Mechanics of Winter Farming

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Ten Hens Farm

Outline

- Experiences and Background
- Winter Crops
- Why Farm Year-round?
- Season Extension Options
- Structure Decisions
- Light, Temperature, and Timing
- Soil and Water Management
- Winter Farming Keys
- Q & A


9/29
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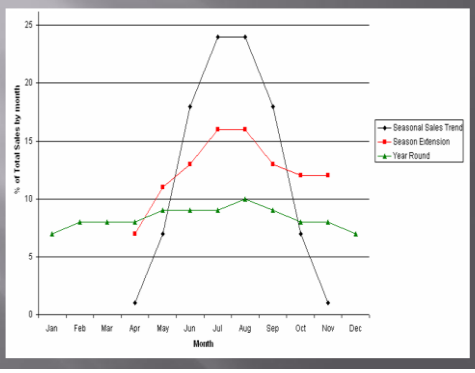
Why Farm Year-round?



Farm Perspective

- Increased Sales
- Distribution over time
- Quality – protection from cold
- Space efficiency – use soil efficiently
- Excitement - Marketing
- Dietary Diversity (not potatoes & cabbage)
- Physical Activity in winter also

Farm Tools and Equipment

- Cultivation equipment like rakes, forks, hoes, rototiller
- Irrigation equipment
- Tractor, loader and cultivating equipment
- Cooler for holding and storing crops prior to marketing
- A vehicle to take crops to market

Why Invest in Equipment?

- Produce more product per person hour of labor
- Make physically difficult jobs easier or tedious tasks shorter
- Increase the profitability of the farm – more income relative to costs
- Provide some marketing advantage
- Improve the quality of life on the farm?

Farm Tools that make money

- What's it cost?
- How long does it take to save that amount by saving work time and increasing production and sales?
- What's the payback period to return the investment

Frost Fabric/Row Cover

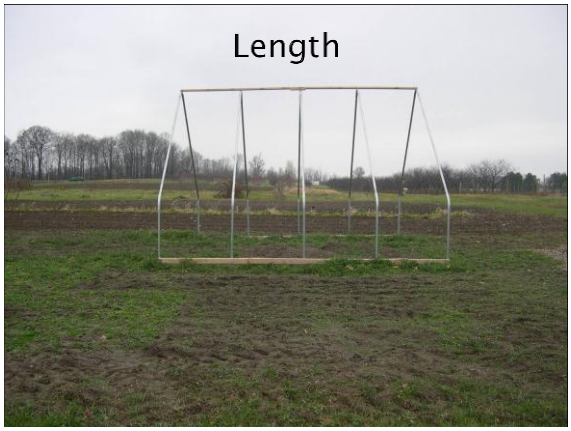
Low Tunnels

Cold Frames

Moveable Cold Frame

Width


Length



Endwalls

Altering Height


Poly Additives


Endwall Materials


Door Options


Roll-Up Sides and End Vents


POSI CLAMP
VENT CONTROL UNIT

Upper Midwest Year-Round Farming

- Key Planting Dates: What about S. Missouri?
  - February/March – Cool/Spring Crops
  - April/Early May – Warm Season
  - August – Carrots and Scallions
  - September/October – Cool Season/Winter Crops
  - November – Spring Harvest Crops

Winter Environment Management

- **Light patterns**
- **Soil temperature patterns**
- **Frost fabric and radiant heat loss**
- **Building heat when the sun shines**

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Light Quantity

- **Light Intensity: footcandles (fc)**
  - **Full summer 10,000 fc, classroom < 100**
  - **Low:<2000, Med: 2000-4000, High: > 4000**
- **Duration: hours - 9 to 16 by season**
- **Quantity = Intensity x Duration**
- **Greenhouse design and covering need to maximize light.**

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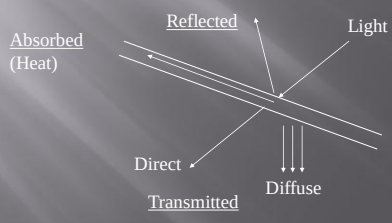
Sunlight Intensity Varies with

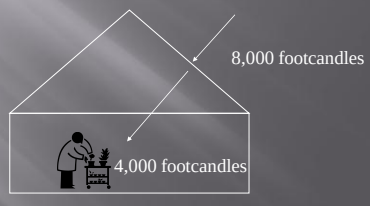
- Time of day
- Latitude
- Time of year
- Cloud density
- Dust in the atmosphere
- Moisture and haze
- Elevation on the earth

Solar Angle & Light Transmission

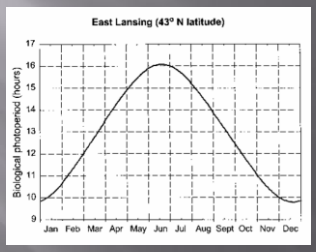
Light can be reflected, absorbed or transmitted



Transmittance

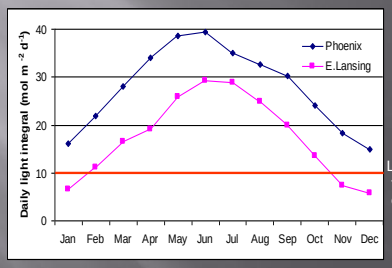


Light Duration: ~9.5 – 16 hrs



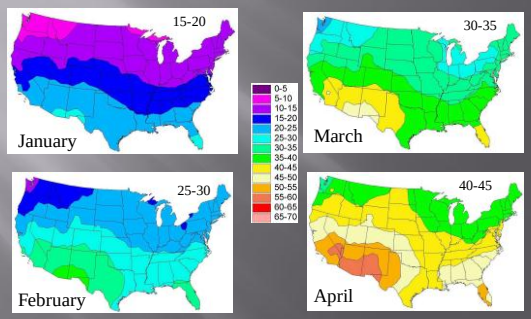
For Joplin: ~10 – 15 hrs

Daily Light Integral inside the Green house Assuming 65% Transmission



Level needed for good growth.

US Outdoor Daily Light Integral



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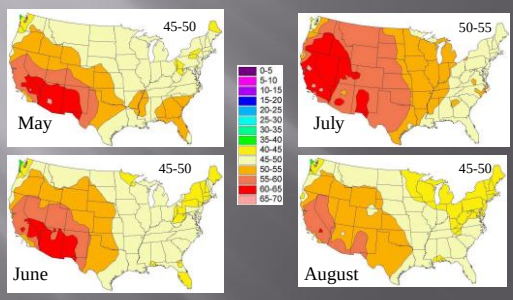

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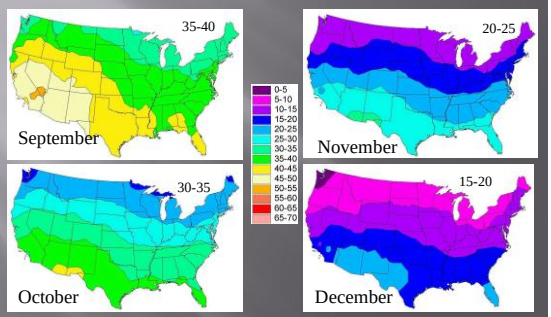

Seed planted correct time – 9/29

Seed Planted too late –
Nov 12 – picture on Jan 18

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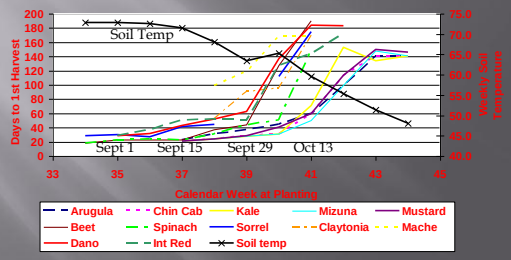
Time to Harvest Increase
With Decreasing Light and Soil Temp



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Upper Midwest Year-Round Farming

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Soil Prep

Rake also for row marking

3 or 4 Step Bed Preparation

Routine Soil Management

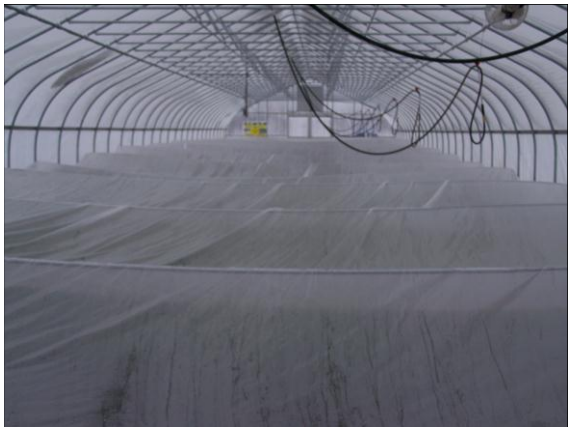
- Compost if available (mature, low N)
  - ~5 ft3/100 ft2 (~2 yds (54ft2)/1000ft2)
- Other Fertility Inputs as needed
  - Blood Meal
  - Bone Meal
  - Potassium Sulfate

Alfalfa Application

- Times to Use
  - Compost not available
  - Low nitrogen compost used
  - Soil test indicates need
  - High nitrogen demand crops
- Rates to Use
  - 6-8 ounces (200 grams) per 20 sq ft
  - 20-25 lbs per 1000 sq ft
- Materials to Use

Alfalfa Fertility

Irrigation




Disease
Management


igloo

MI Water Characteristics

- 300 ppm Bicarbonate
- 100 ppm Calcium
- 25 ppm Mg

Translation?: When we are watering in a tunnel that does not leach we are basically liming (+pH) and impacting the Ca:Mg

How Much Water?

1 Acre Inch = 27,000 gallons

The amount of water it takes to cover 1 Acre (43,560 sq ft) with water 1 inch deep

Most common recommendation for vegetables per week

Flow Rate

Hose and Breaker – Fill a Bucket

Water Pressure - PSI

Overhead or Drip – Calculate by length or area and time

Estimating Your Flow

Seconds to fill a 1 gallon container	GPH*
5	720
6	600
7	450
8	400
9	360
10	300
11	240
12	180
13	120
14	90

*If filling a 5 gallon container multiply the GPH by 5

Flow Rate Calculations

- 8-mil drip line
- 12 inch emitter spacing
- 0.22 gpm/100 linear ft

- Beds are 3 X 30 ft (90 sqft)
- 2 drip lines/bed at 30 ft each = 60 linear ft
- 0.13 gpm/60 linear ft (90 sqft)
- 1 Acre inch equivalent = 56 gallons/wk/bed (27,000 gal X 90 sqft)/43560sqftX

- 56 gallons/wk/bed
- Emitter rate = 0.13 gpm

- 56 gallons/0.13 gpm = 430 minutes
- 430 minutes/60 minutes = ~7 hrs

Options:
1 hr @ 7 days
1.4 hrs @ 5 days
2.3 hrs @ 3 days
3.5 hrs @ 2 days

Other Considerations

- Plant Size

- Plant Type (leafy, fruiting)

- Weather

- Late Fall, Winter, and early Spring Watering

Final Considerations

- $ of automated irrigation materials vs labor to water

- Disease management with a drip system

- Life of irrigation systems, hose replacements, etc.

- Water catchment systems (Lewis Jett, ISU, PFI, and Four Season Tools (KC, MO))

KEYS TO WINTER FARMING

- Right Crop
  -Temperatures
- Right Time
  - Planting dates differ from outside
- Right Harvests
  - Multiple Harvest (of young plants)
- Right Structure
  -Protective Structure and Covering

Markets!