pricing

• What is cost?

• What is break even point? Can I produce/sell that much?

• What will market pay? Why?
  – Quality
  – Local
  – Organic

• Promote your advantage

Hoophouse Tomato Production

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