

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 < 6 ft height
- Row Covers

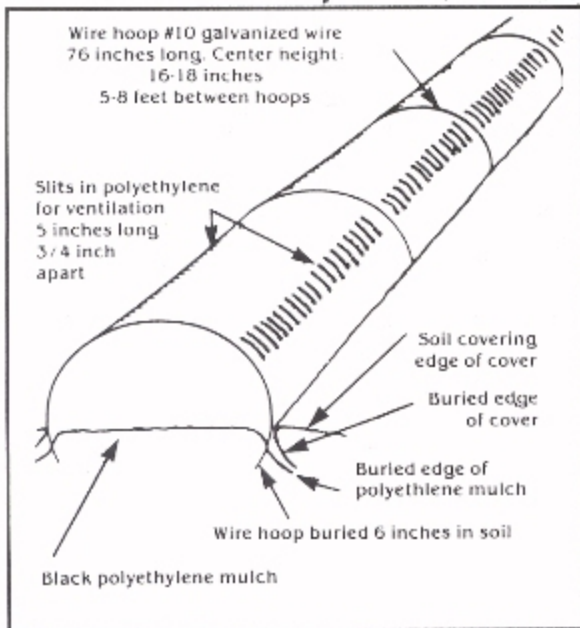








Row Covers



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

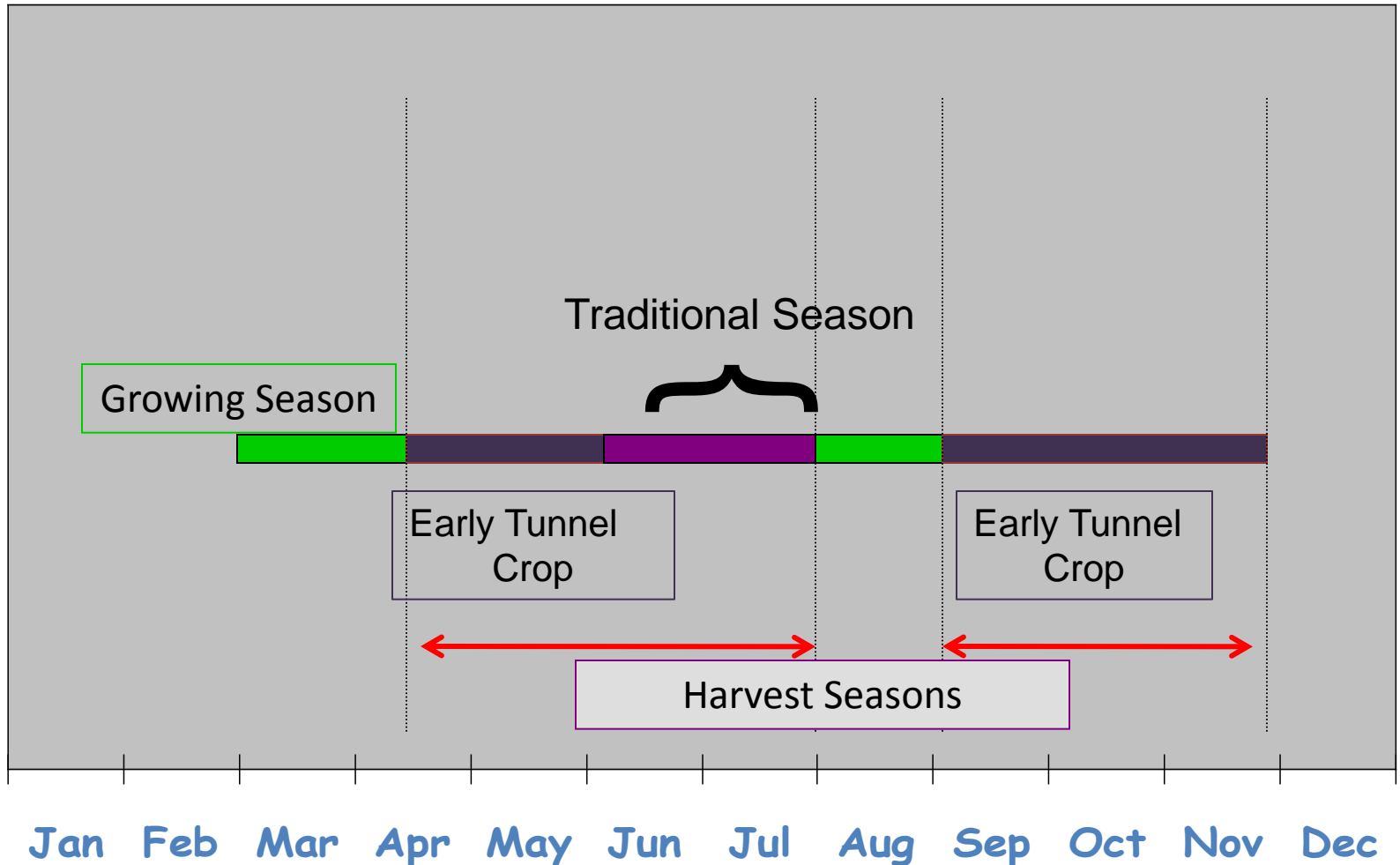
No Obvious Potential

- 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

Potential Total Berry Harvest Season



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!

