Growing Greens in High Tunnels

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High Tunnels for the Central Great Plains:
Profitable, season-extending horticultural production systems (2001-2005)

Multiple cooperators
Kansas State University
University of Missouri, Columbia
University of Nebraska, Lincoln
Kansas Rural Center

Olathe, KS
Columbia, MO
Lincoln, NE
Wichita, KS
Additional project activities

- On-farm research
- Extension programming
- Web-based educational materials development

Aerial photo of paired organic and conventional research plots – Olathe, KS
An unabashed promotion of high tunnels

With some words of caution
– Profitable production
– Practice makes perfect (with luck)

Why use high tunnels?

• Season Extension – Earlier and later warm and cool season crops.
  – Tomatoes by June; Spinach in January and August
• Crop protection from wind, rain, cold (more with row covers or double layer poly), heat (with shade cloth).
• Increased yields, crop quality and reduced need for pesticides (insect problems can be worse, but biological control can be effective, can screen)
Winter production can be good
Soil almost never freezes under row cover in tunnels

Olathe - December, 2003

Outside

Inside

Summer spinach production
- 39% shade
- Sprinkler irrigation

Sprinkler irrigation
Summer air temperatures are about the same in open high tunnels as in the field.

But summer soil temperatures are cooler in open (vented) high tunnels than in the field.
Sometimes there’s no advantage to growing in a high tunnel
Olathe – June, 2003

What is a high tunnel?

Harnois 30’ x 96’ double layer poly
Eliot Coleman’s farm, Maine

Leavenworth, KS

California desert
High Tunnel (hoophouse) – A poly-covered greenhouse with relatively low input for environmental control. (relatively low cost)

30’ x 96’ Gothic
Zimmerman’s, Versailles, MO

30’ X 96’ Quonset with stove
FarmTek
Versailles, MO

Homemade tunnels are less expensive and have their place

Portable field tunnel
St Isidore Farm, MO

PVC hoophouse K-State
Broke in an ice storm
Haygrove high tunnel – 3 season

High tunnels at Michigan State U. Student Organic Farm.

Cross-wise beds – isolated from edges, more space
Poly row cover provides additional insulation.

Moveable tunnels allow for effective timing of crop protection

Moveable tunnel – Four Season Farm, Maine
Moveable tunnels allow for effective timing of crop protection

K-State/JCCC Student Farm – Nov. 2008
Mike Bollinger, Heritage Prairie Farm

Site selection: Drainage and orientation (light and wind)

Site prep with good drainage (note moveable tunnel)  Multi-bay oriented north-south in line with prevailing winds
Tunnels – a tool

- A part of the farm’s production cycle, complemented by open field
- Crop protection
  - Row cover
  - Low tunnels
  - High tunnels (all sorts)
  - High tunnels + (greenhouses)

Fresh, local greens can be profitable

Microgreens

Baby leaf salad greens

Full + adolescent heads
Leafy greens
Johnny’s Selected Seed has a wide selection

- Lettuce
- Endive – escarole
- Spinach
- Collards
- Kale
- Chard
- Mustard
- Arugula
- Cress
- Turnips
- Pac choi
- Asian greens
  - Komatsuna
  - Tatsoi
  - Mizuna
- Corn salad/mache
- Specialty greens
  - Claytonia
  - Minutina
  - Purslane

Heads and cooking greens
Claytonia – Miner’s lettuce is among the most cold tolerant

Spinach and kale are more cold tolerant than lettuce
Winter varieties
(very rough list)

• Asia Greens – Tokyo Bekana, Tatsoi, Kyona Mizuna
• Arugula
• Claytonia
• Lettuce – Tango, Dark Red Lollo, Galactic
• Mustard – Red Giant
• Spinach – Space, Tyee

Cultivars – Summer
(very rough list)

• Oakleaf lettuce - Cocarde
• Romaine lettuce – Jericho, Green Forest
• Butterhead - Ermosa
• Grand Rapids – Simpson Elite, Red Sails

• Spinach – Tyee, Coho
Practices for meeting market needs

- Crop rotation
- Transplants + direct seed
- Lettuce grows slower than arugula for baby leaf salad mix (plant a week earlier)
- Sequential planting for continuous production
- Cut and come again (leave growing tip), harvest lower leaves

For winter harvest, time of planting is critical

Planted – 10/5
January 5, 2006
Planted – 11/9
Simple implements for the hoophouse gardener

Wheel hoe

Earth fork

4-row pin point seeder

Simple implements for the hoophouse

Greens harvester

Tilther run by electric drill
Not so simple implements for high tunnels
Nolt’s compact raised bed mulch layer on Toro Dingo
Irrigation

Hanging sprinklers or handheld are ideal

Drip saves water but gets in the way and may not be convenient in winter

Fertilization

• Greens need plenty of available N
  - Can split application
• Compost is excellent, but beware of possible salt build-up with animal manures and composts.
Pest problems

- High tunnels are amenable to biological control practices
- Worms – Bt
- Aphids – lady bugs
- Flea beetles – row cover

Disease problems

- Mostly moisture related
- Improve ventilation, plant spacing
- Compost
- Solarization

Rhizoctonia on spinach
Lettuce spaced too close

Weed control

• Stale seedbed method for densely planted greens
  – Prepare seed bed, let weeds germinate, cultivate shallowly 1 or more times
  – Plant crop after weed seed bank is used
• Hoeing for transplants – space properly
Postharvest handling and marketing
(Good Agricultural Practices)

Marketing

- Multiple options – produce auctions; restaurants; farmers markets; farm stand; grocery store; CSA, etc.
- Selling your story; fresh, local; family farm; health, environment.
Thinking About the Benefits of High Tunnels

- Returns/square foot/time – Crops vary in value and returns
- Capturing early markets and holding them into the main field production season (e.g., Ralph Cramer - cut flowers)
- Using high cost specialty items to sell other things like fall storage vegetables.

Successful Growers
Paul and Sandy Arnold, Argyle, NY

- Sell at farmers market
- Field houses (14’ x 100’)
- Over winter and spring
- Lettuce
  - $3100/house @ 1.75/ head
- Spinach (leaf)
  - $3500/house @ 6.75/lb (1/3 lb bags)

http://www.newfarm.org/features/0503/arnoldsbuild.shtml
Nice Crop of Greens at the Kansas City Community Farm

Developing efficient production systems

Pete's Greens, Craftsbury, VT
Information sources

• Growers
• Websites (hightunnels, Noble Found, Penn State, etc.)
• Listservs (hightunnels, market farming)
• Books (Grower manuals, extension pubs)
• Magazines (Growing for Market)
• Conferences (Great Plains Veg., HIS, etc.)

Recommended information sources

• www.hightunnels.org + listserv
• Winter Harvest Manual – Eliot Coleman
• Four Season Harvest – Eliot Coleman
• Walking to Spring – Wiediger
• Hoophouse Handbook – Growing for Market
• Penn State High Tunnel Production Manual.
• Production of vegetables, strawberries and cut flowers using Plasticulture. NRAES-133.
• OSU high tunnel workshop audio
• Michigan State University Student Organic Farm Website
High Tunnels Using Low-Cost Technology to Increase Yields, Improve Quality and Extend the Season

By Ted Blomgren and Tracy Frisch

Produced by Regional Farm and Food Project and Cornell University with funding from the USDA Northeast Region Sustainable Agriculture Research and Education Program.

Distributed by the University of Vermont Center for Sustainable Agriculture.

DVD + 74 page book, 2007
Welcome

High tunnels, or hoophouses, are unheated greenhouses that can help market gardeners extend their growing season so that they can improve the profitability of their farms.

This website is part of a USDA-sponsored project that is testing and promoting high tunnel systems in the Central Great Plains.

We hope to provide information developed under our project, and links to relevant sites around the world, so that growers and educators have a one-stop source where they can find information on all aspects of high tunnel construction and use.

We welcome your input and feedback to make this site useful. Please let us know if links to:

High-Tunnel Listerv

A listerv for high tunnel discussion with over 269 subscribers has been generating informative discussion since March 2004. Recently discussed topics include: Strawberries, melons, inexpensive heating, poly repair, and snakes. Additionally, upcoming workshops and farm tours are frequently advertised on the High-Tunnel Listerv.

To sign up, please go to:
http://listserv.isu.edu/cgi-bin/wa?A1=ind040306

To access the high tunnels listerv archives, please go to:
http://listserv.isu.edu/archives/hightunnels.html

Messages in the archives are organized by subject line by month. There is also a search engine to search across months for specific topics.
Come and visit any time

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