



Commercial Cut Flower Project Update from Nebraska

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Extension is a Division of the Institute of Agriculture and Natural Resources at the University of Nebraska-Lincoln cooperating with the Counties and the United States Department of Agriculture

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The Turning Point 2002

- Regional project for high tunnels in the Central States (Kansas, Missouri, Nebraska)
 - Cool season vegetables – Kansas
 - Warm season vegetables – Missouri
 - Someone has to do cut flowers – Nebraska, Laurie?



Why Cut Flowers?

- Increasing sales and demand at farmers' markets
- Good profit potential
- Early and late season market opportunities
- Field & high tunnel production
- Fun, colorful, appealing to many women farmers as well as men

Starting Point of Floriculture Knowledge & Experience

- Personal – very limited but passion for everything about plants
- Professional – none
- Commercial high value perishable crop production & marketing – strong
- Plant sciences – strong
- Greenhouse - none

Starting Point of Floriculture Knowledge & Experience

- Vegetables, small fruit
- Some bedding plant, nursery on-farm experience
- Some academic and on-farm experience with cotton, soybeans, milo, corn, aquatic weed control
- Cellular and whole plant physiology, ecology, weed science, plant pathology

So You Can Start Too!

- Inquisitive “knowledge junkie” – Why? How? What if? Does it matter? What is known out there in the trade? In research publications?
- Systems thinking
- Detail oriented
- Passion for plants, environment, outdoors, action tasks

UNL High Tunnels Construction



Discoveries

- Very poor soil situation, esp. for flowers
 - Very low nitrogen, porosity, hard pans, low organic matter, few signs of soil organisms
 - However abundant soil P & K and clay soil holds moisture and nutrients
- Flowers have more challenges than vegetables or fruit
 - Cultivar differences in every aspect of production & marketing
 - Soil condition very influential
 - Much more labor, time, critical time events, and money
 - Markets change very quickly





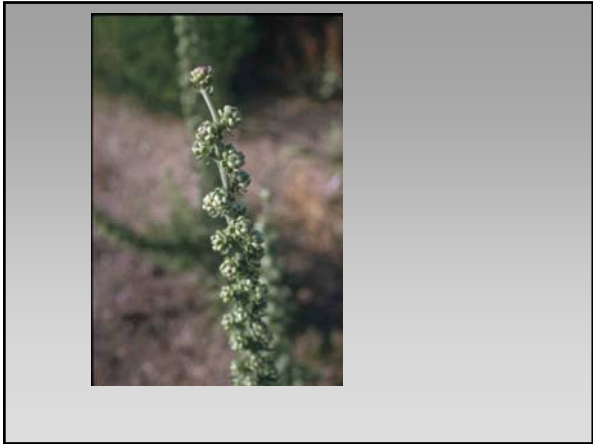
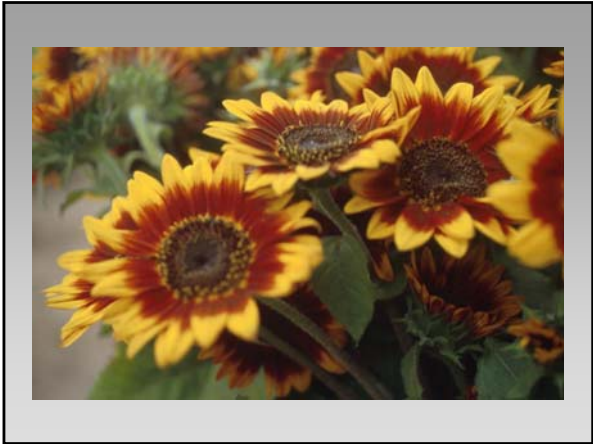
Discoveries

- **Networking is critical to success!**
 - And enjoyment
- **There is no “Answer”!**
 - **But you’ll not run into every problem . . .**
 - › You’ll run into those that no one else seems to have



Current Thoughts

- **Opportunities are numerous**
 - **many niches – unfilled and undiscovered!**
 - › Local, retail, wholesale
 - › Highly specialized to widely diverse crops
 - › Annuals and perennials
 - › Woody and herbaceous





Current Thoughts

- Quality!
- Critical need to watch profitability and cash flow
- Begin small
- Be creative
- Have fun – no one is forcing you to do this!
- Start studying, learning, and working with environmentally sustainable production systems – the future and economics

Il faut cultiver notre jardin

It is necessary to cultivate our garden

Candide, by Voltaire (1759)

Our garden isn't a 45 day crop...




Multiple Aspects of Cut Flower Projects

- High tunnels – no heat, single wall
 - Microclimate effects
 - Season extension
 - Tunnel orientation
- Crop selection & diversity
- Cultural practices
- Economics
- Balance needs of
 - Research (develop knowledge)
 - Extension (apply knowledge)
 - Demonstration (general knowledge, observation)
 - Teaching

High tunnels

- Tunnel orientation
- Microclimate effects
- Season extension

High Tunnel Orientation




- E-W orientation (sidewalls face N-S)
 - 2° F lower average soil temp, esp. early morning & late afternoon
 - Slower response in soil temperature to change in outside air temperature (greater buffering)
- N-S orientation (sidewalls face E-W)
 - Retains soil heat longer



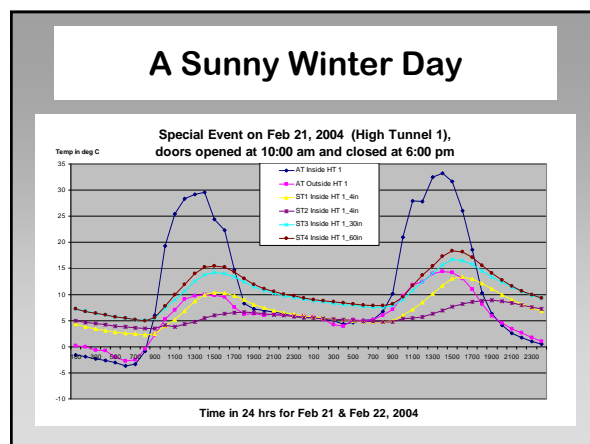
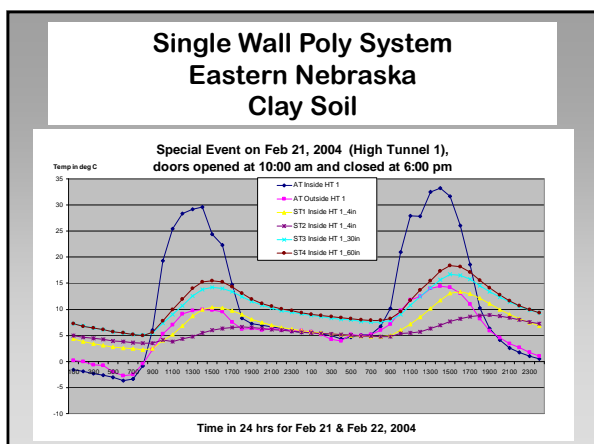
Length of Tunnel

- Longer tunnel had colder soil and air temperatures
 - Ratio of perimeter (circumference) to inside area is key factor
 - 3:1 ratio is good compromise



Side Wall Opening

- Linear relationship with HT soil temperature
- Quickest change in soil temperatures = close sidewalls completely
- Even partial closure (1/4) resulted in soil heat gain



A Sunny Winter Day

- Inside air temperature tracks the external air temperature
 - ≈ 1 hour lag between the respective maximum and minimum.
- Inside soil remains above freezing when outside soil freezes @ 4" depth
- Temperature gradient from the sidewall inward.
 - ≈ 18° F gradient from along the side walls to the inside (10° C)

What do a few degrees make?

- Enzyme Kinetics: **Q10** definition:
- **Q10** = ratio of the rates of a reaction at two different temperatures (standardized for a 10°C difference)
- typical biological reactions: **Q10** of 1.5-3

What do a few degrees make?

- With each 10° C temperature change there is an 18° Fahrenheit change. (There are about 2° F in 1° C)
- Plant enzyme reactions may be 1.5 to 3 X different from the edges of the tunnels

The Consequences in the same crop:

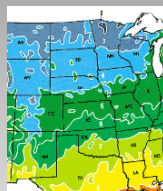
- Plant growth & development
- Post-harvest characteristics
- Plant survival winter/summer

USDA Plant Hardiness Zones

Average Annual Minimum Temperatures Fahrenheit 2003-4

Zone	2003-2004 Lincoln Winter (minimums)	Zone Sub-Category Degrees Fahrenheit	
		A	B
3		-40 to -35	-35 to -30
4		-30 to -25	-25 to -20
5		-20 to -15	-15 to -10
6		-10 to -5	-5 to 0
7	-0.1 outside air	0 to 5	5 to 10
8	11.5 HT air	10 to 15	15 to 20
9		20 to 25	25 to 30
10		30 to 35	35 to 40

USDA Cold Hardiness Zones



1990

Arbor Day Cold Hardiness Zones



2006

Question

- Does this mean we can over winter Zone 7 plants in our high tunnels?
- What about summer heat stress?
- **And what does this mean in terms of my business and profits????**

More Microclimate Effects

- Wind, rain, dew protection
- Insects and diseases – types, frequency, severity, management
- Light
- Humidity
- Air flow

It Is A Whole New World



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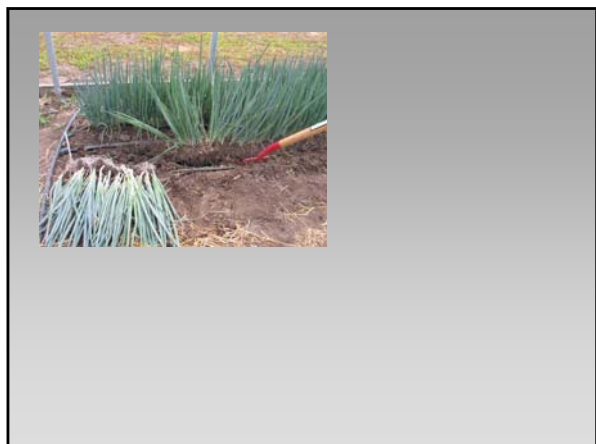
Wide Range of Crops Evaluated

- Ornamentals
 - ≈ 529 cultivars in seed inventory
 - › annual, perennial, biennials, grasses
 - Bulb crops
 - › Tulips, Dutch iris, Grape Hyacinth, Allium, Dahlia, Tuberose, Gloriosa Lily
- Vegetables
 - › Bulb onions, scallions, parsley, broccoli, green beans, elephant garlic, spinach, ornamental peppers & cabbages/kale, beet alpha cukes . . .

A Few Key Crops

- | | |
|---|--|
| <ul style="list-style-type: none"> • Early (April - June) <ul style="list-style-type: none"> ▪ Dutch bulbs – tulip, muscari, allium ▪ Sweet peas ▪ Dianthus ▪ Larkspur * ▪ Sunflowers ▪ Calendula ▪ Rudbeckia* | <ul style="list-style-type: none"> • Fall (Aug – Oct) <ul style="list-style-type: none"> ▪ Sunflowers ▪ Hyacinth Bean ▪ Ornamental Peppers ▪ Grasses ▪ Dahlia* ▪ Lisianthus* ▪ Rudbeckia* |
|---|--|



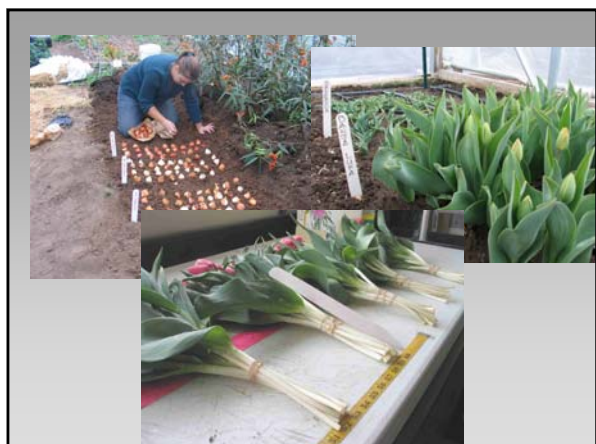


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Cultural Practices

- Minimal use of chemical inputs due to pesticide application regulations & cost of chemicals
- Increasingly biological control & organic practices
 - 5 years insect predator releases and bio-insecticides, adding habitat for beneficial insects
 - 4 years of organic disease management
 - 3 years organic fertilization
 - 1 year no herbicide inside the tunnels
- Attentiveness to microclimate conditions relative to crops
- Begin sprinkling transplants and then drip irrigate
- Management of high tunnel ventilation

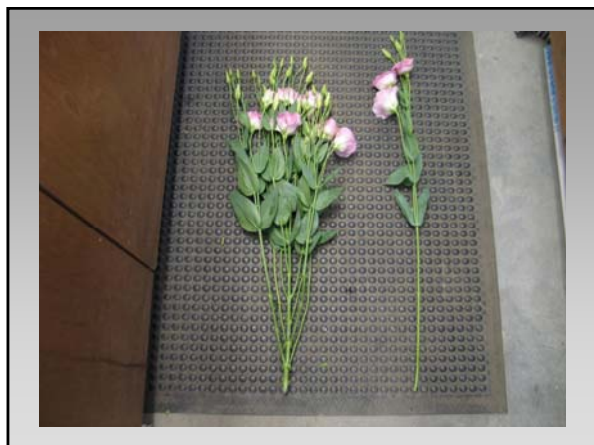


Reasonable Success

- Thrips in early crops
- Spider mites
- Aphids
- Natural predators increasing
- Soil biology increasing
- Mildew control promising
- Plant growth approaching “normal” with improved soil conditions
 - Double dig & heavily amended with alfalfa hay
 - Add beneficial fungi and soil insect predators

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- Cultural practices
- **Economics**



Great Fun ... Can We Make Decent Money?

- High input costs compared with vegetables
- High labor demand
- Wholesale vs retail market
- Travel
- Unaccounted time & hidden costs

Take Notes & Keep Records

Learn How to Run a Business

It does get easier with time

Triple Cropping in the HT







Continuing the Projects

- Complete sample budgets and publish
- Begin research on organic disease control for rust and powdery mildew
- Incorporate higher value crops
- Continue skills/knowledge/research on organic practices
- Work toward organic certification
- Develop demonstration areas for cut flower production and landscape use

Plans

- Expand work with students interested in high value horticultural crops
- Include vegetables
- Find funding to support equipment, transportation, labor, and variable expenses associated with high value horticultural crops

For more information www.hightunnels.org

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