The Potential of High Tunnels

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Or Structures to Enhance Horticulture

(from MotherEarth News)
Terms

Tunnels or Hoophouses

High Tunnels
Low Tunnels
What is a “Tunnel”

**Characteristics** *(varying degrees)*

- “Temporary”, not permanent
  - Minimal Construction
  - Possibly movable
- Plastic Covered
- No forced temperature modification
  - (or limited modification)
  - No heater or cooling system; no forced air
  - Passive temperature controls
- No supplemental lighting system
- Growing in the “floor”
  - – natural soil
- Relatively “Cheap”
  - – inexpensive to construct and operate
Temporary

• The covering may be seasonal
• The structure may be moved around a farm
• Many are semi-permanent, but no permanent structures inside
  – you can move crops around within the structure
Temperature Control

• Passively heated – solar heated
  – May have supplemental heat for some crops or for survival of lethal temperatures
  – May have additional solar heat collectors
  – May have “blankets” to trap heat

• Passively cooled
  – Roll-up the sides, open the doors, open the roof
  – Misting for evaporative cooling
Tunnels

• High Tunnels
  – Typically > 6 ft height

• Low Tunnels
  – Typically < 6ft height

• Row Covers
Row Covers

Wire hoop #10 galvanized wire
76 inches long. Center height 16-18 inches
5-8 feet between hoops

Slits in polyethylene for ventilation
3/4 inch long
3/4 inch apart

Soil covering edge of cover
Buried edge of cover

Buried edge of polyethylene mulch

Wire hoop buried 6 inches in soil

Black polyethylene mulch
Row Covers
Why Tunnels?

Environmental Modification with

A. Temperature Modification
B. Precipitation and Moisture Modification

Thereby allowing the grower to

1. Extend the growing season
   - Advance the Spring Season
   - Extend the Autumn Season

2. Minimize impacts of rain (hail, wind, etc.)

3. Mitigate Pest Problems
The Benefits from Tunnels

• Never a “lost day” due to rain
  – You will always have crop to sell

• Extended Season means
  – Extended Cash-Flow for the farm
  – Capture high value markets
  – More efficient use of equipment and labor

• Reduced Risks from the weather
  – Protect the crops

• Potential Reduced use of Pesticides
The Challenges of High Tunnels

• Temperature Management
  – High daytime temperatures
  – Low nighttime temperatures
  • Heat Retention
  • Frost Protection

• Water Management

• Pest Management

• Crop Rotations
Opportunities for Specialty Crops

• Traditional Crops for the Region

• High Value Crops

• Suited to Multiple Markets
  – On-farm sales
    • Agritourism/Agri-entertainment
  – Farmers’ Markets
  – Local Retail
The Potential For Tunnels

Extending the Season, Better Environment

The Specialty Crops

Flowers
Vegetables and Herbs
Fruit Crops
A Place for Tunnels

Tunnels have a place in the production system to *compliment* field production
Why Fruit in Tunnels?

Review:

1. Produce fruit out of season to capture **high value markets**

2. The opportunity to produce fruit **sustainably and organically**
Potential For Fruit in Tunnels

Easier
- Strawberries
  - Spring, fall
- Blackberries and Raspberries
  - Spring/Autumn
- Blueberries
  - Spring

More Difficult
- Peaches and Cherries
  - Spring
Opportunities of High Tunnels

• Early Spring Production – April and May
  – Traditional Floricane blackberries and Raspberries
  – Strawberries
  – Blueberries

• Late Fall Production – Oct and Nov
  – Primocane Blackberries and Raspberries
  – Strawberries
No Obvious Potential

- Apples
- Pear
- Grapes

- Tunnels will not alter harvest season significantly
- Tunnels may be used to protect from hail, and to minimize diseases on foliage and fruit
- May have a place in Organic Production
Potential for High Tunnel Fruit Production

• Season Extension – Alternative Season
  – Longer marketing period for the crop beyond cultivar selection
  – High Value: Price Premiums as high as 100%

• Reducing Risk of Weather on the crop
  – Hail, rain, sunburn, frosts, etc.

• Reducing the Risk of Damage from pests
  – Growing group out-of-cycle of pests
  – Pest exclusion with screening
  – Reduced pesticide need
  – Possible Organic Production
    • Increased Price Premiums
Tunnels may extend the summer harvest season from 4-6 weeks during summer to 16-20 weeks during the year.
Our Observations and Conclusions

- Tunnels can shift harvest dates
  - approximately 2-3 earlier than field for berries in NWA
  - Extended Autumn season several weeks
  - Saw months differences in other regions

- Increase in Product Size
  - Increase in fruit and vegetable product size

- Increased Yields
  - Due to less stress, increased product size
Problems for High Tunnel Fruit Production

• Problems with tunnel temperature management
  – Opening and closing the tunnels
  – Over-heating
  – “Super-cooling”

• Problem of increased frost risk
• Problems with irrigating during the winter
• Problems with markets being open
• Problem with investment costs and return on the investment
Lessons Learned From Tunnel Berries

• Be sure early crop matches market
• Raspberries tended to do better than blackberries
• Not all cultivars perform equally
  – Select cultivars for the season
• Temperature management is critical
• Should close tunnels earlier
• Year-to-year variation
  – Depends on winter and spring temps
Considerations for High Tunnel Fruits

• Select Early Maturing Cultivars
• Have supplemental heat available
  – To increase heat accumulation to advance bloom and maturity
  – To protect crop from frosts
• Must have irrigation in tunnels
• Open tunnel and/or remove cover after harvest
Observations from China

- More than 1m acres of tunnels in China!
- Flowers, Vegetables, Fruits
  - Strawberries and Peaches in Feb-Mar!
- Three-sided, half-tunnels and Recessed tunnels
- Keep tunnels “tight”
- Special Designs (*lean-to*) for winter production
- Grow *Vertical*!
- Insect Control: Screening and sticky cards
- Blankets, Shading
- Overplant misting for cooling
Other Thoughts and Observations

• Tunnel production best suited for seasons or climates where temperatures are 35-60°F
• For good economics, think about multiple cropping systems
• Because of the investment, tunnels increase the risks,

Which Means Increased Management
Summary

• There is potential and opportunities for High Tunnel production, especially for local markets

• High Tunnels excellent potential for Season Extension; Good Potential for reduced pesticide use

• Tunnels should be a part of a farm management and profitability plan to compliment field operations

• Technology and management of organic and/or tunnel fruit production not thoroughly proven for our region
Questions?
Thanks!