



# The Economics of Citrus Greening

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- The world orange juice market is dominated by two suppliers: Sao Paulo, Brazil and Florida, USA.
- Historically, these two regions have accounted for over 80 percent of world orange juice production.
- The major consumption regions are the United States, the European Union, and Canada. In recent years, new markets in China and Russia have begun to evolve.

# World OJ Consumption

Season	U.S.	EU	Canada	Russia	Japan	South Korea	China	Australia	Others	Total
	Million SSE Gallons									
2000-01	1482	1390	165	16	155	66	17	64	123	3477
2001-02	1460	1426	164	37	135	69	48	68	108	3515
2002-03	1433	1513	157	52	135	78	57	64	119	3608
2003-04	1465	1663	155	63	127	67	67	68	137	3812
2004-05	1394	1543	150	64	127	64	63	68	139	3613
2005-06	1340	1415	161	78	128	65	74	58	120	3439
2006-07	1258	1177	123	78	125	58	87	58	143	3107
2007-08	1166	1224	187	84	106	54	88	56	120	3085
2008-09	1214	1341	150	61	99	42	84	54	119	3164
2009-10	1226	1288	135	56	91	49	82	58	123	3108

Sources: FAS, USDA; FDOC estimates for U.S.

- Both Sao Paulo and Florida face major production challenges.
- In Sao Paulo, these challenges include disease and the production of sugarcane for ethanol and sugar.
- In Florida, growers also face disease issues and until recently, rising grove maintenance costs.
- Even though the hurricanes of 2004 and 2005 did little tree damage, they did spread citrus canker in Florida.

- The State of Florida was forced to abandon an eradication program for citrus canker in January 2006 after over 65,000 acres of citrus had been eradicated.
- The housing boom that ended in 2008 also affected citrus production in Florida.
- Some growers chose to not rehabilitate their groves after the hurricanes in anticipation that their land could be sold for development.

## Factors Affecting Orange Production in Sao Paulo

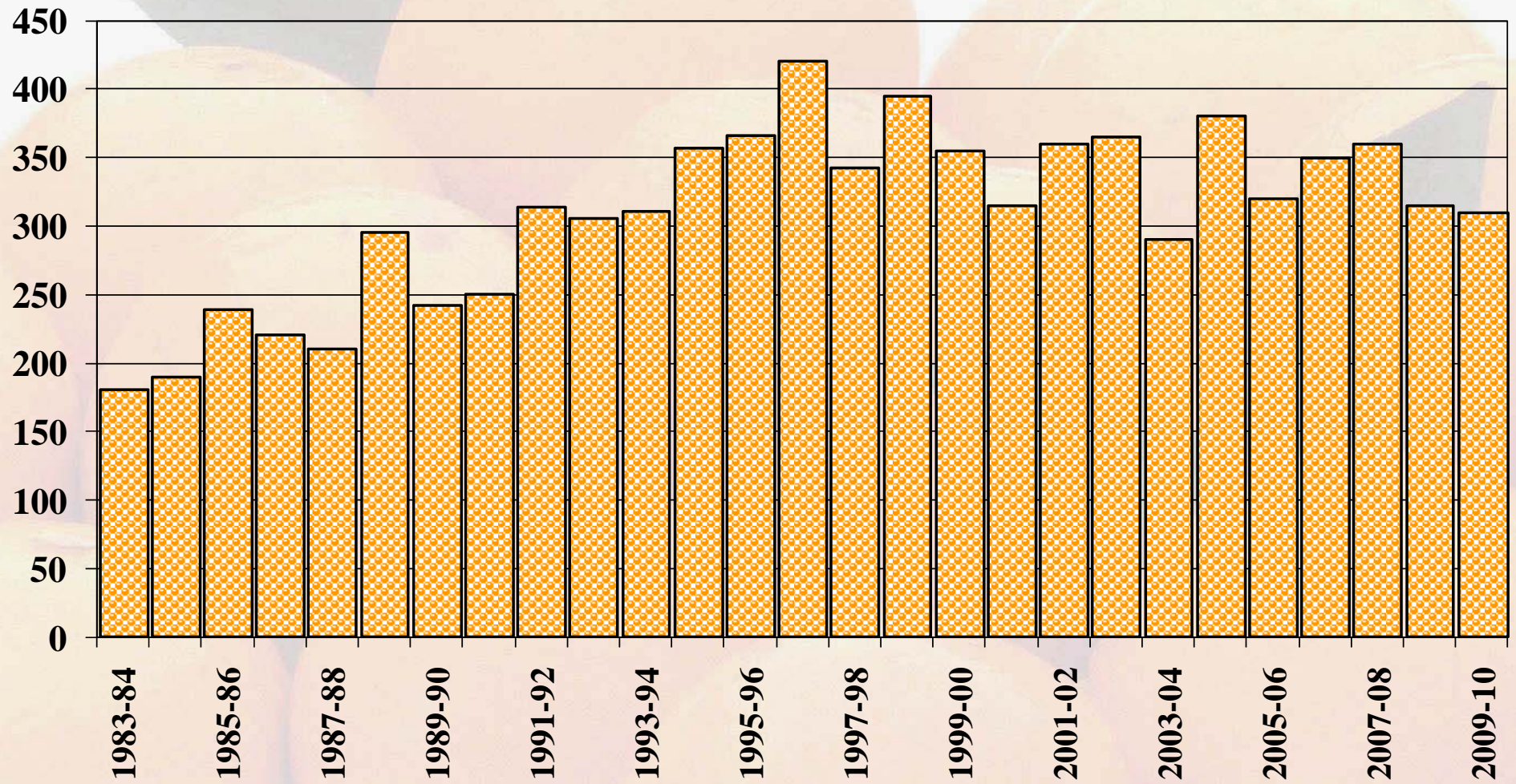
- Several factors have combined to slow the growth in orange production in Sao Paulo.
- Disease: CVC, Sudden Death, Canker, Greening, and Black Spot.
- Competition from sugarcane.
- Until recently, low prices for oranges used for processing.



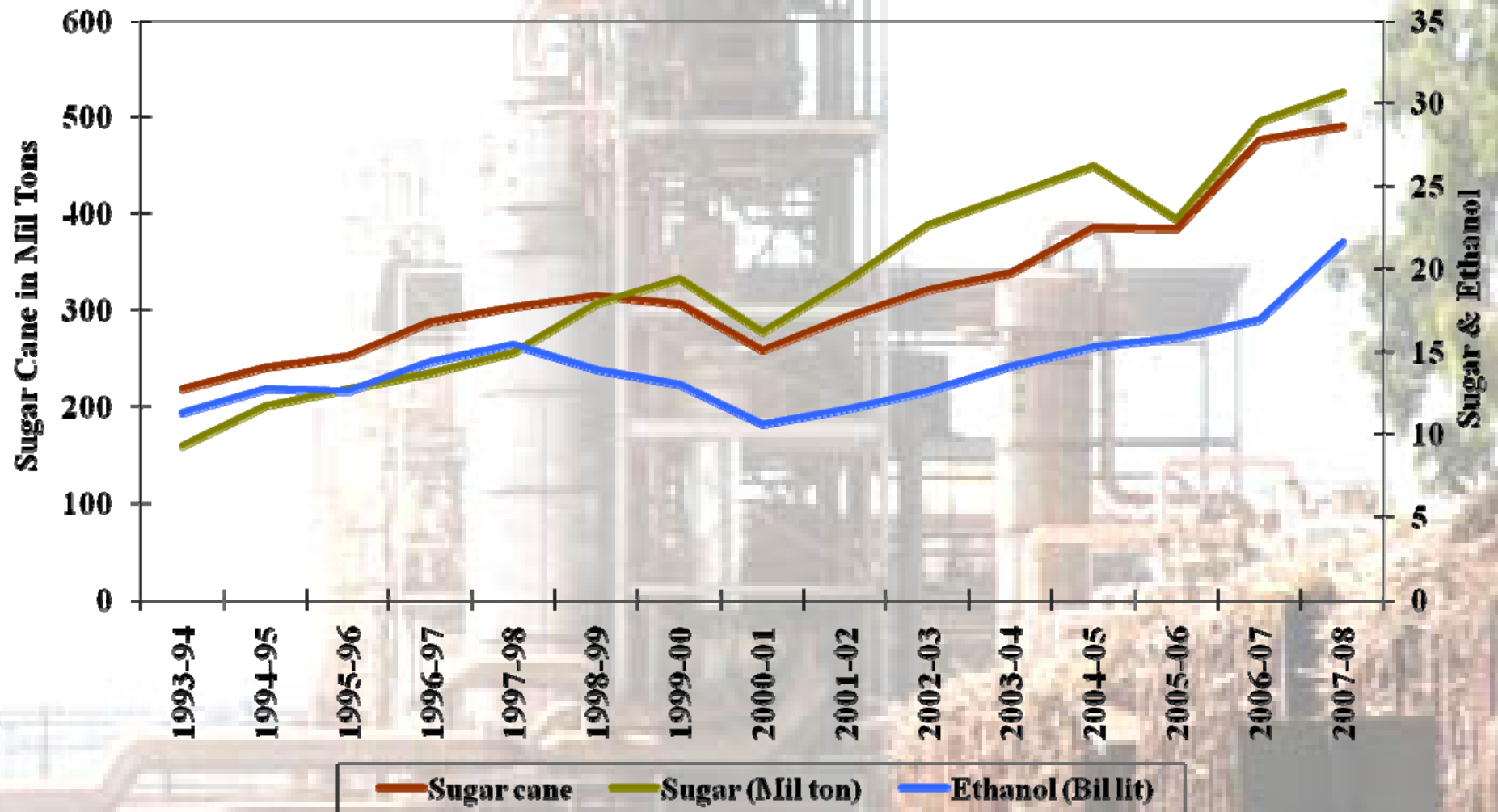




# Sao Paulo orange production



# Sugar cane, sugar and ethanol production in Brazil

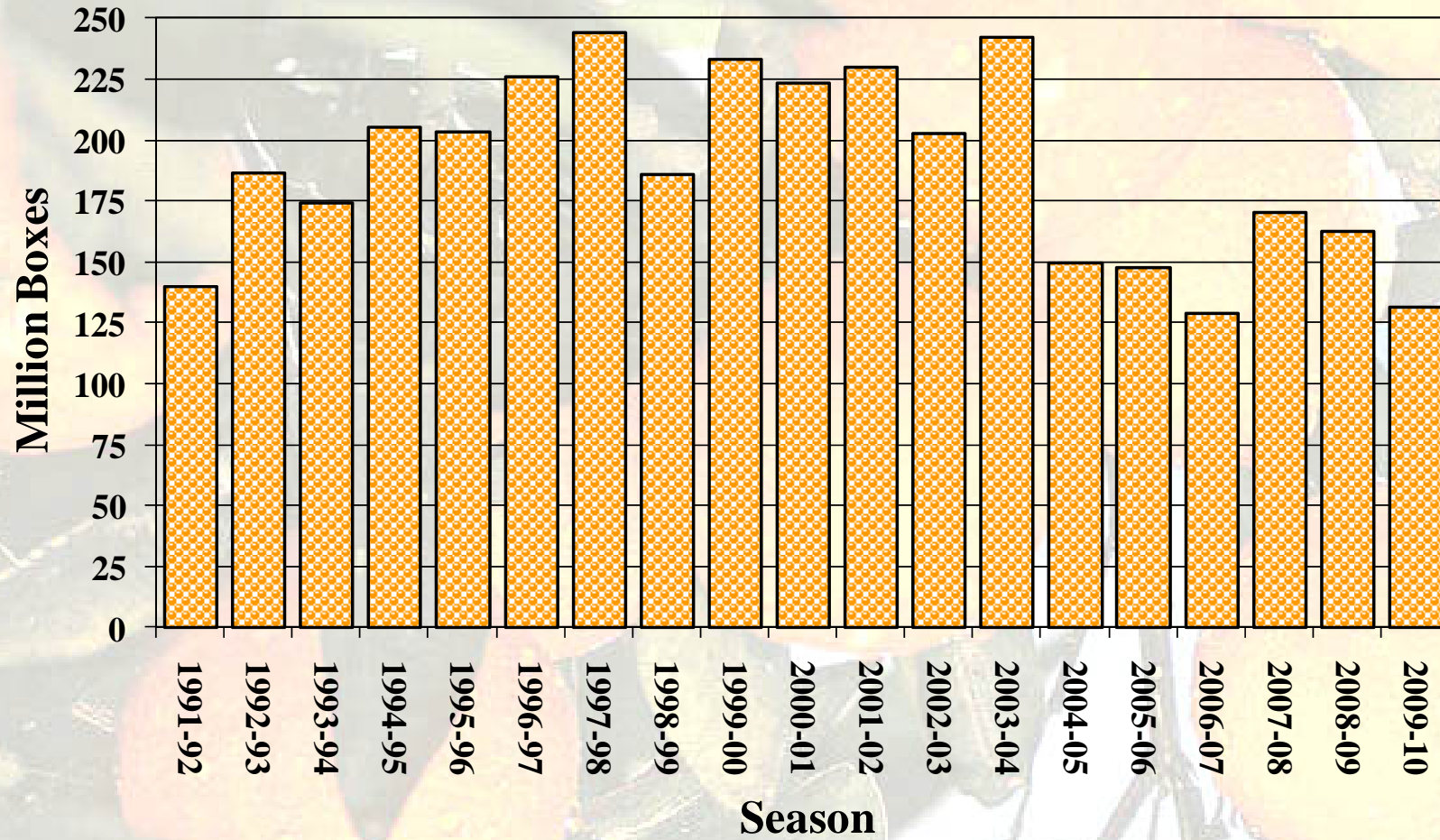


Source: FAS, USDA

# Orange Production in Florida

- Florida orange production was strongly affected by the freezes of the 1980s.
- Orange production recovered and a new production record was set in 1997-98 at 244 million boxes.
- Beginning 1998, however, production stagnated due to lower prices.
- In 2004, the main citrus production area was visited by three hurricanes and greening was discovered in 2005.

# Florida Orange Production

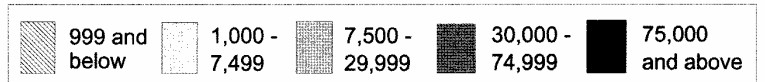
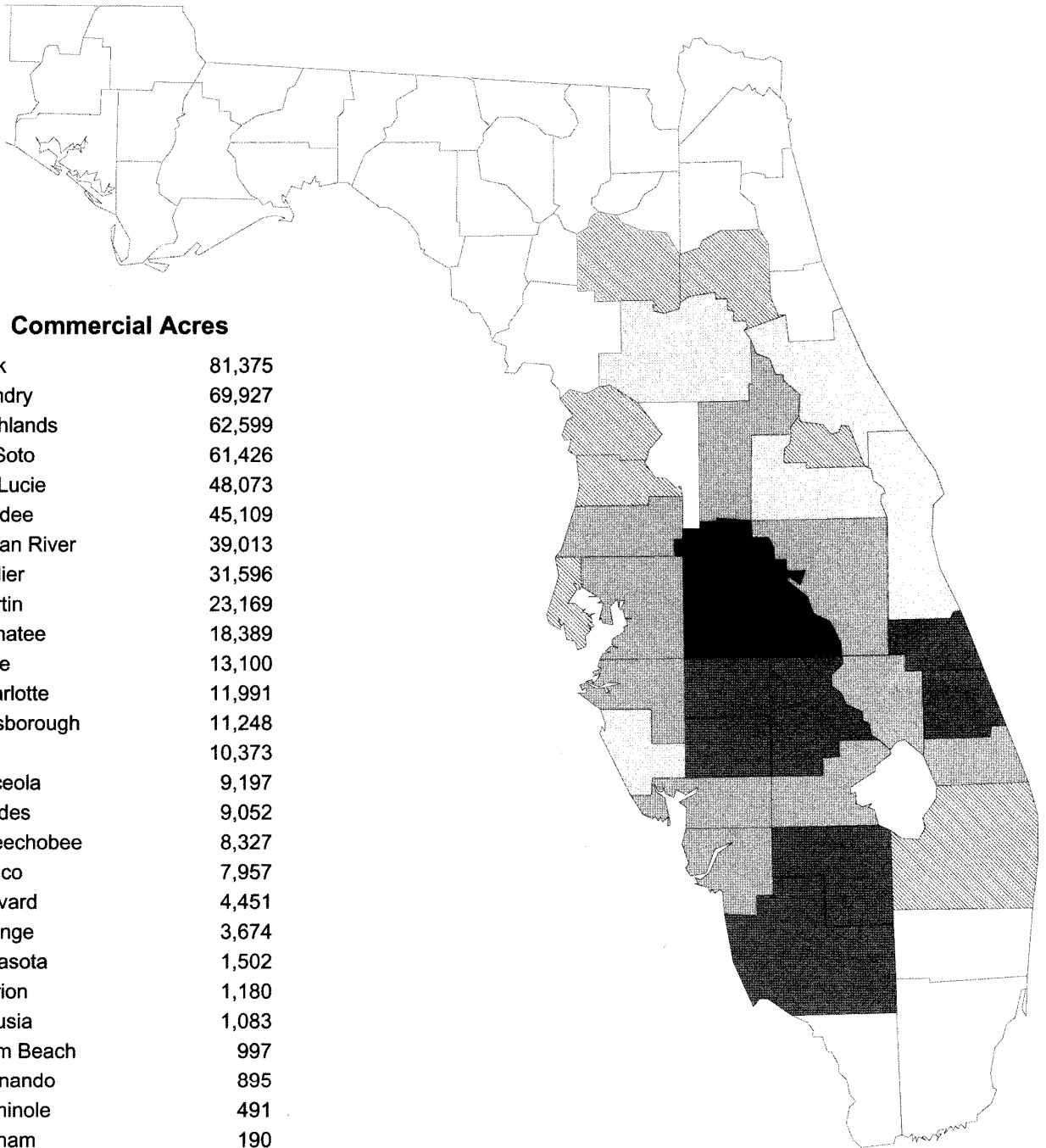


# Florida Commercial Citrus Acreage 2008

## Commercial Acres

Polk	81,375
Hendry	69,927
Highlands	62,599
DeSoto	61,426
St. Lucie	48,073
Hardee	45,109
Indian River	39,013
Collier	31,596
Martin	23,169
Manatee	18,389
Lake	13,100
Charlotte	11,991
Hillsborough	11,248
Lee	10,373
Osceola	9,197
Glades	9,052
Okeechobee	8,327
Pasco	7,957
Brevard	4,451
Orange	3,674
Sarasota	1,502
Marion	1,180
Volusia	1,083
Palm Beach	997
Hernando	895
Seminole	491
Putnam	190
Citrus	138
Other Counties <sup>1/</sup>	55
<b>TOTAL</b>	<b>576,577</b>

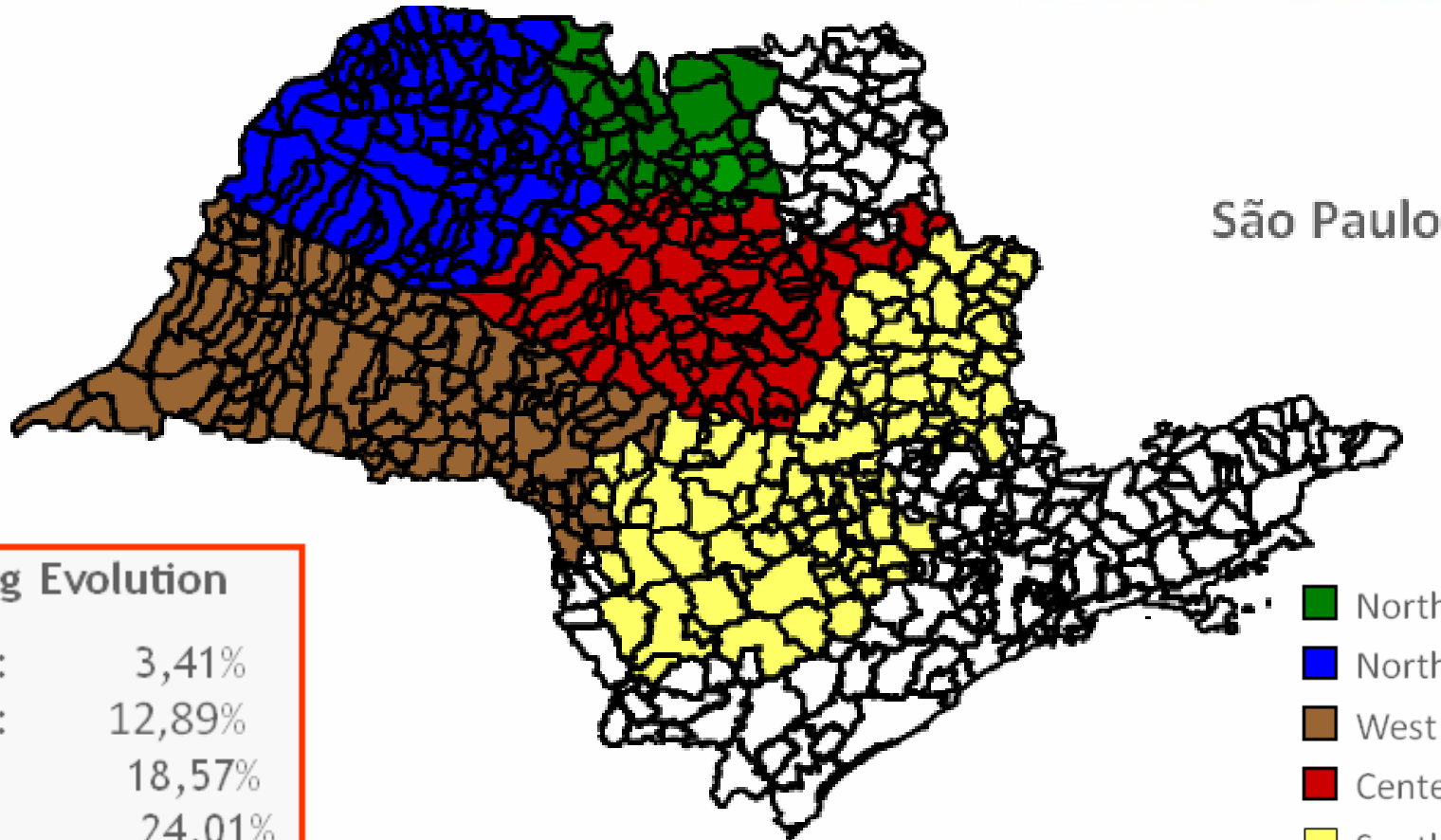
<sup>1/</sup> Alachua and Pinellas counties.



# Greening and Citrus Production

- Citrus greening, also known as Huanglongbing (HLB) and Yellow Dragon, had been confined to Asia and Africa.
- In 2003, it was discovered in Sao Paulo, Brazil.
- In 2005, it was found in Dade County, Florida and the disease quickly moved into the commercial production area of the state.
- Trees and land area lost to citrus greening in Florida is not known.

# Municipalities with HLB in SP - Apr/09



## Greening Evolution

Oct. 2004:	3,41%
Sep. 2007:	12,89%
Apr. 2008:	18,57%
Apr. 2009:	24,01%

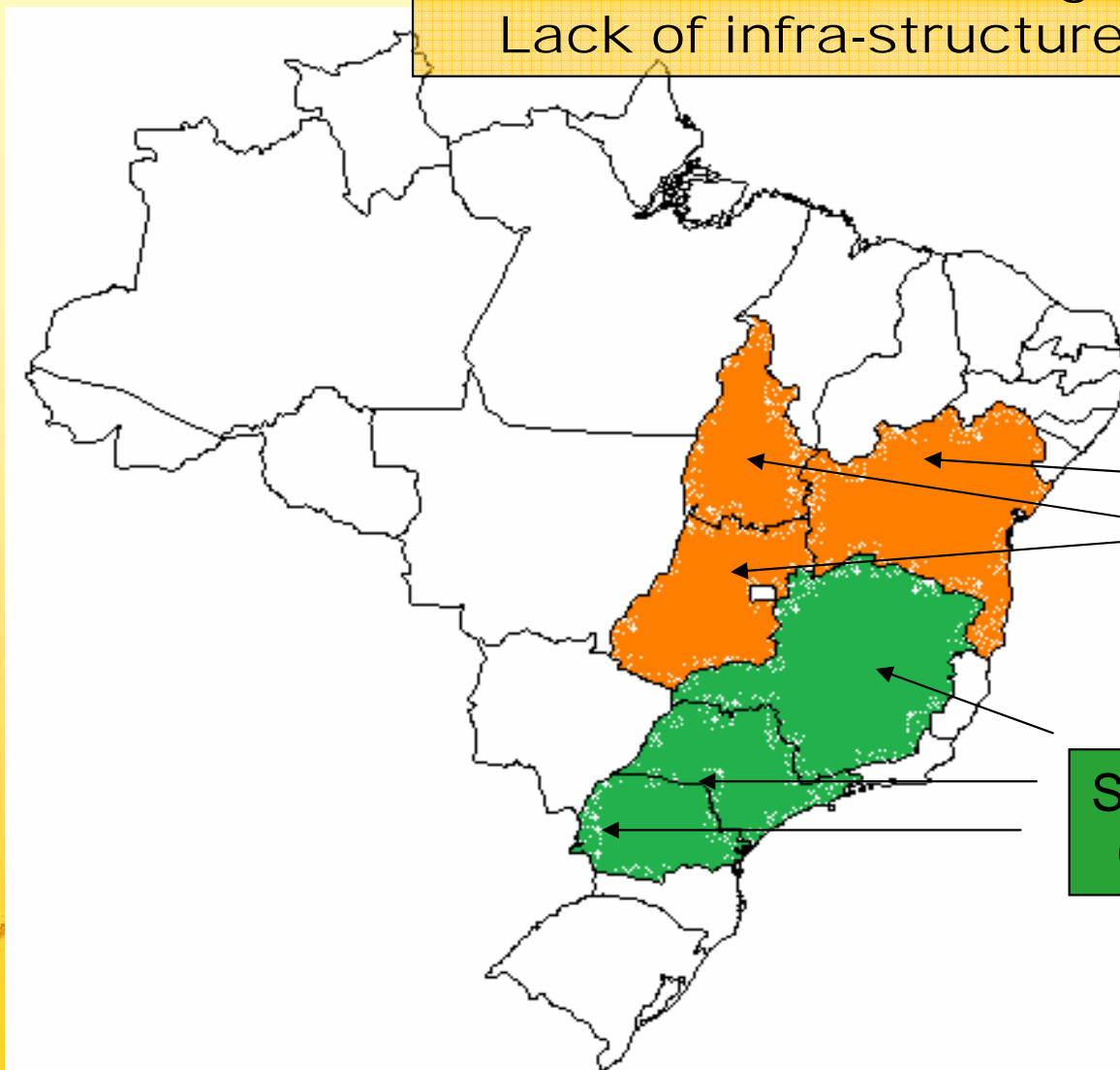
- North (3,67%)
- Northwest (0,10%)
- West (9,99%)
- Center (33,10%)
- South (35,93%)

Percentage of blocks with incurrence of infected trees has increased to 24.01%

# Potential Regions: free of HLB



Good condition for Irrigated Citrus projects.  
Lack of infra-structure for Orange Juice



Bahia, Tocantins, Goiás:  
Greening Free States

SP, Minas, Paraná States  
Greening found already



- Citrus greening is spread by the Asiatic citrus psyllid, an aphid that feeds on new growth.
- Psyllids are a pest that could be tolerated if not for their ability to serve as the vector of transmission for greening.
- Once a citrus tree is infected with greening, there is a latency period that may extend for up to two years.
- Even after exhibiting symptoms, it may take several more years before the entire tree is infected.

- This characteristic of greening, a dormancy period, followed by a slow decline in mature trees is a troubling issue.
- The only known means of control is to eradicate positive trees. Since a tree may be asymptomatic for up to two years, removal of symptomatic trees will likely not rid a planting of the disease.
- There is also a temptation to not immediately eradicate and attempt to salvage fruit from partially infected trees.















# The Effect of Greening on Grove Management

- The presence of greening forces farmers to adopt additional measures.
- The University of Florida recommends that every tree be scouted four times a year.
- Trees are more likely to exhibit the symptoms of greening when dormant.
- Both systemic and contact pesticides are recommended to reduce psyllid populations.

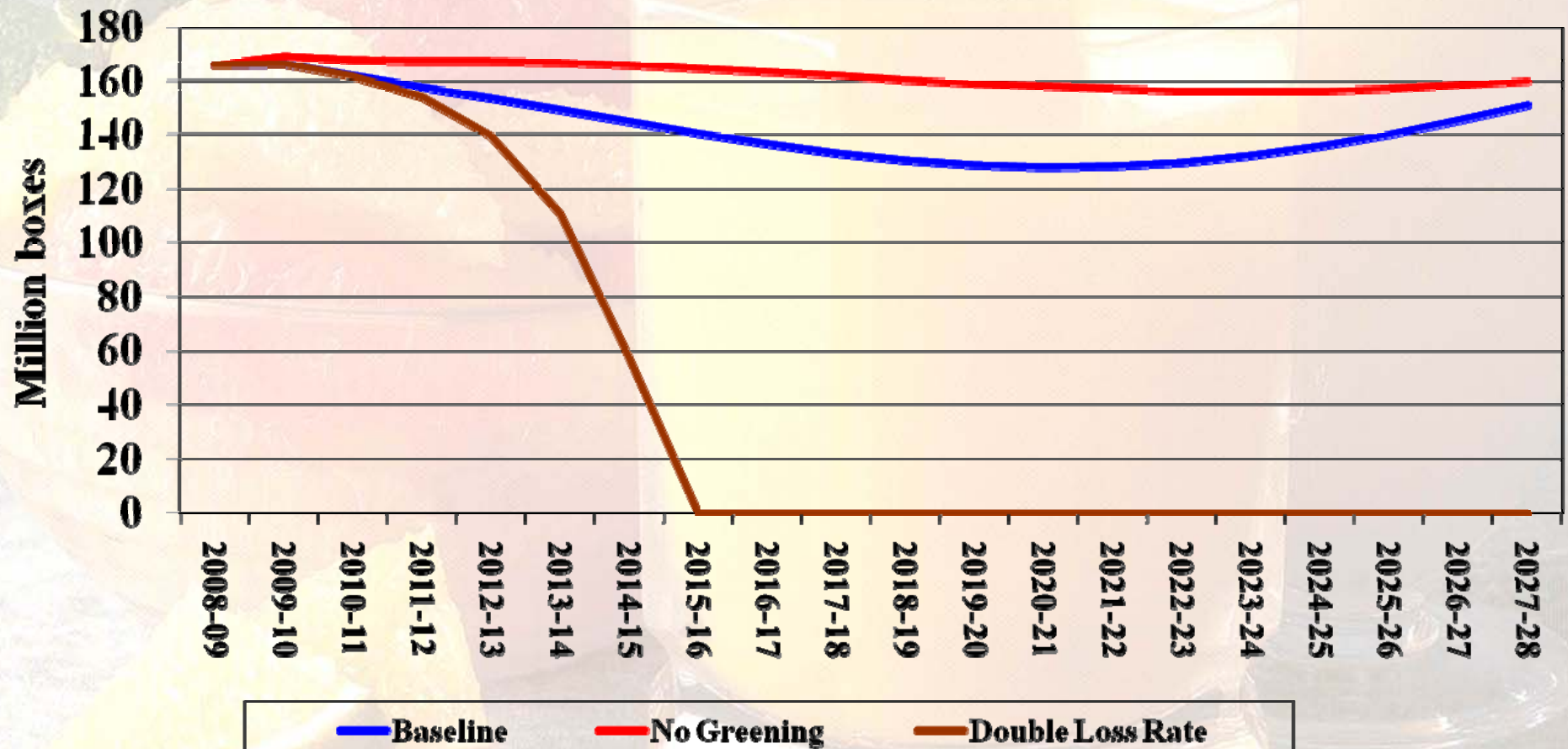
## Production Costs for a 10+-Year-Old Southwest Florida Processed Orange Grove

	2002-03		2008-09		2008-09	
	Without Greening		Without Greening		With Greening	
	\$/Acre	% of Total	\$/Acre	% of Total	\$/Acre	% of Total
Weed Control & Herbicide	183.13	23.3	185.68	16.7	185.68	11.9
<b>Spray-Pesticide</b>	<b>137.18</b>	<b>17.4</b>	<b>148.48</b>	<b>13.3</b>	<b>372.88</b>	<b>23.8</b>
<b>Fertilizer &amp; Lime-Calcium</b>	<b>152.56</b>	<b>19.4</b>	<b>332.54</b>	<b>29.8</b>	<b>332.54</b>	<b>21.2</b>
Pruning/Topping	28.03	3.6	31.48	2.8	31.48	2.0
Tree Removal/Resets	102.44	13.0	143.36	12.9	265.79	17.0
Irrigation & Ditch Maintenance	184.16	23.3	243.17	21.8	243.17	15.5
<b>HLB Scouting Management &amp; Canker Decontamination</b>	<b><u>0.00</u></b>	<b><u>0.0</u></b>	<b><u>33.30</u></b>	<b><u>2.7</u></b>	<b><u>134.29</u></b>	<b><u>8.6</u></b>
<b>Total Production Costs</b>	<b>787.50</b>	100.0	<b>1,115.04</b>	100.0	<b>1,565.83</b>	100.0

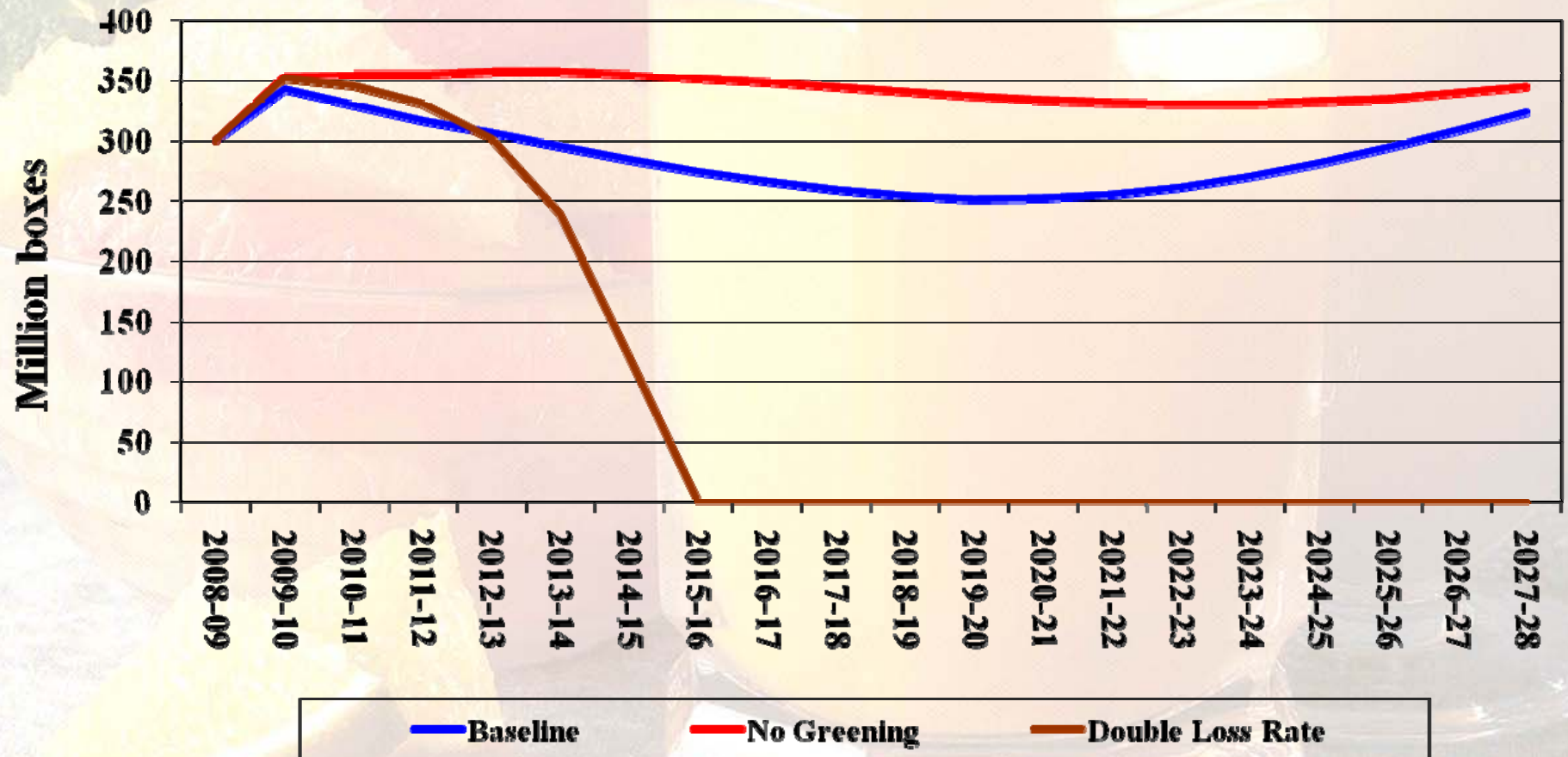
# Price and Production Impacts

- Using a model of the world orange juice market developed at the University of Florida, a forecast of future orange production and prices has been developed.
- To incorporate the effects of greening, tree mortality rates are increased from historical levels.
- Similar adjustments are made for both Florida and Sao Paulo.

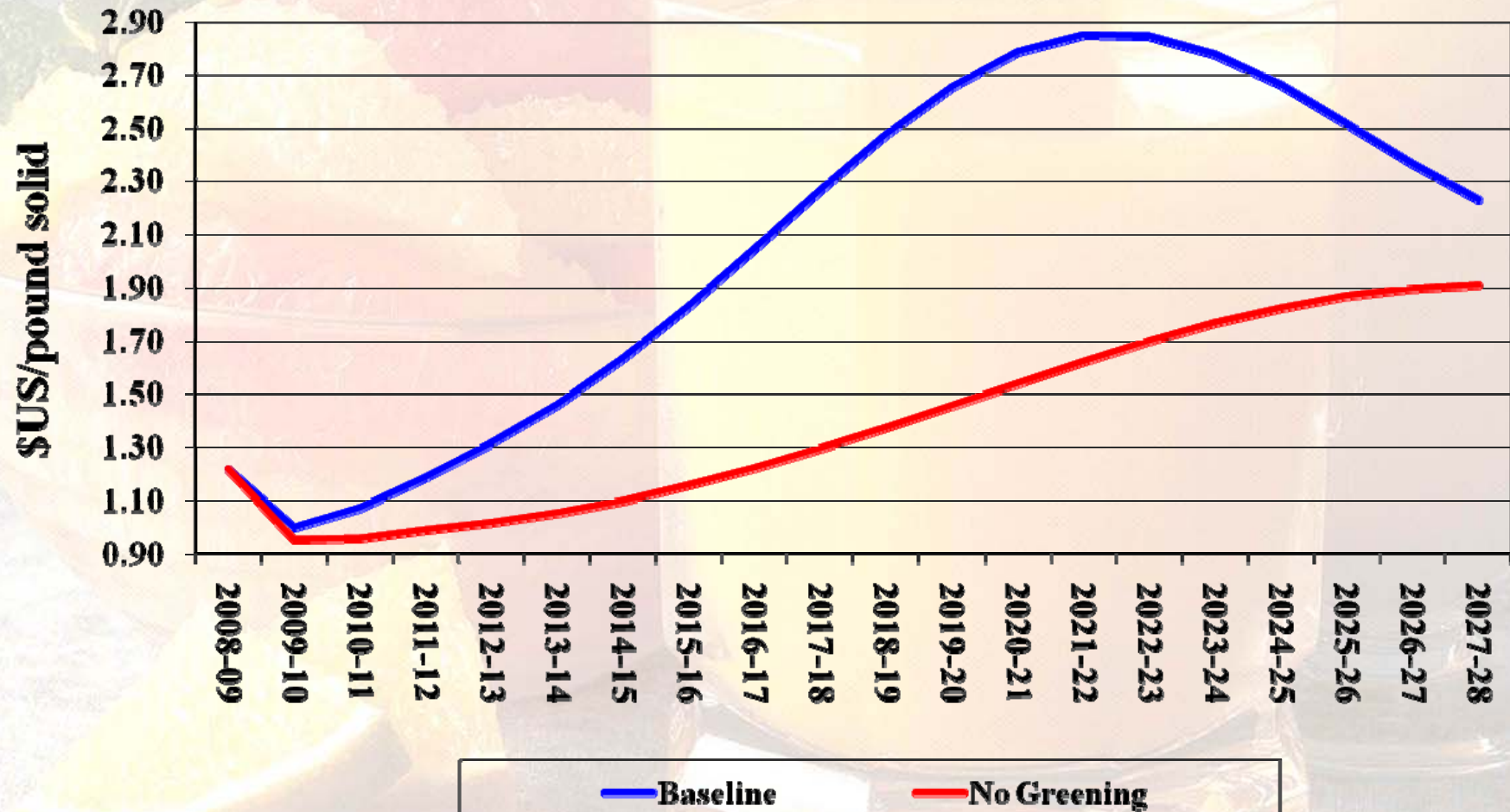
# Projected Florida orange production under alternative production scenarios, 2008-09 through 2027-28 seasons.



# Projected orange production in Sao Paulo under alternative production scenarios, 2008-09 through 2027-28 seasons.



# Projected US FOB FCOJ prices under alternative production scenarios, 2007-08 through 2026-27 seasons.



# Concluding Remarks

- Despite a number of challenges facing both Sao Paulo and Florida, these two regions remain the dominant suppliers of orange juice to the world market.
- Greening is a disease that arrived to both regions less than 10 years ago. It has already caused millions of trees to be eradicated.
- The disease is still in its early stages.

- Florida has embarked on a ambitious research program to combat greening.
- Last year, over \$10 million of grants were awarded to researchers from funds generated by the growers.
- Both state and federal dollars will also be invested in greening research.
- One interesting approach involves the use of an aroma derived from Asian guava as a repellent for the psyllid.





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