Florida Citrus Production Trends 2008-09 Through 2017-18 Update

Economic and Market Research Department

Florida Department of Citrus

December, 2007

CIR 2007-1

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Table of Contents

List of Tables

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Introduction

This report updates the Florida Department of Citrus (FDOC) study "Florida Citrus Production Trends 2007-08 Through 2016-17," December 2006. Since that time, some new information from the Florida Agricultural Statistics Service (FASS) has become available on tree and acre losses due to hurricanes, urban development and diseases such as citrus canker, tristeza and greening. This information is used to update the size and distribution of citrus acreage, by age of tree. The updated acreage is then used to project citrus production over the next ten years. As in the December 2006 report, key assumptions are made on acre- and tree-loss rates, planting rates and yields. Citrus diseases such as canker and greening are expected to be important factors, but uncertainty exists on the course that these diseases may take and their impact levels. Uncertainty also exists with respect to the future economic environment. The estimates in this study are thus intended to be viewed in this context.

It should also be noted that the production projections are estimates of potential production, as opposed to utilized production reported by FASS. Potential production is the fruit that could be utilized assuming favorable citrus prices, while utilized production is the amount of fruit actually entering certified fresh and processing channels, as well as noncertified channels. In the past, some

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fruit has been abandoned rather than utilized when grower prices were below harvest and post-harvest costs.[1]

Citrus Tree Update

Based on the FASS October 2007 crop estimate[2] the bearing orange and grapefruit tree populations for the 2007-08 season are 59.6 and 6.0 million, respectively (Tables 1 and 2). The bearing orange tree population has declined 9.6% since 2005-06 and 25.1% since its high point in 1998-99. The bearing grapefruit tree population has declined 8.0% since 2005-06 and 57.6% since its high point in 1996-97. The number of bearing orange trees is at the lowest level since1992-93, while the number of grapefruit trees is at the lowest level since the late 1960s. The 2007-08 orange and grapefruit tree populations were taken as starting points to project citrus acreage in the upcoming ten seasons.

Methodology

The projections in this reports, like those in the last production-trends report made in December 2006, are based on acres as opposed to trees to deal with the trend towards increasing tree densities in groves.[3] The 2007-08 acres, by age, were estimating by applying age-specific loss rates

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[1] FASS reported abandonment of 3 million, 6 million, 6 million and 2 million boxes of grapefruit in 1995-96, 1996-97, 1997-98 and 2000-01, respectively.

[2] October Forecast, Maturity Test Results and Fruit Size, October 12, 2007, FASS.

[3] The production estimates in this report are made by applying average yields per acre to projected acres ,by age, as opposed to applying average yields per tree to projected trees, by age. Yields per acre were assumed to more fully reflect the impact of increasing tree densities than yields per tree. Increasing tree densities may negatively impact tree yields in upcoming years, making estimation of these yields and tree-based production projections problematic. Yields per acre are assumed to more fully reflect the impact of increasing tree densities. High tree densities have

to the corresponding acres reported in 2006. Loss rates, by tree-age groups, were based on the change in acres from the 2005-06 season to 2006-07 for selected counties, as reported in the 2006 inventory and the Commercial Citrus Inventory Update—Selected Counties, September, 2007 (FASS), respectively. The estimated 2007-08 acres were estimated so as to be consistent with the reported bearing trees for 2007-08 reported by FASS in October.

The acres in 25 tree-age categories were projected for the upcoming ten seasons, by variety. Future production was then estimated by applying average yields per acre to the projected acreage. The acre yields were calculated from data reported by FASS. The biennial inventory reports numbers of trees and acres by age for different varieties of citrus. From these data, tree densities (trees per acre) were calculated and multiplied by reported boxes of fruit per tree, by age, to estimate yields per acre.

Production estimates were made for oranges and grapefruit.[4] These estimates were based on projections for four regions to take into account variation across regions in potential acreage loss and planting rates, as well as yields. The four regions used in modeling production were the South, West, Indian River, and the North & Central.[5] These regions are the same as those for which FASS reports yields per tree.

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occurred in some of the younger age categories, and the observed acre yields for these age categories reflect to some extent the change in this factor. Acre yields for older-age-categories are assumed to be constrained by limited space, sunshine, water and nutrients in the soil, and historical yields are assumed to reflect these yields.

[4]These projections are based on separate estimates for early and midseason oranges, late oranges, white seedless grapefruit including a small amount of seedy grapefruit, and red and pink seedless grapefruit.

[5] The regions included the following counties—South: Charlotte, Collier, Glades, Hendry, Lee and Okeechobee; West: DeSoto, Hardee, Hillsborough, Manatee, and Sarasota; Indian River: Indian River, St. Lucie, Martin, Palm Beach, Brevard, Volusia, and Flagler (parts of some counties are not included, as defined by FASS); North & Central: all other counties.

The orange production projections are made in context of a world supply and demand model described in the study by Spreen et al. The grapefruit production projections are based on a similar model also discussed by Spreen et al. Key supply assumptions made in applying these models in the present analysis are discussed in the next three sections. It is assumed that the demands for orange juice (OJ) in the U.S. and rest-of-the-world (RW) grow (prices constant) by 1% and 2%, respectively; and the demands for grapefruit juice (GJ) and fresh grapefruit in the U.S. and export markets are unchanged over time. See the Spreen et al study for a more complete discussion of the orange and grapefruit models.

Planting Assumptions

The projections are dependent on assumed future acreage-planting rates. Major declines in the production and availability of nursery trees has occurred in the past several years with the destruction of nursery trees exposed to citrus canker[6]. In 2006-07, the orange (grapefruit) planting level is assumed to be the same as in 2005-06 (40% of the 2005-06 level), based on the planting levels in the selected counties surveyed in 2007 (Commercial Citrus Inventory Update—Selected Counties, September, 2007 (FASS) versus Commercial Citrus Inventory 2006 (FASS)). In 2007-08, orange and grapefruit planting levels are assumed to be 2.71 and .15 million trees, respectively, based on the estimate of nursery tree availability made by Jameson (see footnote 6). Thereafter, planting levels are dependent on price as described in the Spreen et al study, assuming the nursery tree industry has recovered sufficiently.

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[6] Estimates of nursery tree production and availability, presented at the 2007 Citrus Expo, August 23, 2007, Fort Meyers, Florida, by Nate Jameson, are available at http://www.imok.ufl.edu/events/expo/2007/08_23_1120_jameson.pdf.

The impact of Brazil orange production on world orange-juice supply and prices, and, in turn, Florida orange tree planting levels and production was also considered. An important factor in determining Brazil's orange-juice supply is their orange planting rate. Based on historical data, the Brazil orange planting rate is positively related to the price of orange juice (FCOJ futures price) and negatively related to the price of sugar cane (Brazil's raw sugar export price). Citrus and sugar cane compete for agricultural land in some areas of Brazil, and demand for sugar cane to produce ethanol has been growing. Thus, an increase in demand for sugar cane tends to increase its price, favoring the use of land for sugar cane production as opposed to orange production. The average sugar price for the period from 2005 to present was assumed over the projection period. The FCOJ futures price was estimated from the model's supply and demand equations.

Tree/Acre-Loss Assumptions

Acreage- and tree-loss rates increased sharply with the citrus canker eradication program (Table 3). Although this program ended in January 2006, this disease will continue to impact losses as well as yields. Before the heavy losses due to canker, loss rates were increasing as a result of the citrus tristeza virus and other factors. Losses to tristeza are assumed to continue, but at a lower level with the removal over time of trees on sour orange rootstock, which are susceptible to this disease. In the upcoming years, a major factor assumed to impact loss rates is the incidence of greening. Future loss rates are the sum of an average (base) loss rate plus assumed increases due to greening, canker, tristeza and development. The base loss rate was determined from losses occurring in the mid-1990s, prior to the occurrence of relatively large tristeza losses. The base loss rate tends to increase with tree age and varies by region.

Greening is assumed to impact acre losses under several scenarios, following the Spreen et al study. This disease is transmitted by an insect, the Asian psyllid, which has spread to most of the citrus-growing regions of the State. Although the psyllid may be present in an area, not all trees may become infected or be in the same symptom-reflecting state. Given the psyllid is widespread, however, the tree- and acre-loss rates are expected to increase significantly in the upcoming years. It is assumed that an effective greening management program including suppressing the citrus psyllid will be implemented (without an effective program greening has the potential to devastate the Florida citrus industry). Trees detected with greening would normally be removed particularly when the incidence of the disease in surrounding trees is low. However, with the high incidence of greening in some groves, infected trees may not be removed immediately in order to obtain the value from production, although the entire grove would eventually be lost as it's production declines and trees eventually die.

A low-greening scenario assumes that loss rates for acreage susceptible to this disease (areas where the citrus psyllid and greening are established) are above the average or base rate by 100% for young trees, 75% for middle age trees and 50% for old trees (e.g., if the base loss rate for a young (old) tree were 1% (5%) without greening, then with greening, the loss rate would go to 1% times 2.0 or 2.0% (5% times 1.5 or 7.5%). Middle- and high-greening scenarios assume the increases in the loss rates are 50% and 200% above those in the low-greening scenario. Additionally, a scenario where 1.5% is added to the base loss rate across all tree ages is considered to allow for the possibility of increased losses to development. Canker is also assumed to increase loss rates by 10% above the base. Loss rates were also adjusted for tristeza over the next five years; thereafter, losses due to this disease are assumed to be reflected in the base rate. For oranges (grapefruit), tristeza is assumed to add .5% (1.5%) to the base loss rate in the 2007-08 season; in the following three years the increment declines to zero.

Greening is also assumed to impact the tree-loss rate in Brazil. As for Florida, three scenarios are considered, and the increases in the Brazil tree-loss rates are assumed to be proportional to the increases in Florida. Brazil's base tree-loss rate of 5% is alternatively assumed to increase by 50%, 75% and 150% over the next four years.

Yield Assumptions

Average yields over the non-hurricane period from 1993-94 through 2003-04 were used in estimating production. Production estimates were also made based on the below-average yields in 2006-07 and the two hurricane-impacted seasons, 2004-05 and 2005-06. These yields and results are referred to as hurricane estimates— although Florida's citrus-growing regions were not struck by a hurricane in 2006-07, the yields in this season, along with those in the hurricane-impacted seasons were well below average and grouped together.

The yields above were applied to acreage that was not affected by citrus canker. For acreage with citrus canker, the yields were reduced by 10.0% for early and midseason oranges, 5.0% for Valencia oranges, and 20.0% for grapefruit. The incidence of citrus canker was assumed to be the same as in the Spreen et al report. The assumed occurrence of canker varies over time and by region: in the South and West, the incidence increases from 25% in 2006-07 to100% in 2009-10; in the Indian River, the incidence is assumed to be 100% over the projection period; in the North and Central, the incidence increases from 15% in 2006-07 to100% in 2011-12. The incidence of canker in a region does not mean all trees in the region are in the same symptom-reflecting stage or have canker, but that canker is present and tree-loss rates can be expected to increase on average.

An orange production scenario was also considered where the density of new plantings was 200 trees per acre.[7] This density is significantly higher than the average orange density of 128 trees per acre for non-bearing trees in 2006. Yield per acre was constructed as 200 trees per acre times the 1993-94-through-2003-04 average yield per tree, by age, except when the result exceeded the observed maximum average yield per acre across all ages, in which case the yield per acre is set at the observed maximum (i.e., acre yields for younger age categories increase with tree density but are capped at the maximum observed yield).

It should also be noted that abandonment of grapefruit in 1995-96, 1996-97, 1997-98 and 2000-01 negatively impacted grapefruit boxes of fruit per tree reported by FASS for those seasons. For each age category, FASS boxes of fruit per tree were calculated as that age category's utilized production divided by the number of trees in that age category, including trees that yielded abandoned fruit. Hence, estimates of grapefruit production based on mean FASS yields for the past decade may understate potential production. To correct for this problem, reported grapefruit yields for the four seasons when abandonment occurred were adjusted upward by multiplying the reported yields times the ratio of potential production (utilized production plus reported abandonment by FASS) to utilized production. Separate adjustments were made for white and colored seedless grapefruit yields.

[7] Some field-test yield results for higher tree densities are provided by Muraro: http://www.imok.ufl.edu/events/expo/2007/08_23_220_muraro.pdf.

Production Estimates

Orange and grapefruit production projections under various assumptions are shown in Tables 4 and 5, respectively. The assumptions are given in the footnotes of these tables. Tables 6 and 7 show further details for the base projections which assume non-hurricane yields, canker yield reductions of 10% for early and midseason oranges, 5% for Valencia oranges and 20% for grapefruit; greening loss rates of 150%, 113% and 75% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively; restricted planting levels in 2006-07 and 2007-08 and unrestricted levels, dependent on price, thereafter; growth in U.S. and rest of the world OJ demands of 1% and 2% per year, respectively; zero growth in U.S. and export demands for fresh and processed grapefruit (see previous discussion for further details).

The production trends in the above tables generally follow those reported in December 2006, except the production levels are somewhat lower, particularly for oranges, as a result of lower estimated acre and tree populations, given the FASS updates.

The orange production estimates for the three greening scenarios decline from the166-to-168 million box level in 2008-09 to the 130-to-156 million box level in 2014-15 and 2015-16, before increasing to 135-to-159 in 2017-18 as a result of the maturation of new plantings over the projection period. The high-development scenario is similar to the high-greening scenario. The production estimates assuming hurricane yields are 37 to 51 million boxes less than the base estimates assuming non-hurricane yields. The estimates assuming denser tree planting suggest orange production might recover to around 172 million boxes at the end of the projection period. Finally, projections assuming no new plantings over the next ten years are provided to illustrate the impact of this factor: a decline of production to 112 million boxes in 2017-18. As shown in Table 6 for the base scenario, orange planting rates are estimated to be relatively high driven by relatively high projected oranges prices.

The grapefruit projections across all scenarios indicate declining production. Grapefruit production is estimated to decline from the 21 million box level in 2008-09 to the 10-to-14 million box range in 2017-18. The results are related to relatively low planting rates in comparison to loss rates, over most of the projection period, as shown for the base scenario (Table 7). Relatively low projected processed price over the first half of projection period underlie the projected plantings. As processed and fresh grapefruit prices increase over the next ten years, projected planting rates increase. Planting rates (in absolute value), however, remain below loss rates until 2016-17 and 2017-18. An increase in the assumed demand growth rates for fresh and processed grapefruit from zero to 3% per year, results in planting rates exceeding the loss rates in 2014-15 and thereafter. In this case, production levels off at 14 million boxes in 2016-17 and 2017-18, and then begins to grow. Alternatively, if trees lost were replanted, projected production levels off at 17 million boxes in 2014-15 through 2017-18, and the fresh/processed on-tree price stands at $7.25 per box at the end of the projection period, as opposed to $11.90 per box for the base scenario.

Lastly, although annual grapefruit planting levels are projected to be relatively low, from .15 million trees in 2006-07 to .38 million trees in 2017-18, for the base scenario, orange tree planting levels are projected be relatively high (Table 8). For the base (high density) scenario, orange tree plantings range from 2.7 million in 2006-07 to 5.6 (8.1) in 2016-17 and 5.5 (7.9) in 2007-18. Planting levels for the high density scenario are comparable to the freeze-related levels that occurred in the late 1980s and early 1990s. The 8.1 million orange trees projected to be planted in 2016-17 assuming high densities would be 94% of the record level of 8.6 million orange trees in 1987.

Concluding Comments

The bearing orange tree population has declined 9.6% since 2006 and 25.1% since its high point in 1998-99, while the bearing grapefruit tree population has declined 8.0% since 2006 and 57.6% since its high point in 1996-97. Given these lower tree populations and the expectation of relatively high tree-loss rates due to diseases and development, orange production in the upcoming ten years is projected in the 130-to-160 million box range, while grapefruit production is projected in the 11-to-20 million box range. These estimates are based on average, non-hurricane yields. Yield variation, however, is relatively large, as illustrated by the production estimates based on hurricane yields— 106 to 117 million boxes for oranges and 10 to 15 million boxes for grapefruit. Orange production may increase somewhat at the end of the 10-year projection period, depending on planting rates and planting densities.

TABLES

Table 1. Florida bearing orange trees.

Season	Early & Mids		Valencias		Total	
	1,000 Trees	% Total	1,000 Trees	% Total	1,000 Trees	% Change
1985-86	16,487	50.4	16,221	49.6	32,708	-7.6
1986-87	17,320	51.3	16,432	48.7	33,752	3.2
1987-88	18,822	53.0	16,715	47.0	35,537	5.3
1988-89	19,744	53.7	17,006	46.3	36,750	3.4
1989-90	22,034	54.2	18,632	45.8	40,666	10.7
1990-91	23,511	53.3	20,566	46.7	44,077	8.4
1991-92	27,051	54.6	22,526	45.4	49,577	12.5
1992-93	30,379	53.7	26,222	46.3	56,601	14.2
1993-94	32,312	52.4	29,396	47.6	61,708	9.0
1994-95	36,244	52.3	33,051	47.7	69,295	12.3
1995-96	38,914	51.7	36,373	48.3	75,287	8.6
1996-97	40,292	51.3	38,233	48.7	78,525	4.3
1997-98	39,861	50.7	38,726	49.3	78,587	0.1
1998-99	40,124	50.4	39,484	49.6	79,608	1.3
1999-00	38,833	49.3	39,888	50.7	78,721	-1.1
2000-01	38,446	48.3	41,119	51.7	79,565	1.1
2001-02	36,617	47.2	40,979	52.8	77,596	-2.5
2002-03	36,355	46.6	41,682	53.4	78,037	0.6
2003-04	34,445	45.7	40,947	54.3	75,392	-3.4
2004-05	32,165	44.3	40,427	55.7	72,592	-3.7
2005-06	28,784	43.6	37,170	56.4	65,954	-9.1
2006-07	27,507	43.2	36,160	56.8	63,667	-3.5
2007-08	25,757	43.2	33,835	56.8	59,592	-6.4

SOURCE: Florida Agricultural Statistics Service, Citrus Summary, various issues; Forecast Component Update: http://www.nass.usda.gov/Statistics_by_State/Florida/Publications/Citrus/2007strikeout.doc; October Forecast, Maturity Test Results and Fruit Size, October 12, 2007.

Table 2. Florida bearing grapefruit trees.

Season	White		Colored		Total	
	1,000 Trees	% Total	1,000 Trees	% Total	1,000 Trees	% Change
1985-86	4,900	58.6	3,468	41.4	8,368	-6.1
1986-87	4,814	56.7	3,677	43.3	8,491	1.5
1987-88	4,748	54.9	3,907	45.1	8,655	1.9
1988-89	4,704	53.4	4,103	46.6	8,807	1.8
1989-90	4,471	51.1	4,277	48.9	8,748	-0.7
1990-91	4,345	48.1	4,681	51.9	9,026	3.2
1991-92	4,240	44.4	5,317	55.6	9,557	5.9
1992-93	4,594	43.6	5,952	56.4	10,546	10.3
1993-94	4,940	42.9	6,574	57.1	11,514	9.2
1994-95	5,191	41.0	7,469	59.0	12,660	10.0
1995-96	5,409	39.7	8,224	60.3	13,633	7.7
1996-97	5,533	39.0	8,656	61.0	14,189	4.1
1997-98	5,184	38.5	8,286	61.5	13,470	-5.1
1998-99	4,628	37.2	7,803	62.8	12,431	-7.7
1999-00	4,550	37.3	7,654	62.7	12,204	-1.8
2000-01	4,282	36.7	7,374	63.3	11,656	-4.5
2001-02	4,142	38.1	6,728	61.9	10,870	-6.7
2002-03	3,944	38.3	6,352	61.7	10,296	-5.3
2003-04	3,247	36.2	5,721	63.8	8,968	-12.9
2004-05	2,712	34.8	5,079	65.2	7,791	-13.1
2005-06	2,214	33.8	4,329	66.2	6,543	-16.0
2006-07	2,012	32.2	4,232	67.8	6,244	-4.6
2007-08	1,862	30.9	4,155	69.1	6,017	-3.6

SOURCE: Florida Agricultural Statistics Service, Citrus Summary, various issues; Forecast Component Update: http://www.nass.usda.gov/Statistics_by_State/Florida/Publications/Citrus/2007strikeout.doc; October Forecast, Maturity Test Results and Fruit Size, October 12, 2007.

Table 3. Historical citrus tree- and acreage-loss rates by variety.[a]

Variety	Annual Loss Rate[b]													
	Trees							Acres						
	94-96	96-98	98-00	00-02	02-04	04-06	06-08	94-96	96-98	98-00	00-02	02-04	04-06	06-08
	- % -													
ORANGES[c]														
Early & Midseason	1.2	1.9	2.3	3.8	4.3	9.3	7.7	2.2	2.3	2.7	4.2	4.8	9.7	na
Late	1.2	1.9	2.3	3.8	4.3	9.3	7.7	2.2	2.3	2.7	4.2	4.8	9.7	na
GRAPEFRUIT[d]														
Indian River														
White Seedless[e]	1.5	3.0	4.8	5.8	9.5	17.2	6.4	2.4	3.5	5.5	6.1	10.2	17.4	na
Red & Pink Seedless	1.5	3.0	4.8	5.8	9.5	17.2	6.4	2.4	3.5	5.5	6.1	10.2	17.4	na
Interior														
White Seedless[e]	2.3	7.4	9.3	9.4	10.8	16.6	6.4	2.8	7.9	9.6	8.8	11.7	16.2	na
Red & Pink Seedless	2.3	7.4	9.3	9.4	10.8	16.6	6.4	2.8	7.9	9.6	8.8	11.7	16.2	na

[a]Losses due to all factors.

[b]Based on 1994, 1996, 1998, 2000, 2002, 2004 and 2006 *Commercial Citrus Inventories*, except 2006-008 which was based on comparison of the bearing trees in the 2006 *Commercial Citrus Inventory* in to those in the FASS report entitled *October Forecast, Maturity Test Results and Fruit Size,* October 12, 2007.

[c]One loss rate for round oranges (early and midseason and late oranges) was estimated due to the unidentified (by variety) young round-orange trees.

[d]One loss rate for seedless grapefruit was estimated due to the unidentified (by variety) young grapefruit trees. The 2006-2008 annual loss rate is a weighted average of the Indian River and Interior Loss rates.

[e]Includes seedy for the 1998 to 2006 period.

Table 4. Florida orange production projections, actual for 2003-04 through 2006-07, FASS estimate for 2007-08 and FDOC estimates for 2008-09 through 2017-18.

Season	Base[a]	Low Greening[b]	High Greening[c]	High Develop.[d]	Hurricane Yields[e]	High Density[f]	No Plantings[g]
	- - - - - - - - - - - - - - - - - - - -	- - - - - -	- - - - - -	million boxes	- - - - - -	- - - - - -	- - - - - - - - - - - - - - - - - - - -
2003-04	242	242	242	242	242	242	242
2004-05	150	150	150	150	150	150	150
2005-06	148	148	148	148	148	148	148
2006-07	129	129	129	129	129	129	129
2007-08	168	168	168	168	168	168	168
2008-09	167	168	166	165	117	167	167
2009-10	162	164	158	157	113	162	162
2010-11	159	161	150	151	110	160	159
2011-12	155	159	143	145	108	158	153
2012-13	152	157	137	141	106	157	147
2013-14	150	156	133	137	106	158	141
2014-15	149	156	130	134	106	159	134
2015-16	149	156	130	132	108	162	126
2016-17	150	157	131	132	111	167	119
2017-18	152	159	135	133	115	172	112

[a] Assumes non-hurricane yields, canker yield reductions of 10% for early and midseason oranges and 5% for Valencia oranges; greening loss rates of 150%, 113% and 75% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively; restricted planting levels in 2006-07 and 2007-08 and unrestricted levels, dependent on price, thereafter; growth in U.S. and rest of the world OJ demands of 1% and 2% per year, respectively (see discussion in text for further details).

[b] Same as the base scenario except greening loss rates of 100%, 75% and 50% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively.

[c] Same as the base scenario except greening loss rates of 300%, 225% and 150% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively.

[d] Same as the base scenario except loss rates are increased by 1.5% across tree ages.

[e] Same as the base scenario except average yields over 2004-05, 2005-06 and 2006-07.

[f] Same as the base scenario except tree planting densities are increased as discussed in the text.

[g] Same as the base scenario except tree planting are zero in 2008-09 and after.

Table 5. Florida grapefruit production projections, actual for 2003-04 through 2006-07, FASS estimate for 2007-08 and FDOC estimates for 2008-09 through 2017-18.

Season	Base[a]	Low Greening[b]	High Greening[c]	High Develop.[d]	Hurricane Yields[e]	Replacement Plantings[f]
	- - - - - - - - - -	- - - - - -	- - - million boxes	- - - - - -	- - - - - -	- - - - - -
2003-04	41	41	41	41	41	41
2004-05	13	13	13	13	13	13
2005-06	19	19	19	19	19	19
2006-07	27	27	27	27	27	27
2007-08	25	25	25	25	25	25
2008-09	21	21	21	21	15	21
2009-10	20	20	20	20	14	20
2010-11	19	20	18	18	14	19
2011-12	18	19	17	17	13	19
2012-13	18	18	16	16	12	18
2013-14	17	17	15	15	12	18
2014-15	16	16	14	14	11	17
2015-16	15	16	13	13	11	17
2016-17	14	15	12	12	11	17
2017-18	13	14	11	12	10	17

[a] Assumes non-hurricane yields, canker yield reductions of 20%; greening loss rates of 150%, 113% and 75% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively; restricted planting levels from 2006-07 through 2008-09 and unrestricted levels, dependent on price, thereafter; zero growth in U.S. and export demands for fresh and processed grapefruit (see discussion in text for further details).

[b] Same as the base scenario except greening loss rates of 100%, 75% and 50% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively.

[c] Same as the base scenario except greening loss rates of 300%, 225% and 150% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively.

[d] Same as the base scenario except loss rates are increased by 1.5% across tree ages.

[e] Same as the base scenario except average yields over 2004-05, 2005-06 and 2006-07.

[f] Same as the base scenario except trees lost are replanted.

Table 6. Base Florida orange production projections, actual for 2003-04 through 2006-07, FASS estimate for 2007-08 and FDOC estimates for 2008-09 through 2017-18.[a]

Season	Florida Produc-tion	Bearing Acres	Acre Loss Rate	Acre Plant Rate	FL Bulk FCOJ Price	Processed On-Tree
	million boxes	1,000 acres	- - - - - - %	- - - - - -	- $/ps -	- $/box -
2003-04	242	564.4	-4.8	2.7	0.84	2.85
2004-05	150	541.8	-9.0	2.4	0.99	3.31
2005-06	148	491.0	-10.0	2.4	1.52	5.49
2006-07	129	477.2	-6.0	2.0	2.08	8.97
2007-08	168	438.3	-9.9	4.6	1.82	6.98
2008-09	167	427.6	-4.2	5.3	1.93	7.99
2009-10	162	414.8	-4.8	5.7	2.11	9.14
2010-11	159	411.2	-5.2	6.3	2.28	10.18
2011-12	155	409.7	-5.4	7.0	2.44	11.20
2012-13	152	409.5	-5.3	7.6	2.57	12.04
2013-14	150	412.5	-5.3	8.1	2.67	12.69
2014-15	149	418.6	-5.1	8.4	2.73	13.07
2015-16	149	428.2	-5.0	8.5	2.75	13.19
2016-17	150	440.5	-4.9	8.3	2.72	13.05
2017-18	152	455.0	-4.7	8.0	2.67	12.69

[a] Assumes non-hurricane yields, canker yield reductions of 10% for early and midseason oranges and 5% for Valencia oranges; greening loss rates of 150%, 113% and 75% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively; restricted planting levels in 2006-07 and 2007-09 and unrestricted levels, dependent on price, thereafter; growth in U.S. and rest of the world OJ demands of 1% and 2% per year, respectively (see discussion in text for further details).

Table 7. Base Florida grapefruit production projections, actual for 2003-04 through 2006-07, FASS estimate for 2007-08 and FDOC estimates for 2008-09 through 2017-18.[a]

Season	Florida Produc-tion	Bearing Acres	Acre Loss Rate	Acre Plant Rate	FL Fresh FOB	FL Bulk FCGJ Price (White)	Fresh/ Processed On-Tree
	million boxes	1,000 acres	- - - - - %	- - - - -	- $/box -	- $/ps -	- $/box -
2003-04	41	82.3	-10.2	2.8	16.80	0.78	3.33
2004-05	13	71.0	-14.9	2.2	30.10	na	13.47
2005-06	19	59.8	-19.2	1.3	24.80	na	7.75
2006-07	27	57.2	-6.3	0.6	20.44	na	4.03
2007-08	25	55.0	-6.1	2.3	21.52	na	3.38
2008-09	21	53.3	-4.4	0.1	21.73	0.63	3.59
2009-10	20	51.0	-4.8	0.0	22.87	0.71	4.31
2010-11	19	49.6	-5.1	0.0	23.83	0.80	4.97
2011-12	18	46.9	-5.5	0.2	25.02	0.90	5.76
2012-13	18	44.3	-5.6	0.8	26.33	1.01	6.61
2013-14	17	41.8	-5.6	1.7	27.87	1.13	7.60
2014-15	16	39.5	-5.6	2.9	29.57	1.25	8.67
2015-16	15	37.6	-5.5	4.5	31.35	1.37	9.77
2016-17	14	36.1	-5.3	6.3	33.23	1.49	10.90
2017-18	13	35.2	-5.0	8.1	34.91	1.60	11.90

[a] Assumes non-hurricane yields, canker yield reductions of 20%; greening loss rates of 150%, 113% and 75% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively; restricted planting levels from 2006-07 through 2008-09 and unrestricted levels, dependent on price, thereafter; zero growth in U.S. and export demands for fresh and processed grapefruit (see discussion in text for further details).

Table 8. Projected Florida orange tree plantings, 2007-08 through 2017-18.

Season	Base[a]	High Density[b]
	- - - - - - - - - - - - - - - million trees	- - - - - - - - - - - - - - - - - -
2007-08	2.7	2.7
2008-09	3.1	4.9
2009-10	3.3	5.2
2010-11	3.7	5.8
2011-12	4.2	6.4
2012-13	4.6	7.0
2013-14	5.0	7.5
2014-15	5.3	7.9
2015-16	5.5	8.1
2016-17	5.6	8.1
2017-18	5.5	7.9

[a] Assumes non-hurricane yields, canker yield reductions of 10% for early and midseason oranges and 5% for Valencia oranges; greening loss rates of 150%, 113% and 75% above base rates for 1-3 year old trees, 4-11 year old trees and 12+ year old trees, respectively; restricted planting levels in 2006-07 and 2007-08 and unrestricted levels, dependent on price, thereafter; growth in U.S. and rest of the world OJ demands of 1% and 2% per year, respectively (see discussion in text for further details).

[b] Same as the base scenario except tree planting densities are increased as discussed in the text.