Potential of Protected Agriculture for Small Fruit and Vegetable Production in Florida

Bielinski M. Santos
Types of Structures
Types of Structures
Types of Structures
Types of Structures
Structure of the Program

- Research, Extension and Education.
- Involvement:
  - Research studies and validations.
  - Field demonstrations.
  - Advising and consulting.
Areas of Expertise

- Structures and maintenance.
- Soil/soilless media.
- Cultural practices.
- Irrigation and water management.
- Fertilization and plant nutrition.
- Pest management: Other scientists.
Main Principles

- Protected ag is not only for the rich, but rather for the rich of creativity, ideas and desire!

- Keep it simple!

- Work as much as possible with materials and resources that the grower already has.
Horticultural Program at the GCREC: Area Served under Protected Agriculture in Florida

<table>
<thead>
<tr>
<th>Crops</th>
<th>2009</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strawberry</td>
<td>2.5</td>
<td>15.7</td>
</tr>
<tr>
<td>Tomato</td>
<td>0</td>
<td>5.7</td>
</tr>
<tr>
<td>Pepper</td>
<td>0</td>
<td>1.8</td>
</tr>
<tr>
<td>Blueberry</td>
<td>2.3</td>
<td>40.2</td>
</tr>
<tr>
<td>Herbs</td>
<td>0</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.8</strong></td>
<td><strong>64.4</strong></td>
</tr>
</tbody>
</table>
Potential Benefits for Florida

- Early production: Competitive edge in the market.
- Grow diverse crops and cultivars.
- Freeze protection:
  - Reduced water consumption.
  - Reduced low fuel/electricity.
- Reduced foliar and fruit diseases.
- Intensive ag: Intercropping and soilless culture.
Strawberry under Tunnels

- Open field and high-tunnel culture.
- RCB design with 4 replications.
  - Early (6 harvests) and total fruit weight.
  - Water use for freeze protection.
Effective freeze protection

27°F
Water use: 2.5 acre-inch/acre/night

43°F
Water use: 0
## Strawberry Yields (2007-08 & 2008-09)

<table>
<thead>
<tr>
<th>Production systems</th>
<th>Early yield</th>
<th>Total yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>High tunnels</td>
<td>2.7 a</td>
<td>14.6 a</td>
</tr>
<tr>
<td>Open fields</td>
<td>2.1 b</td>
<td>9.4 b</td>
</tr>
</tbody>
</table>

Significance \((P<0.05)\)

- \(*\)

Difference

- +28%
- +55%
## Strawberry Preliminary Economics (2007-10)

<table>
<thead>
<tr>
<th>Components</th>
<th>Open fields</th>
<th>High tunnels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early yield</td>
<td>+0.6 ton/acre (+$3000/acre)</td>
<td>+4.4 ton/acre (+$8800/acre)</td>
</tr>
<tr>
<td>Total yield</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tunnel installation &amp; maintenance</td>
<td></td>
<td>5 years (-$7000/acre)</td>
</tr>
<tr>
<td>Freeze protection</td>
<td>15 acre-inch (3 acre-inch x 5 days)</td>
<td>Water: 0 (+$150/acre) Personnel:10 h/man (+$150/acre)</td>
</tr>
<tr>
<td>Balance</td>
<td></td>
<td>+$5100/acre</td>
</tr>
</tbody>
</table>
Performance of Blueberry Cultivars under High Tunnels

Teresa Salamé and Bielinski M. Santos

Gulf Coast Research and Education Center
IFAS, University of Florida
Blueberry Prices

Harvest season north Fla.: April 1 to May 15

[Graph showing blueberry price decrease from April 7 to May 26]
Objective

To compare early yield of two blueberry cultivars grown under high tunnels and in open fields.
Materials and Methods

- Summer management.
Materials and Methods

- Waldo, Florida.
- 2010 & 2011 seasons.
- Fine sand soil and pinebark beds.
- Black row covers.
Materials and Methods

- Open fields and high tunnels.
- Two blueberry cultivars
  - ‘Snow Chaser’
  - ‘Springhigh’
- Split-plot design.
- 4 replications.
Materials and Methods

- **Freeze protection:**
  - Open field (sprinklers: 120 gal/min/acre).
  - High tunnels (minisprinklers: 60 gal/min/acre).
- Turn on water at 33°F.
## Temperatures

<table>
<thead>
<tr>
<th>Year</th>
<th>Location</th>
<th>Days under 33F</th>
<th>Min. Temp. (F)</th>
<th>Max. Temp. (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Open field</td>
<td>27</td>
<td>19.3</td>
<td>93.6</td>
</tr>
<tr>
<td></td>
<td>Open field</td>
<td>25</td>
<td>19.8</td>
<td>93.2</td>
</tr>
<tr>
<td></td>
<td>High tunnel entrance</td>
<td>8</td>
<td>29.3</td>
<td>97.0</td>
</tr>
<tr>
<td></td>
<td>High tunnel center</td>
<td>2</td>
<td>31.7</td>
<td>97.0</td>
</tr>
<tr>
<td>2011</td>
<td>Open field</td>
<td>34</td>
<td>20.6</td>
<td>115.5</td>
</tr>
<tr>
<td></td>
<td>Open field</td>
<td>32</td>
<td>20.6</td>
<td>114.6</td>
</tr>
<tr>
<td></td>
<td>High tunnel entrance</td>
<td>5</td>
<td>31.7</td>
<td>129.4</td>
</tr>
<tr>
<td></td>
<td>High tunnel center</td>
<td>1</td>
<td>32.5</td>
<td>115.5</td>
</tr>
</tbody>
</table>
Water Savings

Considering the temperatures on 2010, the potential savings could be:

- Open fields:
  \[60,000 \text{ gal/acre} \times 25 \text{ days} = 1,500,000 \text{ gal/acre/season}\]

- High tunnels:
  \[30,000 \text{ gal/acre} \times 8 \text{ days} = 240,000 \text{ gal/acre/season}\]

Savings: 1.25 gal/acre/season
Blueberry Yield 2010

Blueberry Yield (ton/ac)
• Determinate specialty ‘Tasti-Lee’ tomato.
• “Soilless trench system”.
• RCB design with 5 replications.
### ‘Tasti-Lee’ Tomato Yields (2009-10)

<table>
<thead>
<tr>
<th>In-row distances</th>
<th>Marketable yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>inches</td>
<td>ton/acre</td>
</tr>
<tr>
<td>12</td>
<td>42.6 a</td>
</tr>
<tr>
<td>16</td>
<td>39.6 a</td>
</tr>
<tr>
<td>20</td>
<td>39.8 a</td>
</tr>
<tr>
<td>24</td>
<td>40.0 a</td>
</tr>
<tr>
<td>Average</td>
<td>40.5</td>
</tr>
<tr>
<td>Significance (P&lt;0.05)</td>
<td>NS</td>
</tr>
<tr>
<td>Open field in Florida</td>
<td>15.0</td>
</tr>
</tbody>
</table>
Then, at the grower level you can expect anything!

Bielinski M. Santos
Gulf Coast Research and Education Center
IFAS, University of Florida
Balm, Hillsborough Co. (2009-11)
Color peppers-STS-pine bark
Balm, Hillsborough Co. (2009)
Tomato-boxes-pine bark
Balm, Hillsborough Co. (2010-11)
Pepper and strawberry-pine bark
Balm, Hillsborough Co. (2010-11)
Tomato-bags-coconut core, pine bark
Lake Wales, Polk Co. (2009-11)
Strawberry-tables, bags, vertical
Pine bark, coconut coir
Lake Wales, Polk Co. (2009-11)
Strawberry-tables, bags, vertical
Pine bark, coconut coir
Lake Wales, Polk Co. (2010-11)
Pepper-bags, STS
Pine bark, coconut coir
Lake Wales, Polk Co. (2010-11)
Pepper-bags, STS
Pine bark, coconut coir
Lake Wales, Polk Co. (2010-11)
Tomato-bags-coconut coir
Waldo, Alachua Co. (2010-11)
Pepper, strawberry-STS-pine bark
Waldo, Alachua Co. (2010-11)
Strawberry-tables-pine bark
Haines City, Polk Co. (2010-11)
Strawberry-bags-coconut coir
Haines City, Polk Co. (2010-11)
Strawberry-bags-pine bark
Haines City, Polk Co. (2010-11)
Strawberry-troughs-pine bark
Clewiston, Hendry Co. (2010-11)
Basil-STS-soil, pine bark
Crescent City, Putnam Co. (2010-11)
Pepper-bags-pine bark, potting mix
Crescent City, Putnam Co. (2010-11)
Blueberry-pots-pine bark
Ruskin, Hillsborough Co. (2010-11)
Tomato-bags, pots, troughs
Coconut coir, pine bark
Ruskin, Hillsborough Co. (2010-11)
Tomato-bags, pots, troughs
Coconut coir, pine bark
Brooksville, Hernando Co. (2011)
Tomato-STS-pine bark
PAINet: Protected Ag Information Network for Central America and the Caribbean

- Initiative: Gulf Coast REC, IFAS, Univ. of Florida.
- Guatemala, El Salvador, Nicaragua, Costa Rica, Honduras, Dominican Rep., and Haiti.
- Sustainable.
- Free education, information and research exchange.
PAINet: Protected Ag Information Network for Central America and the Caribbean

- Horizontal communication: Most members are growers and exporters.
- Country and grower-driven.
Thanks!!
Questions?
bmsantos@ufl.edu