

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



**Bielinski M. Santos**

# Types of Structures



# Types of Structures



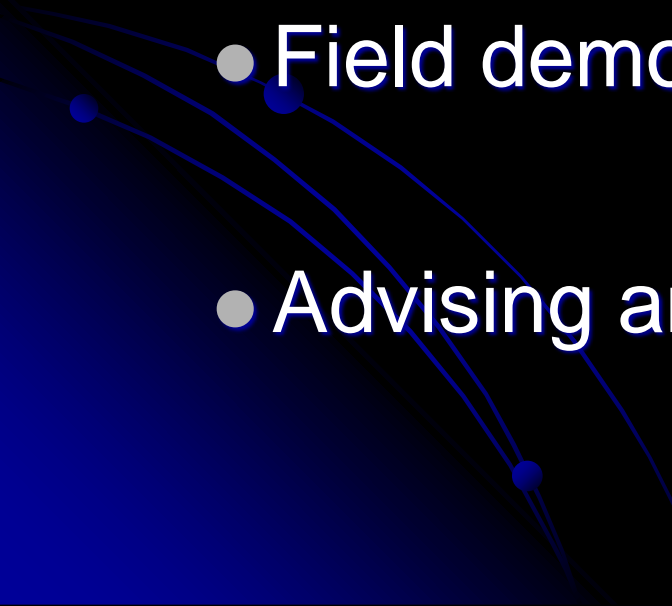
# Types of Structures




# Types of Structures



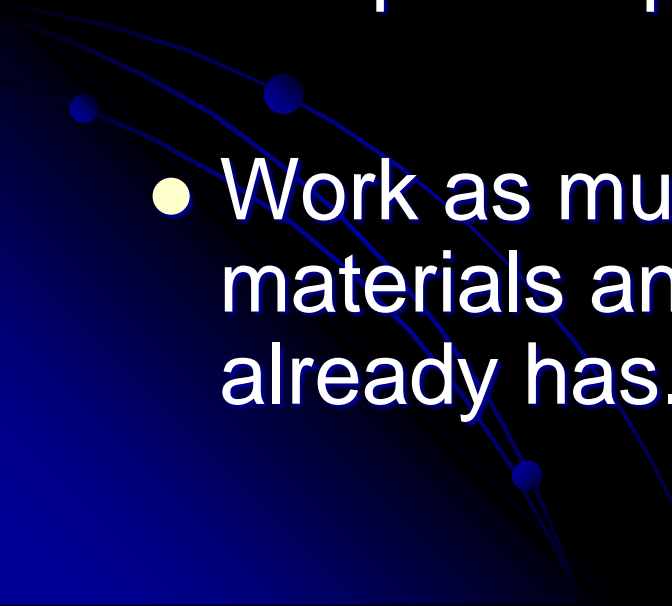
# Structure of the Program

- 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

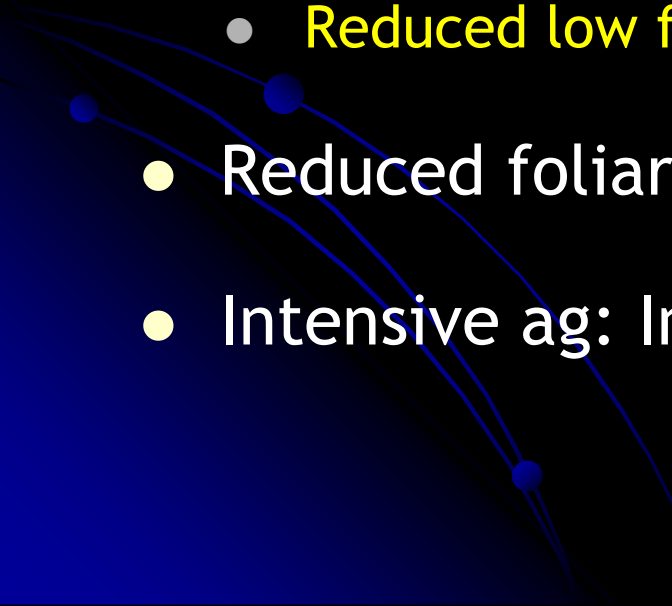
- Protected ag is not only for the rich, but rather for the rich of creativity, ideas and desire!
  - Keep it simple!
  - Work as much as possible with materials and resources that the grower already has.
- 



## Horticultural Program at the GCREC: Area Served under Protected Agriculture in Florida

Crops	Acreage	
	2009	2011
Strawberry	2.5	15.7
Tomato	0	5.7
Pepper	0	1.8
Blueberry	2.3	40.2
Herbs	0	1.0
<b>Total</b>	<b>4.8</b>	<b>64.4</b>

# 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

- Three studies: 2007-08, 2008-09 and 2009-10.
- 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)

Production systems	Early yield -----ton/acre-----	Total yield
High tunnels	2.7 a	14.6 a
Open fields	2.1 b	9.4 b
Significance ( $P < 0.05$ )	*	*
Difference	+28%	+55%

# Strawberry Preliminary Economics (2007-10)

Components	Open fields	High tunnels
Early yield		+0.6 ton/acre (+\$3000/acre)
Total yield		+4.4 ton/acre (+\$8800/acre)
Tunnel installation & maintenance		5 years (-\$7000/acre)
Freeze protection	15 acre-inch (3 acre-inch x 5 days)	Water: 0 (+\$150/acre) Personnel: 10 h/man (+\$150/acre)
Balance		+\$5100/acre

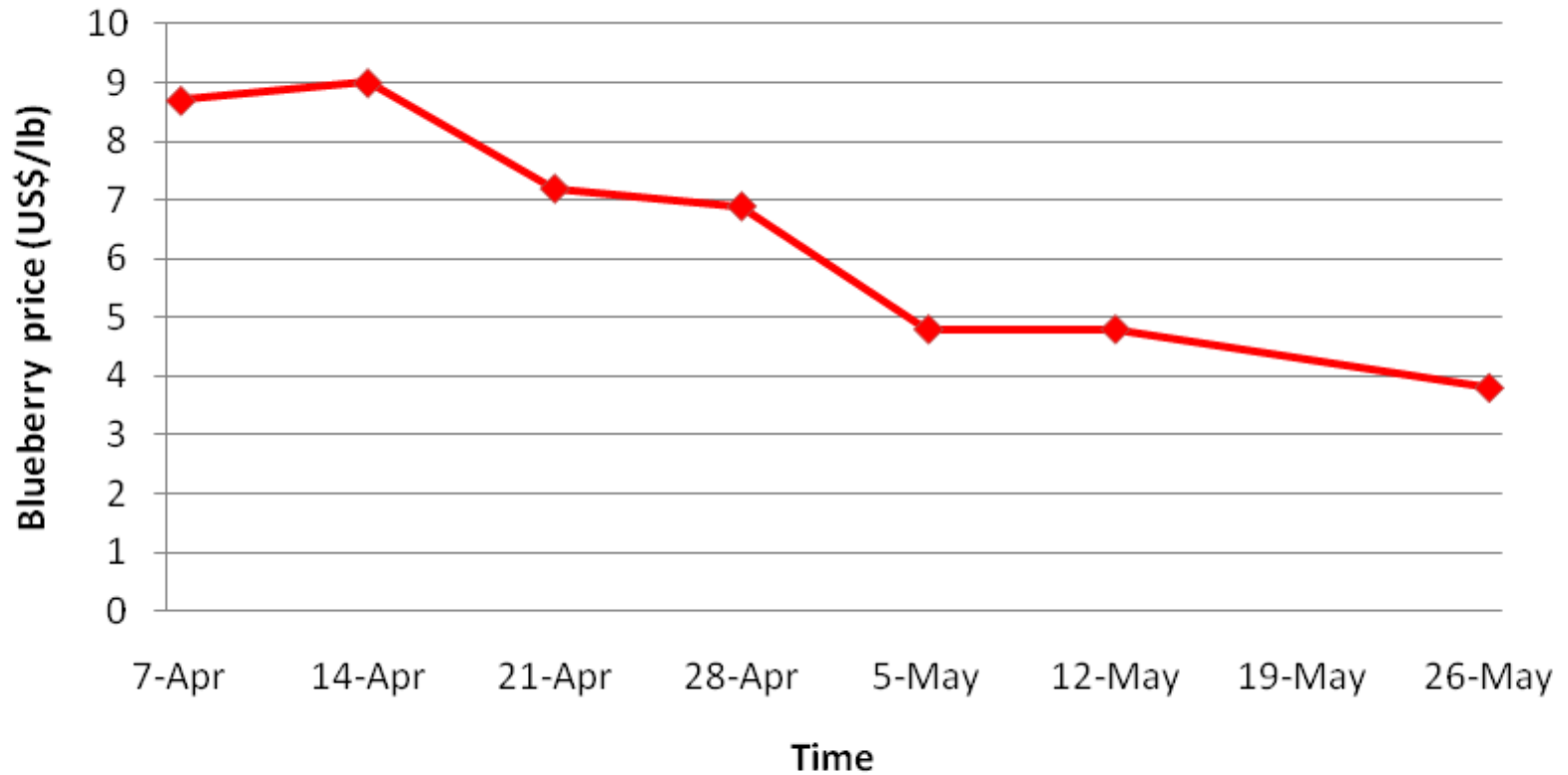


# Performance of Blueberry Cultivars under High Tunnels

**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



# 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

2010	Days under 33F	Min. Temp. (F)	Max. Temp. (F)
Open field	27	19.3	93.6
Open field	25	19.8	93.2
High tunnel entrance	8	29.3	97.0
High tunnel center	2	31.7	97.0

2011	Days under 33F	Min. Temp. (F)	Max. Temp. (F)
Open field	34	20.6	115.5
Open field	32	20.6	114.6
High tunnel entrance	5	31.7	129.4
High tunnel center	1	32.5	115.5

# Water Savings

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

-Open fields:

**60,000 gal/acre x 25 days = 1,500,000 gal/acre/season**

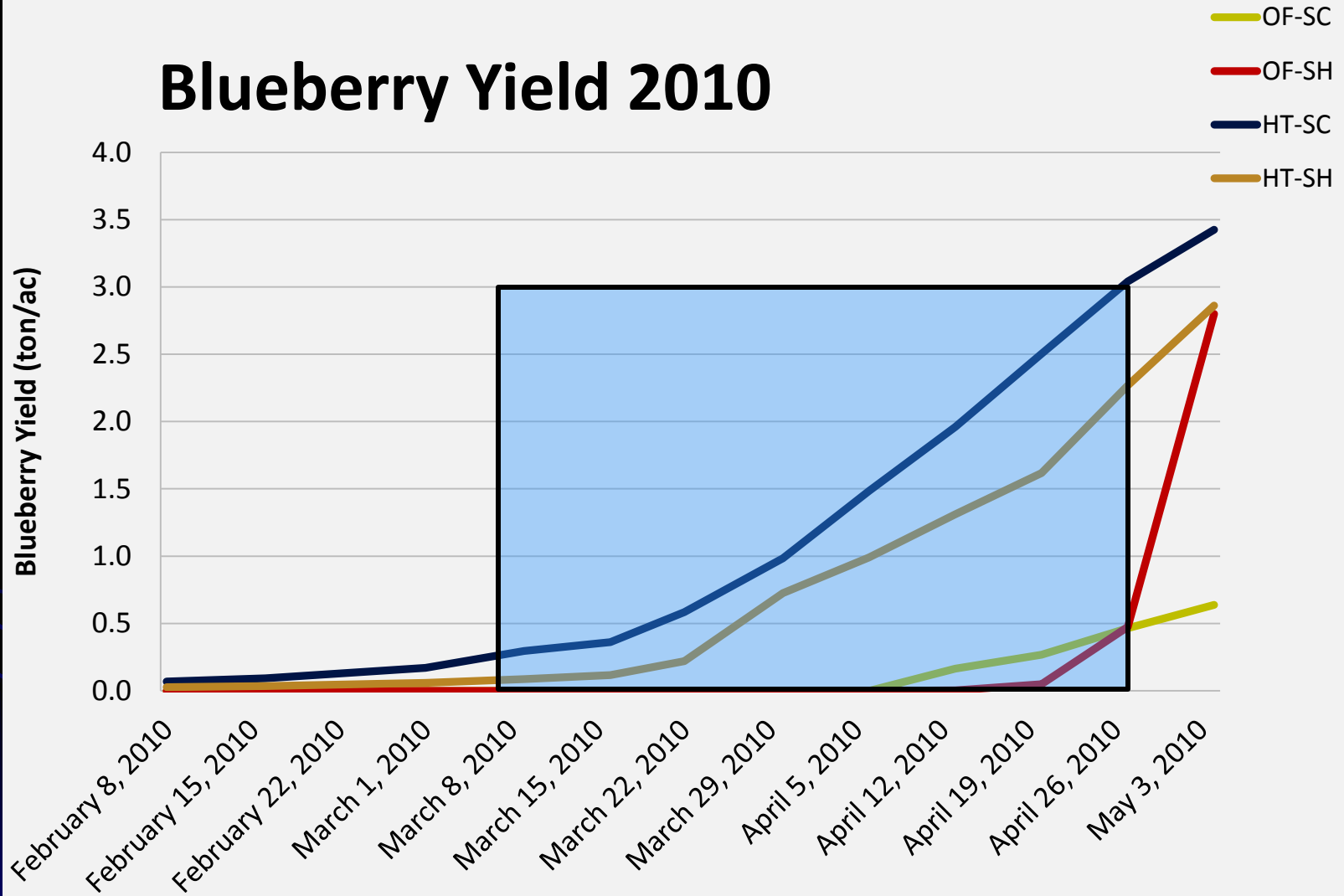
-High tunnels:

**30,000 gal/acre x 8 days = 240,000 gal/acre/season**

**Savings: 1.25 gal/acre/season**

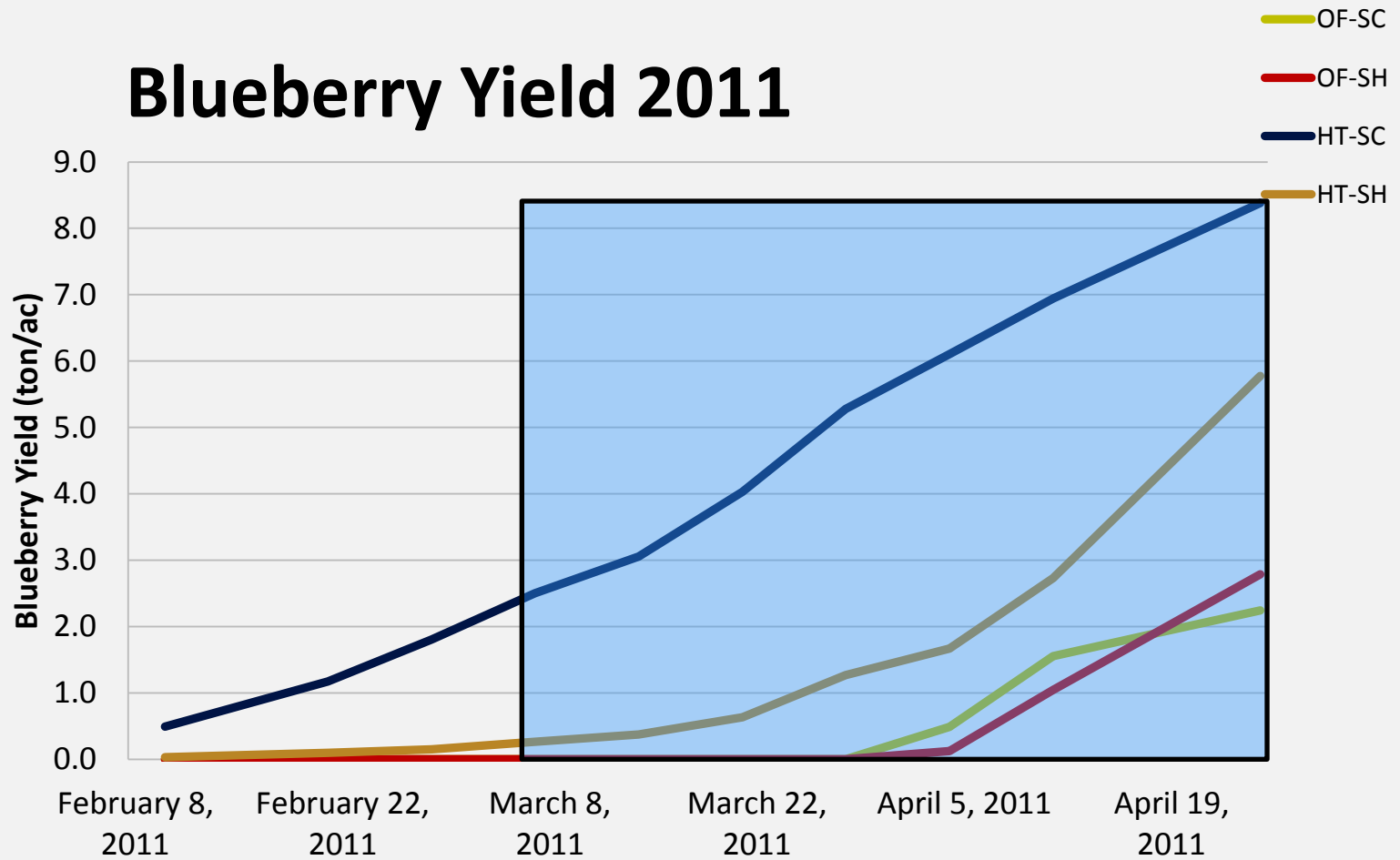


# Blueberry Yield 2010





# Blueberry Yield 2011

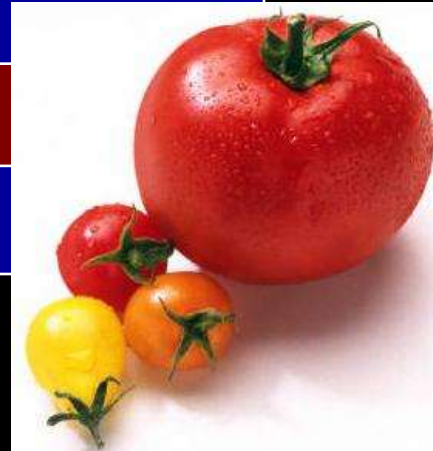


- Determinate specialty 'Tasti-Lee' tomato.
- "Soilless trench system".
- RCB design with 5 replications.



# 'Tasti-Lee' Tomato Yields (2009-10)

In-row distances	Marketable yield
inches	ton/acre
12	42.6 a
16	39.6 a
20	39.8 a
24	40.0 a
Average	40.5
Significance ( $P < 0.05$ )	NS
Open field in Florida	15.0

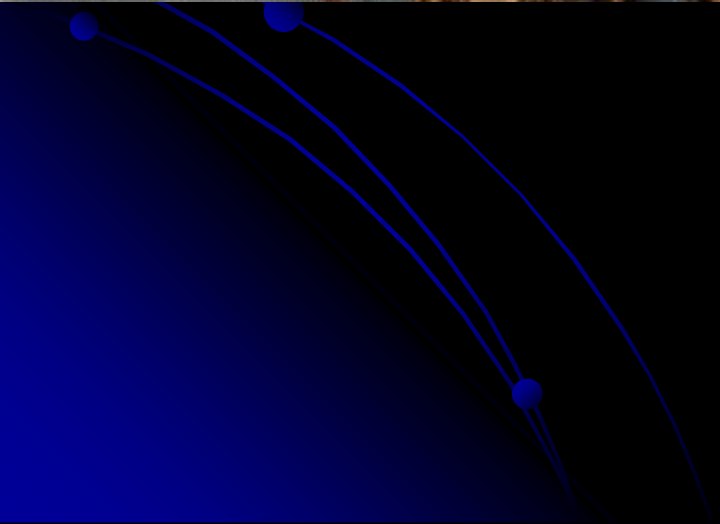


**Then, at the grower level you  
can expect anything!**

***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. (2009-11) Strawberry-boxes and vertical systems-medium





# Balm, Hillsborough Co. (2010-11) Strawberry-tables-pine bark



**Balm, Hillsborough Co. (2010-11)  
Tomato-bags-coconut core, pine bark**



**Balm, Hillsborough Co. (2010-11)  
Basil-boxes-pine bark**



# Lake Wales, Polk Co. (2009-11)



**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)



**Lake Wales, Polk Co. (2010-11)**  
**Pepper-bags, STS**  
**Pine bark, coconut coir**

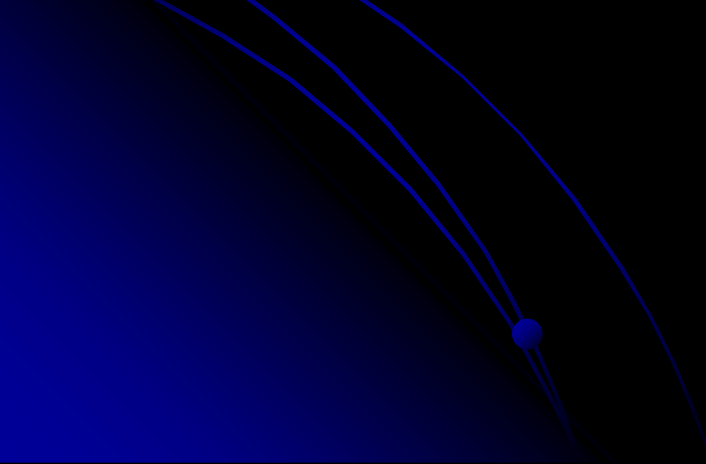




**Lake Wales, Polk Co. (2010-11)**  
**Pepper-bags, STS**  
**Pine bark, coconut coir**



# 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**



# Plant City, Hillsborough Co. (2010-11) Strawberry-soil



# 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**



**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](mailto:bmsantos@ufl.edu)**