

Winter Vegetable Production In Unheated High Tunnels

10 Greatest Challenges

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Happy Hollow Farm, LLC

- 82 acres northern Moniteau, Co.
- 12 acres certified organic hay field
- 6.5 acres certified organic vegetable growing fields
- 1 acre certified organic orchard
- 21,640 sq. ft in High tunnels



Count Down From 10

- 10 Marketing
- 9 Construction & Design
- 8 Can You Grow It?
- 7 Persephone Period
- 6 Ventilation
- 5 Pests & Diseases
- 4 Wash/Pack
- 3 Labor
- 2 Winter vs. Summer!
- 1 Pros & Cons



#10 Marketing Outlets



Community Supported Agriculture

- Close relationship with customers
- \$\$ at the beginning of the year
- Rigorous planting schedule
- Over 100 fruit & veggie varieties

Farmer's Markets

- CSA Outlet
- Free advertising
- Safety net



#9 Tunnel Construction

Location, Location, Location...



#9 Tunnel Construction

Location & Site Prep

- Soil type
- Slope vs. flat
- Hillside vs. valley
- Summer vs. winter (snow load)
- End wall direction
- Site preparation is critical!!!!



#9 Tunnel Construction

Brand vs. Design

- Summer vs. winter growing
- Size, strength & design
- Extra bracing
- End wall material



Semi-Gothic

Gothic



Moveable



#9 Tunnel Construction

Design & Bracing

- Size, strength & design



#9 Tunnel Construction

- Location
- Brand vs. Design
- Design & Bracing
- Price \$\$\$
- Reliability of structure
- Reliability of company



#9 Tunnel Construction



#8 Can You Grow It?

– Variety Selection



#8 Can You Grow It?

- Variety selection
- Soil preparation



Final bed prep.



Soil aeration & compost applications

Transplanting



Direct seeding

#8 Can You Grow It?

- Variety selection
- Soil preparation
- Moisture & airflow regulation



#8 Can You Grow It?

- Variety selection
- Soil preparation
- Moisture & airflow regulation
- **Scheduling**
 - GH Seeding for transplanting no later than Sept. 30th

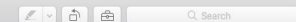


Scheduling

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DISEASE RESISTANCE CODES

COOPERATIVE EXTENSION

GLOSSARY OF TERMS

FARM VISITS & GROWER PROFILES

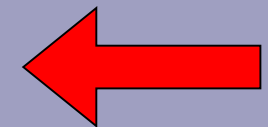
PLANTING DATES FOR WINTER-HARVEST CROPS

CROP	Start Transplants	Direct Seed	Week 15	Week 14	Week 13	Week 12	Week 11	Week 10	Week 9	Week 8	Week 7	Week 6	Week 5	Week 4	Week 3	Week 2	Week 1	Last 10-Hour Day
TIER 1	Kale (Full)	✓		15	14	13												
	Tatsoi (Full)	✓							9	8								
	Spinach (Full)	✓	✓							8	7							
	Claytonia (Full)		✓							8	7							
	Kale (Baby)		✓								7	6						
	Spinach (Baby)		✓									6	5					
	Tatsoi (Baby)		✓									6	5					
TIER 2	Pac Choi (Full)	✓						10	9	8								
	Cilantro (Full)		✓					10	9	8								
	Wild Arugula (Full)		✓						9	8								
	Mizuna (Full)		✓							8	7							
	Salad Arugula (Full)		✓							8	7							
	Salad Arugula (Baby)		✓									6	5					
	Cress (Later-Maturing Var.)		✓									6	5					
	Cress (Early-Maturing Var.)		✓									6	5	4				
	Mizuna (Baby)		✓										5	4				
TIER 3	Carrots		✓			13	12											
	Bunching Onions (Scallions)	✓				13	12											
	Lettuce, Salanova (Full)	✓					11	10										
	Swiss Chard (Full)	✓	✓					10	9									
	Turnips		✓					10	9									
	Lettuce (Baby)		✓								7	6						
	Swiss Chard (Baby)		✓								7	6						





Variety
Selection

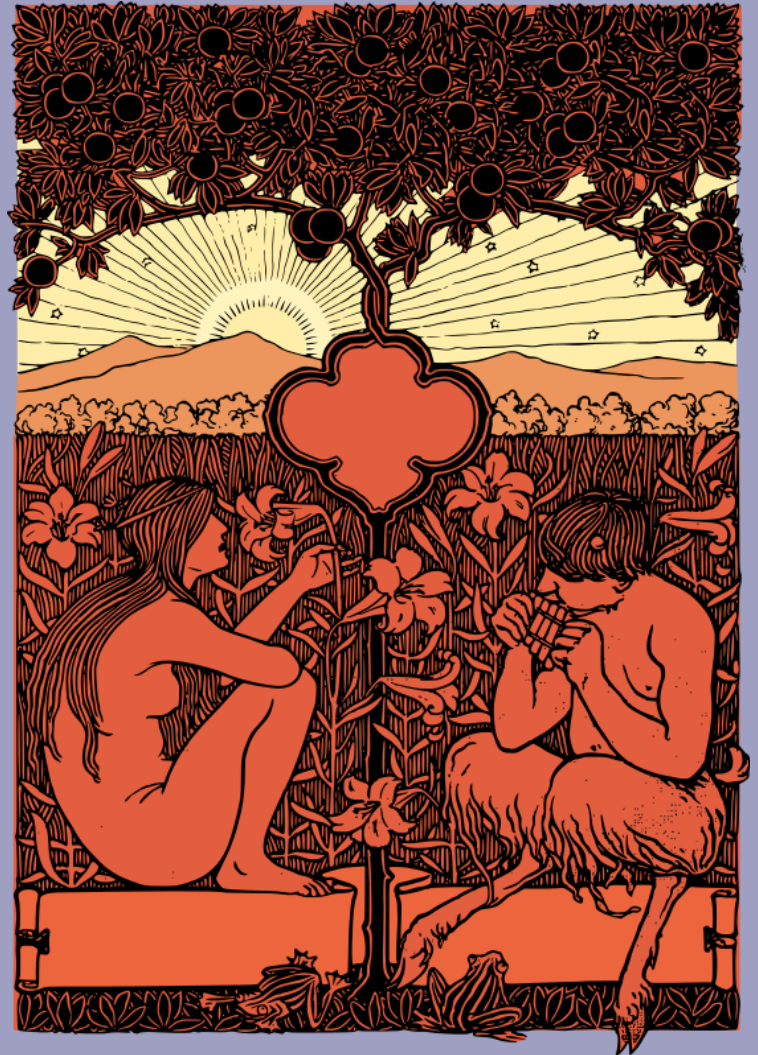


Irrigation
& venting

Scheduling

#7 Persephone Period

- Variety Selection
- Moisture & airflow regulation
- Scheduling
- **Timing!**
 - Wednesday Nov. 15th
 - <https://sunrise-sunset.org/>



Questions???

#6 Day Length

- Time investment
- Sunny days vs. Cloudy days
- Rate of plant growth slows drastically
- Daylight hours combined with temperature



#5 Temperature Regulation

“Air Flow”

- Time investment
- Daily maintenance & adjustments
- Sunny days vs. Cloudy days
- Air flow is crucial
- Row Cover *Trauma!!!*



#4 Pests & Diseases

- Aphids
- White flies
- Scale
- Nematodes
- Moles
- Voles
- *Schlerotinia*



#3 Wash/Pack House

- Enclosed & Insulated
- Walk-In coolers
- Concrete & floor drains
- Warm water
- Wash gear
- **HEAT!!!**



#2 Labor

- Cash flow
- Proximity to work
- Full time vs.
Seasonal vs.
Part time



#1 Winter vs. Summer

- Whole new set of rules
- Weather fanatic
- Heat vs. no heat?
- Lights vs. no lights?
- Monitoring equipment?



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Pros

- High quality product
- No competition
- Controlled growing environment
- Constant income stream

Cons

- Higher pest pressure
- Higher nutrient requirements
- No winter break
- More management = more labor



Let's Get Growing!

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