Florida Round Orange Production Trends

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Florida Round Orange Production Projection Scenarios: 2017-18 through 2027-28

Introduction

In this report, production projection scenarios for Florida round oranges are provided for the 2017-18 through 2026-27 seasons. The production projections are based on the Florida Agricultural Statistics Service (FASS) commercial citrus tree inventory[1]. The inventory report provides the number of trees and acres, by age, for different varieties of citrus. Complete data, however, was only available for round oranges so that is the only variety analyzed in this report. These data are combined with FASS yield data on boxes of fruit per tree, by age. Future production is projected by applying average yields to projected tree numbers, by age. Both production and consumption in upcoming years are highly dependent upon on a number of factors difficult to predict given a number of measures with uncertainty. For production, assumptions are made related to planting rates and yields per tree.

The projections in this report are intended to indicate possible future trends in production as opposed to actual production in any given season. The same average yields, by age, are used in estimating production levels in each season to obtain the projection (many factors determine yields in a given season, and this analysis does not attempt to estimate season-specific yields). Yields can vary significantly from year to year. Hence, for each of the upcoming seasons considered, actual yields could be significantly different than the average yields used here, with the result that the season's production projection in this report may be significantly different than the actual

[1] The authors of this report wish to express their gratitude to the staff of the Florida Agricultural Statistics Service (FASS), a joint unit between the Florida Department of Agriculture and Consumer Services and the National Agricultural Statistics Service, United States Department of Agriculture (NASS) located in Maitland, FL for making the complete Florida commercial orange tree inventory available for this research.

production that occurs. Given this issue, production projections are not provided for the upcoming 2016-17 season. The first forecast for the 2016-17 season will be made in October, 2016, by the USDA, FASS.

The citrus industry in Florida, as well as other leading citrus-growing regions in the world, including Brazil, has been confronted with the citrus disease Huanglongbing (HLB) (also known as citrus greening). This disease eventually destroys the economic viability of infected groves, and has the potential to devastate the Florida citrus industry if left unmitigated. Infection rates of HLB vary significantly across regions in Florida. A recent survey published by Singerman and Useche[2] (2016) reported that 80 percent of the citrus trees in Florida are infected with HLB. Several scientific research efforts related to mitigating the harmful effects of HLB are ongoing, while others are being implemented each season. Grower practices are evolving as more is learned about the disease. The ultimate goal is to develop disease-resistant trees, but it is assumed in this report, that disease resistant trees will not be available over the ten-year projection period considered here. A number of short-term solutions, including heat treatment and broadening the establishment of Citrus Health Management Areas (CHMAs)[3] are on the horizon, and could offer some relief from the deleterious effects of HLB. Three bactericides were released in 2016 and are currently being used in Florida.

The disease, however, can be directly linked to a substantial decline in Florida citrus production, lower per tree fruit yields, and reduced fruit quality. Citrus production in Florida has drastically declined over a few short seasons, and is at its lowest point in more than 50 years. The

[2] Singerman, Ariel, and Pilar Useche. "The Impact of Citrus Greening on Citrus Operations in Florida." Extension Digital Information Source (EDIS) FE 983, University of Florida, Gainesville, FL, Feb. 2016. Available at edis.ifas.ufl.edu/FE983 .

[3] Citrus Health Management Areas (CHMAs) are geographic zones in which growers coordinate their efforts to suppress the Asiatic Citrus Psyllid (ACP), the vector that spreads HLB. CHMAs have shown some success in suppressing psyllid populations.

United States Department of Agriculture (USDA) estimate for the 2015-16 orange crop is 81.5 million 90-lb boxes, down from the near record 242 million boxes produced in 2003-04. It is also down substantially from the post hurricane crop of 170.2 million boxes produced in 2007-08.

2015 Commercial Orange Acreage and Tree Inventory Overview

The USDA National Agricultural Statistic Service, in cooperation with the Florida Department of Agriculture and Consumer Services, releases annual updates of the Florida commercial citrus inventory (FASS commercial tree inventory), including total acreage and trees, by citrus variety. This analysis was conducted using the disaggregated 2015 commercial orange tree inventory. Florida's total citrus acreage decreased by 2.7% from 515,147 acres in 2014 to 501,396 acres in 2015 (Table 1). Similarly, the number of citrus trees decreased by 1.9% from 68.1 million in 2014 to 66.9 million in 2015.

The FASS commercial citrus inventory reported that the population of bearing and nonbearing round-orange trees declined by 1.6% from 60.5 million trees to 59.6 million trees in 2015 (Table 2). Florida commercial round-orange tree inventory has declined by nearly 32% since 2004. Loss rates for commercial trees and acreage continued the trend of exceeding the replanting rates (Figure 1). At the same time, the rate of new tree plantings of orange trees have slightly outpaced the total rate of new acreage plantings between the 2013-14 and 2015-15 citrus seasons, suggesting higher tree densities (Figure 2).

The orange tree population remains relatively mature with 63.5% of the tree population having an average age of 14 years or older. While the total orange tree population is likely to continue to represent an industry of mature tree in upcoming years given recent levels of new

plantings, the previous two seasons have seen a modest increase in tree plantings that will represent bearing acreage within three seasons.

Methodology and Assumptions

The production forecasts discussed in this report are based on projecting the tree numbers in each of the 24 tree-age categories for the upcoming ten seasons, by variety. Projections are reported for oranges disaggregated into early-midseason and Valencia oranges. Assumed annual acreage loss and planting rates are used to project citrus tree numbers from year to year, and average yields per tree by tree age are applied to the projected tree numbers to obtain production projections.

Orange production projections are made using the same methodology that has been used by the Florida Department of Citrus for the past 40 years. This approach is referred to as the FDOC model in this report.

Yield Assumptions

The production estimates were made by multiplying the projected number of trees in each specific age category by the yield or number of boxes per tree for that age category and summing the results across age categories. Estimated yields from the 2015-16 season are used to establish a baseline. The widespread adoption of higher per acre tree densities along with the use of irrigation (either microspinkler or drip) suggests that most trees planted after the freezes of the 1980s exhibit a yield profile that flattens out around the 13-15 age range. Historical per tree yields for oranges it reported by FASS are shown in Tables 11 and 12, respectively. Average tree yields by tree age by variety are given in Figures 5 and 6.

Planting Assumptions

Production projections are dependent upon assumed future acreage-planting rates. Significant declines in planting levels have occurred in recent years with the destruction of nursery trees exposed to citrus canker, re-establishment of the nursery industry in screen houses, and the risk of planting in an HLB environment. Three planting scenarios are considered in this report. The first scenario assumes the planting level will be half (50%) the replacement level (the number of trees lost). This assumption roughly corresponds to the average planting level in recent years. The second and third scenarios assume planting levels are higher at 100% and 125% of the replacement level, respectively. It is assumed nurseries will be able to supply the trees required, although the current number of nursery trees in inventory may not be sufficient to accommodate some of the high-planting scenarios in the immediate upcoming years. These scenarios, thus, require that nurseries respond relatively quickly to grower demand for trees.

Structure of the Report

Given the challenge of HLB and other diseases (citrus canker and black spot), two other approaches are also utilized to forecast future production. The first approach extrapolates yields beginning with the 2010-11 season through 2015-16. This time frame is chosen because 2010-11 is the first year which showed a significant decline in per tree yields that could not be traced to a weather event (hurricane or freeze). In Figure 11, both observed and projected orange yields (aggregated across varieties) are shown. The dashed line in the figure separates observed data from projections. Statistical techniques were employed in an attempt to extrapolate recent per tree yields which are being adversely affected by HLB. Under this analysis, the implicit assumption is that no remedy for HLB will be found in the next ten years.

The second approach utilizes the world orange juice model developed at the University of Florida in cooperation with the Florida Department of Citrus. A mathematical description of the

model is found in Spreen, et al.[4] (2003). The model includes Florida and Saõ Paulo, Brazil as endogenous (determined within the model) supply regions and Mexico and California as exogenous (fixed) supply regions. The production models for Florida and Saõ Paulo work in the same manner as the FDOC model except new tree plantings are predicted using an equation most recently updated by Spreen et al.[5] (2014). The new planting equation uses the on-tree price from the previous season as well as lagged new plantings as factors to predict new plantings. The new plantings equation for Saõ Paulo drives off of the on-tree price for processed oranges divided by the wholesale price of sugarcane, the primary competitor for land in Saõ Paulo state.

Once fruit production in Florida and Saõ Paulo is determined, it is allocated between not-from-concentrate (NFC) orange juice and frozen concentrated orange juice (FCOJ). FCOJ from Mexico and California are added to world supply. Collectively Florida, Saõ Paulo, Mexico, and California account for nearly 90 percent of the world supply of orange juice.

The consumption regions in the model are the United States, Canada, the European Union, and the rest of the world. Japan is used as a proxy for the rest of the world. World orange juice supply is allocated across the four consumption regions taking into account transportation and tariffs. Once this is accomplished, prices in each of the consumption regions are determined. In the present form of the model, NFC consumption takes place in the United States and Canada only. All four consumption regions are assumed to consume FCOJ.

Prices in the consumption regions determine FOB juice prices in Florida and Saõ Paulo. After accounting for processing, harvest, and fruit hauling costs, on-tree prices are calculated for

[4] Spreen, Thomas H., Charlene Brewster, and Mark G. Brown. "The Free Trade Area of the Americas and the World Processed Orange Market." Journal of Agricultural and Applied Economics 35(2003): 107-26.
[5] Spreen, Thomas H., Jean-Paul Baldwin, and Stephen H. Futch. "The Economic Implications of Huanglongbing (HLB) on New Citrus Tree Plantings in Florida." HortScience 49(2014): 1052-55.

growers in both Florida and Saõ Paulo. These prices are used in the new planting equations. The tree inventory in both regions is updated to the next season and the model is run again.

Production Projections

Florida orange production projections using the FDOC model, which represents the current state of the industry, are shown in Tables 6. The results evaluate three planting scenarios assuming constant fruit per tree yields using the 2015-16 season average yields. Under the assumption of a 100 percent replanting rate of lost trees, round orange production is expected to remain nearly flat through the 2026-27 season. Under the low planting scenario, 50 percent of replacement planting level (roughly average planting level in recent years), production declines an average of 0.7 percent each season with total orange production declining modestly to reach 77.1 million boxes of oranges by 2026-27. Under the high planting scenario, where 125 percent of replacement planting level is assumed, production increases by an average of 0.37 percent each season to reach 85.1 million boxes of oranges by 2026-27.

A fourth scenario was conducted to determine the rate at which new and replacement orange tree plantings would be needed to push Florida production above 100 million boxes by the 2026-27 season. A replanting rate of 255 percent is needed to accomplish this task. The results are shown in the fourth column of Table 6. Table 7 indicates the number of new plantings under the recovery rate scenario. New orange tree plantings are separated by replanting of lost trees and net new plantings. Assuming a replanting process baseline for the 2016-17 season, the total orange tree investment needed would be approximately 47 million trees over a ten year time horizon. Clearly, this level of new plantings does not incorporate the subsequent increases to production

that would result in those seasons beyond 2026-27. At the same time, it is one measure of the massive investment needed to enable the industry to recover.[6]

The results from the extrapolated yields model are shown in Table 8. These results give a highly pessimistic outlook for the Florida citrus industry with orange output declining to 27.3 million boxes by 2026-27 without HLB mitigation measures in place. Production at these levels would have severe ramifications for industry. These results point to the urgent need to find resolution(s) to HLB.

The results from the baseline world orange juice model are shown in Table 9 for Florida production and in Table 10 for Saõ Paulo production. These baseline model assumes constant yields and tree mortality for both production regions. New orange tree plantings are predicted using equations that depend on lagged on-tree prices. The results in Table 9 suggest a modest decline in Florida production with production of 77.1 million boxes by the 2026-27 season. On-tree prices are projected to modestly rise over the forecast horizon, largely due to declining production in Saõ Paulo. In Saõ Paulo, production is expected to decline to 235 million boxes in the 2026-27 season, largely due to high tree mortality rates. Saõ Paulo has also realized decreased round orange production in recent years. United States Department of Agriculture's Foreign Agricultural Service (FAS-USDA) projects the 2016-17 Saõ Paulo crop at 245 million boxes, the smallest crop since the 1990-91 season. The main factor driving smaller crops in Saõ Paulo is reduced per tree yields which this season is projected to be approximately 1.4 boxes per tree, down from their historical average of two boxes per tree.

[6] A caveat to this analysis is that a recovery in per tree yields would reduce the number of new plantings to achieve a comparable level of production by the 2026-27 season.

Conclusions

The 2015 Florida Citrus Tree Inventory provided the baseline for the projections in this report. Three different models were used to make production projections for Florida. The FDOC model suggests that Florida orange production is expected to decline modestly over the next ten years, assuming constant yields and recent rates of tree loss and new plantings. On-tree prices are expected to remain relatively constant over the forecast period. The model using extrapolated yields projects a sharp decline in Florida orange production with a projection of a crop of 27.1 million boxes by the 2026-27 season. The world orange juice model also projects a modest decline in Florida production over the next 10 seasons, but rising on-tree prices due to decreased orange crops in Brazil.

As such, the long-run outlook of the Florida citrus industry continues to be in a precarious state. The persistent trend of tree mortality rates exceeding tree planting rates sets a downward course for production levels. Declining per tree yields, realized in recent years, further depress production and adversely affect grower profitability. In the long-run, the industry risks losing relevance and economic impact. Long-run sustainability, relevance, and impact can be realized with reduced tree mortality, improved per tree yields, new tree plantings, and modest market growth.

Reduced mortality involves sustained efforts to control the Asian citrus psyllid, the vector known to spread HLB; the application of current/future research to maintain tree health and HLB-resistance. As new measures are being developed to mitigate the impact of HLB and improve fruit yields, the industry can be sustained for the long-run. Increased plantings will be influenced by on-tree prices high enough to attract reinvestment and an expectation that trees will survive to generate returns over time. Sustained market growth to support the long-term viability of the

industry is also dependent on the continuity of effective promotional programs by the FDOC and the brands to maintain and grow the market for Florida citrus.

TABLES

Table 1. Florida citrus acreage and tree numbers by commercial inventory.

Year of Inventory	Number of Acres	Percent Change from Previous Acre Inventory	Number of Trees	Percent Change from Previous Tree Inventory	Tree Density
	- thousands -	- % -	- millions -	- % -	- trees/acre -
1970	941.5	1.1	76.7	3.1	81.5
1972	878.0	-6.7	72.1	-6.0	82.1
1974	864.1	-1.6	71.3	-1.1	82.5
1976	852.4	-1.4	70.5	-1.1	82.7
1978	831.2	-2.5	69.1	-2.0	83.1
1980	845.3	1.7	70.7	2.3	83.6
1982	847.9	8.5	71.6	1.3	84.4
1984	761.4	-10.2	66.0	-7.8	86.7
1986	624.5	-18.0	57.5	-12.9	92.1
1988	697.9	11.8	69.3	20.5	99.3
1990	732.8	5.0	78.9	13.9	107.7
1992	791.3	8.0	92.0	16.6	116.3
1994	853.7	7.9	103.7	12.7	121.5
1996	857.7	0.5	107.1	3.2	124.9
1998	845.3	-1.4	107.1	NC	126.7
2000	832.3	-1.5	106.7	-0.4	128.2
2002	797.3	-4.2	103.2	-3.3	129.4
2004	748.6	-6.1	97.9	-5.1	130.8
2006	621.4	-17.0	81.9	-16.4	131.8
2008	576.6	-7.2	75.4	-8.0	130.7
2009	568.8	-1.3	74.1	-1.7	130.3
2010	554.0	-2.6	72.2	-2.6	130.3
2011	541.3	-2.3	70.6	-2.1	130.5
2012	531.5	-1.8	69.6	-1.5	130.9
2013	524.6	-1.3	69.0	-0.9	131.5
2014	515.1	-1.8	68.1	-1.3	132.3
2015	501.4	-2.7	66.9	-1.9	133.4

SOURCE: Florida Agricultural Statistics Service, *Commercial Citrus Inventory*, various issues.

Table 2. Florida round-orange acreage and tree numbers by commercial inventory.

Year of Inventory	Number of Acres	Percent Change from Previous Acre Inventory	Number of Trees	Percent Change from Previous Tree Inventory	Tree Density
	- thousands -	- % -	- millions -	- % -	- trees/acre -
1970	715.8	0.3	57.800	2.1	80.7
1972	659.4	-7.9	53.700	-7.0	81.4
1974	642.4	-2.6	52.500	-2.3	81.7
1976	628.6	-2.1	51.600	-1.8	82.1
1978	616.0	-2.0	50.800	-1.5	82.5
1980	627.2	1.8	52.000	2.2	82.9
1982	636.9	1.5	53.500	2.9	84.0
1984	574.0	-9.9	49.900	-6.8	86.9
1986	466.3	-18.8	43.500	-12.9	93.3
1988	536.7	15.1	54.500	25.5	101.5
1990	564.8	5.2	62.600	14.9	110.8
1992	608.6	7.8	72.800	16.3	119.6
1994	653.4	7.4	81.600	12.1	124.9
1996	656.6	0.5	84.200	3.1	128.2
1998	658.4	0.3	85.400	1.5	129.8
2000	665.5	1.1	87.200	2.1	131.0
2002	648.8	-2.5	85.800	-1.7	132.2
2004	622.8	-4.0	83.000	-3.2	132.2
2006	529.2	-15.0	70.900	-14.6	133.9
2008[a]	496.5	-11.3	65.800	-7.2	132.5
2009[a]	492.5	-0.8	65.000	-1.2	132.0
2010[a]	483.4	-1.8	63.777	-1.9	131.9
2011[a]	473.4	-2.1	62.529	-2.0	132.2
2012[a]	464.9	-1.7	61.640	-1.4	132.6
2013[a]	459.3	-1.2	61.167	-0.8	133.2
2014[a]	452.4	-1.5	60.546	-1.0	133.8
2015[a]	441.6	-2.4	59.571	-1.6	134.9

[a] Includes Temples oranges; in prior years, Temple oranges included with specialty citrus.

SOURCE: Florida Agricultural Statistics Service, *Commercial Citrus Inventory*, various issues.

Table 3. Age distribution of Florida round-orange trees by year of inventory.

Year of Inventory	Tree Age						Total Trees	Bearing Trees
	≤2	3-5	6-8	9-13	14-23	≥24		
	- - - - - - - - - - - - - - - - - - % -						- - - - thousand - - - -	
1970	9.1	20.6	17.6	14.8	13.4	24.4	57,801.5	49,404.2
1972	5.5	11.1	20.2	22.0	14.1	27.0	53,731.1	49,786.5
1974	4.0	5.9	16.9	27.8	16.9	28.4	52,521.7	49,466.9
1976	4.0	4.8	7.5	29.7	24.1	29.8	51,595.3	48,373.8
1978	5.2	4.5	4.7	23.4	31.5	30.6	50,843.2	47,454.5
1980	7.2	4.7	3.8	13.0	39.1	32.2	51,977.8	47,366.3
1982	12.0	5.1	3.7	7.2	40.2	31.8	53,504.7	46,078.5
1984	17.5	7.1	4.5	5.8	35.2	29.9	49,884.7	39,777.7
1986	20.0	12.4	6.1	7.1	28.7	25.7	43,461.4	32,708.0
1988	30.7	13.9	7.8	5.7	17.7	24.1	54,536.6	35,537.3
1990	35.1	14.3	10.7	6.7	10.0	23.3	62,613.4	40,666.0
1992	31.9	23.4	9.9	8.4	6.7	19.7	72,826.3	49,577.1
1994	24.4	24.6	16.7	11.0	6.5	16.9	81,614.4	61,707.7
1996	10.5	26.9	24.0	14.7	8.2	15.7	84,155.4	75,286.6
1998	8.0	15.5	26.7	23.0	11.5	15.3	85,430.6	78,586.5
2000	9.7	7.2	21.4	33.7	13.6	14.4	87,200.1	78,721.0
2002	9.5	8.6	9.3	37.0	22.5	13.1	85,751.1	77,595.9
2004	9.1	9.4	8.1	29.0	32.4	12.0	82,987.5	75,391.7
2006	6.9	9.4	10.1	17.1	44.9	11.5	70,849.4	65,954.4
2008[a]	6.1	8.2	10.1	13.3	49.7	12.5	65,775.3	61,740.6
2009[a]	6.6	7.6	9.3	14.7	48.8	13.1	64,992.7	60,752.9
2010[a]	6.6	6.7	9.7	14.6	48.6	13.8	63,776.7	59,560.8
2011[a]	7.0	6.5	8.0	16.2	46.3	16.0	62,528.9	58,160.4
2012[a]	6.8	7.1	7.4	15.5	42.9	20.2	61,640.1	57,460.4
2013[a]	6.6	7.5	6.6	15.2	40.9	23.2	61,167.0	57,146.1
2014[a]	7.7	8.1	6.2	13.5	36.7	27.9	60,545.5	55,891.7
2015[a]	8.7	8.2	7.0	12.7	31.2	32.3	59,571.2	54,383.3

[a] Temple oranges were included in the round orange category beginning in 2008.
SOURCE: Florida Agricultural Statistics Service, *Commercial Citrus Inventory*, various issues.

Table 5. Average round orange yields by tree age.

Season	Early and Midseason Oranges						Late Oranges					
	3-5	6-8	9-13	14-23	24+	wt avg[a]	3-5	6-8	9-13	14-23	24+	wt avg[a]
	1-3/5 bushel boxes per tree											
1993-94	1.4	3.2	3.8	4.5	5.2	4.1	1.0	2.0	2.7	3.5	4.0	3.1
1994-95	1.2	3.1	4.1	4.6	5.2	4.2	1.4	2.7	2.5	3.6	4.2	3.3
1995-96	1.3	2.9	3.8	4.1	4.9	3.8	1.2	2.0	2.5	3.2	4.0	2.9
1996-97	1.3	2.8	3.7	5.1	5.3	4.4	1.1	2.3	2.5	3.3	4.2	3.0
1997-98	1.3	2.7	3.8	4.8	5.3	4.2	1.1	2.2	2.6	3.8	4.9	3.4
1998-99	0.8	1.9	2.9	3.8	4.2	3.3	0.8	1.5	1.9	2.2	3.2	2.1
1999-00	0.9	2.1	3.4	4.7	5.2	4.0	0.9	1.7	2.4	3.1	4.5	2.9
2000-01	1.0	2.0	3.2	4.2	4.6	3.6	0.9	1.7	2.3	2.7	3.7	2.6
2001-02	1.4	1.8	3.0	4.2	5.2	3.7	0.9	1.7	2.4	2.8	4.5	2.7
2002-03	0.7	1.8	2.7	3.8	4.3	3.3	1.0	1.6	1.9	2.6	4.0	2.5
2003-04	1.8	1.9	3.2	4.1	5.3	3.7	1.7	2.1	2.5	3.0	5.1	3.0
2004-05	1.2	1.7	2.2	2.9	2.8	2.5	1.1	1.2	1.7	2.0	2.1	1.8
2005-06	1.8	1.8	2.0	2.8	3.7	2.7	0.8	1.8	1.8	2.1	3.0	2.1
2006-07	1.1	1.8	1.8	2.5	3.6	2.4	0.6	1.5	1.5	1.9	2.7	1.8
2007-08	0.8	1.9	2.5	3.4	4.8	3.1	0.7	2.1	2.5	2.5	4.1	2.6
2008-09	1.2	1.8	2.9	3.5	4.7	3.2	0.9	1.8	2.3	2.3	3.4	2.3
2009-10	1.0	1.8	2.1	2.8	4.0	2.7	1.0	1.4	2.0	1.9	2.9	1.9
2010-11	0.8	1.6	2.1	3.0	4.2	2.8	0.5	1.2	2.1	2.2	3.1	2.1
2011-12	0.7	1.8	2.7	3.1	4.2	3.0	0.9	1.4	1.9	2.3	3.0	2.2
2012-13	0.9	1.5	2.2	2.6	4.1	2.7	0.5	1.4	1.8	2.1	2.9	2.1
2013-14	0.7	0.9	1.7	2.2	3.2	2.2	0.5	0.8	1.4	1.6	2.2	1.6
2014-15	0.8	1.0	1.5	2.0	2.9	2.0	0.7	0.8	1.4	1.6	2.0	1.6
2015-16[b]												

[a] Weighted average based on 2015-16 tree distribution. [b] Estimated based upon 2015-16 crop.

SOURCE: Florida Agricultural Statistics Service.

Table 6. Florida orange production projections, actual for 20014-15 and FDOC estimates for 2017-18 through 2026-27.[a]

Season	Constant Yields			
	Low Planting Scenario[b]	Middle Planting Scenario[c]	High Planting Scenario[d]	Recovery Rate[e]
	---------- 1,000 boxes ----------			
2015-16	81,500			
	A forecast for the 2016-17 season will be made in October 2016 by the USDA, Florida Agricultural Statistics Service.			
2017-18	82,306	82,306	82,306	82,306
2018-19	82,245	82,245	82,245	82,245
2019-20	82,013	82,239	82,351	82,938
2020-21	81,596	82,213	82.522	84,140
2021-22	81,162	82,301	82,873	85,885
2022-23	80,582	82,354	83,247	87,974
2023-24	79,886	82,400	83,673	90,463
2024-25	79,004	82,365	84,075	93,293
2025-26	78,106	82,406	84,606	96,606
2026-27	77,106	82,388	85,109	100,138

[a] Assumes yields based upon the 2015-16 season.

[b] 50% of replacement planting level (roughly average planting level in recent years).

[c] 100% of replacement planting level.

[d] 125% of replacement planting level.

[e] 255% of replacement planting level

Table 7. New tree plantings under the recovery rate assumption, 2017-18 through 2026-27 seasons.

Season	Replanted Trees	Net New Plantings	Total Trees
	---------- million trees ----------		
2017-18	1.585	2.458	4.403
2018-19	1.606	2.489	4.094
2019-20	1.620	2.511	4.314
2020-21	1.692	2.622	4.314
2021-22	1.765	2.735	4.500
2022-23	1.838	2.849	4.687
2023-24	1.912	2.964	4.875
2024-25	1.989	3.083	5.073
2025-26	2.070	3.208	5.278
2026-27	2.154	3.339	5.493

Table 8. Projected Orange Production Using Extrapolated Yields Curve.

Season	Early-Midseason Oranges	Late Season Oranges	Total Production
	---------- 1,000 boxes ----------		
2017-18	33,480	35,402	68,882
2018-19	30,277	31,859	62,136
2019-20	27,397	28,712	56,109
2020-21	24,782	25,874	50,656
2021-22	22,407	23,327	45,734
2022-23	20,258	21,019	41,277
2023-24	18,311	18,941	37,252
2024-25	16,543	17,061	33,604
2025-26	14,942	15,368	30,310
2026-27	13,491	13,846	27,337

Table 9. Results from World orange juice model, Florida 2017-18 through 2026-27 seasons.

Season	Florida Production	On-tree Price	OJ Production	FOB FCOJ Price	FOB NFC Price
	mil. boxes	$/box	mil ps	$/ps	$/ps
2015-16	81.5	8.23	457	1.56	2.167
2016-17	A forecast for the 2016-17 season will be made in October 2016 by the USDA, Florida Agricultural Statistics Service.				
2017-18	80.6	8.26	472	1.55	2.15
2018-19	79.9	8.29	467	1.55	2.16
2019-20	79.2	8.37	463	1.56	2.17
2020-21	78.6	8.48	460	1.58	2.19
2021-22	78.2	8.61	457	1.61	2.21
2022-23	77.8	8.78	455	1.63	2.24
2023-24	77.5	8.93	453	1.66	2.27
2024-25	77.2	9.09	451	1.69	2.29
2025-26	77.1	9.22	451	1.71	2.32
2026-27	77.1	9.32	451	1.72	2.33

Table 10. Results from the world orange juice model, Sao Paulo, 2017-18 through 2026-27 seasons.

Season	Sao Paulo Production	On-tree Price	OJ Production	FOB Price
	mil. boxes	$/box	mil ps	$/ps
2015-16	280	4.13	1430	1.23
2016-17	245[a]	-----	-----	-----
2017-18	287	4.06	1463	1.22
2018-19	287	4.09	1462	1.22
2019-20	283	4.17	1444	1.24
2020-21	278	4.27	1419	1.25
2021-22	272	4.39	1386	1.28
2022-23	264	4.54	1347	1.30
2023-24	257	4.68	1308	1.33
2024-25	249	4.82	1269	1.35
2025-26	242	4.93	1236	1.37
2026-27	235	5.02	1212	1.39

[a] Source: USDA, FAS, "Brazil Citrus Semi-annual 2016," GAIN report no. BR16007, 6/16/2016.

FIGURES

Figure 1. Florida round-orange replacement rate as defined by the difference between loss rate and tree planting rates, 1993-94 through 2014-15 seasons.

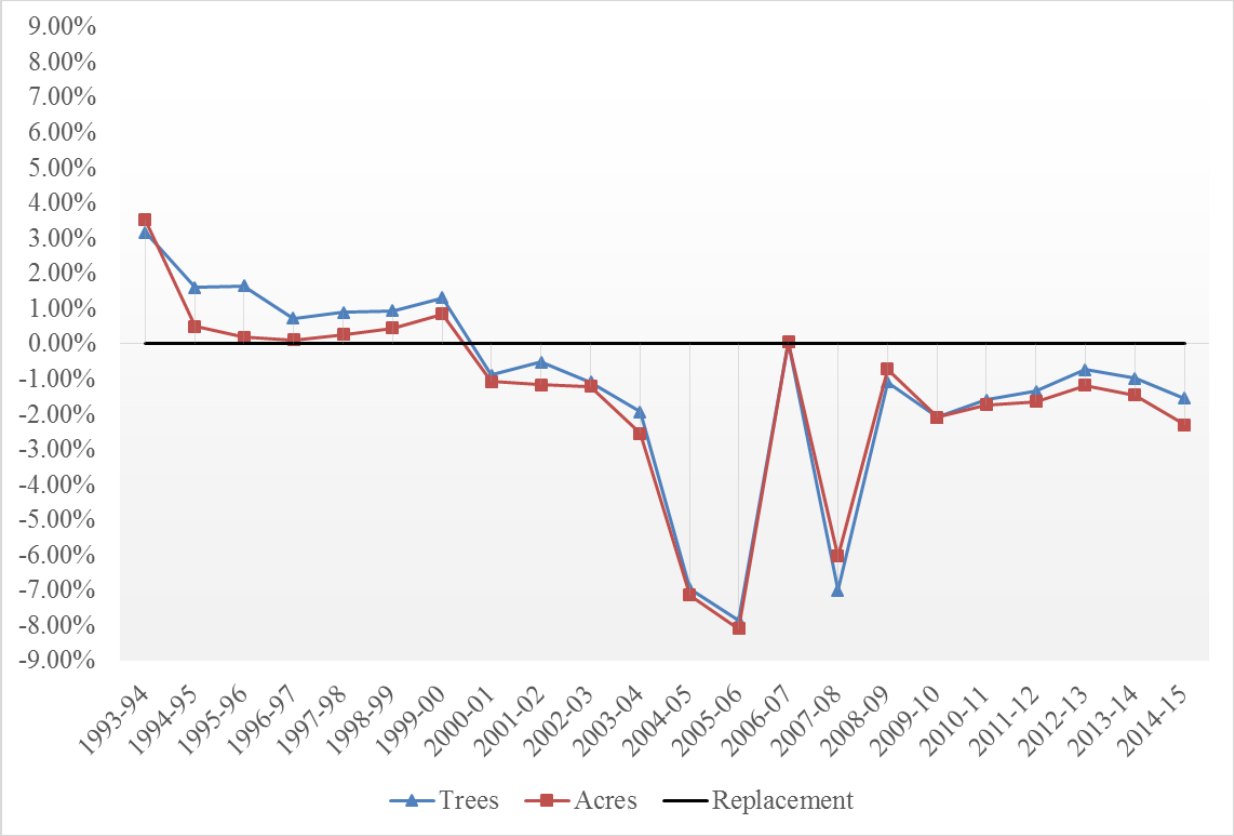

Figure 2. New plantings of round-orange commercial acreage and trees 1993-94 through 2014-15 seasons.

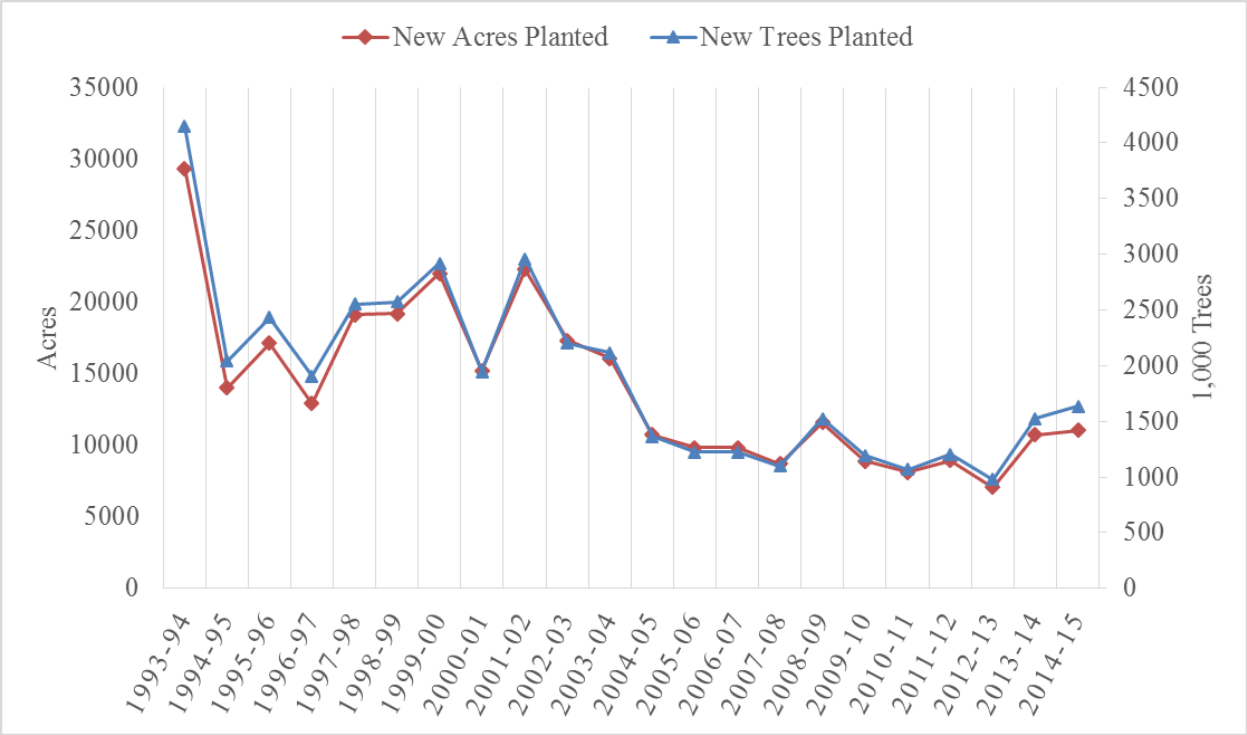

Figure 3. Historical Early-Mid Orange Tree Yields, by Age of Tree

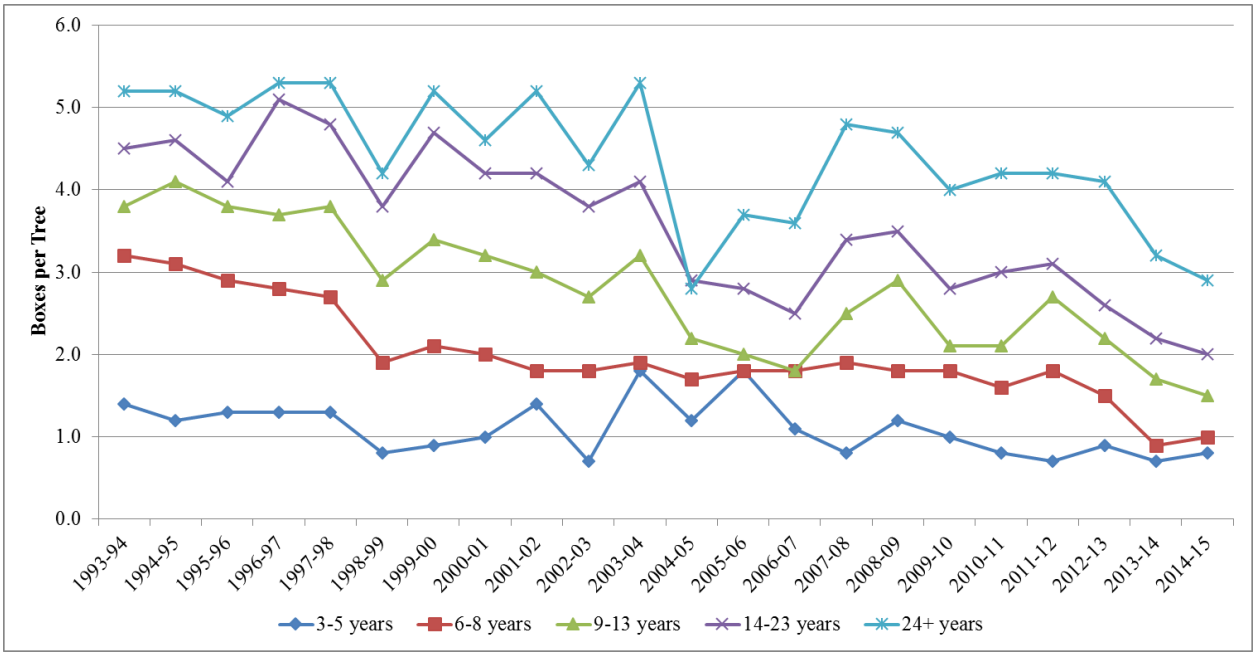

Figure 4. Historical Valencia Orange Tree Yields, by Age of Tree