Florida Round Orange and Red Grapefruit Production Projection Scenarios 2022-23 Through 2031-32

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Presented to:
Florida Citrus Commission
Economic and Market Research Committee

June 2021

Working Paper 2021-1

EMRD Working Papers are generally speeches and research reports to the Florida Citrus Commission and other industry organizations. The content focuses on research results and industry implications. Technical details of the analytical models are presented in other professional and EMRD publication outlets.

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Florida Round Orange and Red Grapefruit Production Projections Scenarios: 2022-23 Through 2031-32

Introduction

In this report, production projection scenarios for Florida round oranges and red grapefruit are provided for the 2022-23 through 2031-32 seasons. The production projections are based on the Florida Agricultural Statistics Service (USDA/NASS) commercial citrus tree inventory[1]. The inventory report provides the number of trees and acres, by age, for different varieties of citrus. State level data was available for round oranges and red grapefruit; an analysis for each is presented in this report.[2] These data are combined with USDA/NASS 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 will depend on a number of factors that are difficult to predict. For production, assumptions are made related to planting rates.

The projections in this report are intended to indicate possible future trends in production given current production yield trends as opposed to actual production in any given season using the current commercial inventory as the baseline. 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 and across regions. 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

[1] The authors of this report express their gratitude to the staff of the Florida Agricultural Statistics Service (USDA/NASS), 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 round orange and red grapefruit Florida commercial tree inventory available for this research. Data management provided by Gregory Caudill, FDOC Database Analyst.

[2] Complete disaggregated regional data was not provided by USDA to avoid the disclosure of data of individual operations.

the actual production that occurs. During the 2017-18 Florida citrus season, yields were significantly impacted when Hurricane Irma crossed through the majority of Florida's citrus producing regions on September 11, 2017 just as the 2017-18 Florida citrus season was about to commence. The timing of the hurricane served to disrupt most efforts to forecast the size of the crop for the 2017-18 season, and the resulting drop rates negatively impacted fruit yields. Initially, it was estimated that trees would recover well in subsequent seasons; however, and the current final estimate for the 2020-21 season of 52.7 million boxes for round oranges and 3.48 million boxes of red grapefruit would suggest there are lingering impacts related to the hurricane season that have been exacerbated by citrus greening. Historically, the production trends analysis does not provide a production forecast for the next season. The first official forecast for the 2021-22 season will be made in October 2021, by the USDA's National Agricultural Statistics Service (USDA/NASS).

The citrus industry in Florida, as well as a number of other 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 renders infected trees economically unviable. Infection rates of HLB vary significantly across the citrus production regions of Florida. A survey published by Singerman and Useche[3] (2016) suggested that 80 percent of the citrus trees in Florida are infected with HLB. Several research efforts related to HLB are ongoing, and grower practices are evolving over time as more is learned about the disease. The goal is to develop disease-resistant trees and implement production strategies to improve yields, but it is assumed in this report that only current trends will be present over the timeframe considered here.

[3] 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 .

Despite the efforts to mitigate the impact of HLB on production, the disease has caused a substantial decline in the commercial tree inventory over the past decade, has reduced per tree yields, and, consequently, has reduced crop sizes. The 2020-21 orange crop, currently estimated to be 52.8 million boxes, is substantially smaller than that realized 10 years ago when production for the 2010-11 season was 140.5 million boxes. The grapefruit crop declined by 62.5% percent over the same time frame from 19.75 million boxes in the 2010-11 season to 4.1 million boxes in the 2020-21 season.

2020 Commercial Citrus Inventory Overview

The September 2020 Commercial Citrus Inventory suggests that Florida's total citrus acreage has continued a downward trend with a decrease of 22.5% from 541,328 acres in 2011 to 419,452 acres in 2020 (Table 1). The decline in commercial acreage has occurred incrementally since 1996 when Florida commercial acreage peaked at 857,687 acres. Over the last decade total commercial acreage declined by 121,876 acres. Similarly, the number of citrus trees decreased by 14.3% from 70.6 million in 2010 to 55.3 million in 2020. The rate of decline for commercial acreage outpaced the rate of decline for the commercial tree inventory. Acreage and tree inventory data for individual varieties of citrus – round oranges and red grapefruit – are shown in Tables 2, 3, 4 and 5, respectively.

The USDA/NASS commercial citrus inventory indicates that the population of bearing and non-bearing round orange trees was 55.3 million trees in 2020 (Table 2). Tree density has increased from an average of 134.8 trees per acre in 2016 to 144.4 trees per acre in 2020. As indicated in Table 4, the orange tree population is relatively mature with nearly 57% of the tree population being age of 14 years or older although this proportion has declined somewhat over the past five years.

In the 2017-18 season, the number of new orange tree plantings exceeded the number of trees lost for the first time since the 1999-00 season, although the acres planted was slightly less than the acres lost (Figure 1). The first season in which the replacement rate exceeded 100 percent signaled a possible reversal to the ever-declining tree numbers and was a significant event as declining tree numbers are a significant factor in the decline in Florida orange production over the previous 10 years. However, the replacement rate, which compares tree loss to new plantings has fallen below 100 percent replacement in the past two seasons.

The USDA/NASS commercial citrus inventory indicates that the population of bearing and non-bearing grapefruit trees was 2.7 million trees in 2020 (Table 2). Tree density has increased from an average of 113.4 trees per acre in 2016 to 120.9 trees per acre in 2020. As indicated in Table 5, the grapefruit tree population is very mature with nearly 70% of the tree population being age of 14 years or older with this proportion increasing over the past five years due to lack of replanting (refer to Table 6 for data on the decline in new plantings). The declining commercial tree inventory for grapefruit over the past decade is due to a combination of hurricane destruction, urbanization, and, most notably, a higher susceptibility to HLB and higher costs of production.

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 (late) 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. The production projections are induced by aging the disaggregated

commercial tree inventory over the course of 24+ years with varying per tree yields and replanting rates.

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 2020-21 season are used to establish a baseline.[4] 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. Average per tree yields by tree age by variety are illustrated in Figures 5 and 6.

Planting Assumptions

Production projections are dependent upon assumed future planting rates. In past reports, producer prices were assumed to be the important factors in projecting planting levels, but, in recent years, risk aversion to losing new plantings to HLB appears to have become a primary factor underlying many grower planting decisions. The decline in commercial tree inventory is linked to producer uncertainty with respect to HLB and the insufficient tree replanting effort, which has fallen below 100 percent tree replacement for every tree lost to production since the 2000-01 season (with the exception of 2017-18). Figure 1 describes the replacement rate of the commercial orange tree and acreage inventory for early-mids and Valencia orange trees for the seasons 1993-94 through 2019-20. The replacement rate is the difference in the loss rate and the replanting rate.

[4] This assumption is aligned with current fruit per yield trends and deviates from the approach used in past reports in which an average of the previous five-years was used. The rapid decline in per tree yields in recent years suggests that a five season average would inflate production projections and provide unrealistic results.

The replacement rate is the year-over-year percentage change in commercial tree inventory and the replanting rate is the percentage of trees planted each season.

When the loss rate exceeds the replant rate, the replacement rate is less than 100 percent. The replacement rate exceeded 100 percent for the commercial tree inventory during the 2017-18 season when the rate was 3.4% compared to the loss rate of a 1.5% decline. The commercial acreage rate that season remained just below a 100 percent replacement rate, indicative of the higher tree densities with recent replanting efforts. The replacement rate dipped below 100 percent once again for the commercial tree inventory in the subsequent seasons. During the 2019-20 season the replacement rate dropped below 100 percent replacement as the 1.96% new round orange tree planting rate did not offset the 3.35% loss rate.

Three production trend scenarios are considered in this report. The first scenario assumes the planting level moving forward will be 80 percent the replacement level considering current estimated replacement rates and employs estimated yields from the 2020-21 crop for oranges. The estimated yields are summarized in Table 7 of this report. The second scenario uses the 2020-21 yields as a starting point and then begins to degrade per tree fruit yields for trees age 15 and older beginning in the 2022-23 season by three percent per year. An 80 percent replant rate is assumed. The third scenario considers an aggressive replanting level moving forward of 125 percent the replacement level with use of the 2020-21 yields per tree across the defined tree age categories. 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 the higher-planting scenarios in the immediate upcoming years. These scenarios, thus, require that nurseries respond relatively quickly to grower demand for trees.

In the case of red grapefruit, the tree planting assumptions analyzed are 50 percent and 100 percent of the replacement with the assumption that 100 percent replanting would be the aggressive replanting strategy. The narrow look at planting assumptions is considered given the faster contraction of the red grapefruit bearing area. Yields from the 2020-21 season are used.

Production Projections

Orange production projections for the period 2022-23 through 2031-32 across the three scenarios are shown in Table 9. The first scenario is the status quo scenario in which it is assumed that replanting occurs at 80 percent of the tree loss each season and the estimated 2020-21 yields per tree are expected to persist. Projected orange production under scenario one indicates that the production will likely continue to decline incrementally even with stabilized yields. Under a replant rate of 80 percent, production is projected to decline from 52.0 million boxes in 2022-23 to 47.8 million boxes by 2031-32.

Scenario 2 considers what would happen to future production assuming the replant rate of the commercial inventory hovers around 80 percent and the recent declines in per tree yields will continue. The assumption is that per tree yield are decreased by three percent per year for trees 15-years of age and older beginning in the 2022-23 season. Projected orange production under scenario two suggests production would continue to decline over the course of the decade from 48.1 million boxes in 2022-23 to 36..9 million boxes in 2031-32. Production at these levels would have a number of negative consequences for the Florida orange industry infrastructure.

The third scenario provided the conditions under an aggressive 125 percent replanting effort using 2020-21 yields. Projected orange production under scenario three ranges from 51.5 million boxes in 2022-23 to 54.4 million boxes in 2031-32. Comparison of these results indicate that the steep decline in per tree yields has been the main factor causing smaller orange crops.

Declining per tree yields also have serious economic ramifications on grove profitability and the willingness of growers to invest new plantings.

Red grapefruit production projections from the FDOC model are shown in Table 10. Under the assumption of 100 percent replant of lost trees, red grapefruit production is expected to decline slightly from 3.7 million boxes in 2022-23 to 3.3 million boxes in 2031-2032. Under the 50 percent replant assumption projected production declines from 3.7 million boxes in 2022-23 to just under 2.8 million boxes in 2029-30.

Conclusions

For more than 15 years, a number of adverse factors have negatively impacted the Florida citrus industry, as reflected in the size and scope of the commercial tree inventory today. Beginning with a series of hurricanes that struck peninsular Florida in 2004 and 2005, followed by the spread of citrus canker and then, even more devasting, Huanglongbing (HLB). Production of Florida citrus across all varieties – oranges, grapefruit, and tangerines - has been in sharp decline as a result. Beyond the farm gate, industry infrastructure has suffered with the closure of both citrus processing and fresh citrus packing plants.

The 2020 Florida Citrus Tree inventory provided the baseline for the projections in this report. Three different production scenarios were considered to analyze production projections for both Florida round oranges and red grapefruit. The results indicate that the long-run outlook of the Florida citrus industry continues to be in a precarious state without massive replanting efforts in place. There is legitimate concern that majority of the commercial tree inventory in Florida is older than 14 years and yields are not likely to improve in older trees. Prior to the arrival of citrus greening, an older commercial tree inventory was considered to be a stable

variable in projecting production over a forthcoming decade. The persistent trend of tree mortality rates exceeding tree planting rates also 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 without support for replanting efforts. Long-run sustainability, relevance, and impact can be realized with reduced tree mortality, improved per tree yields, new tree plantings, and modest market growth to accommodate reemerging production from such efforts.

The industry has a history of overcoming adversity in the wake of lower replanting rates. From 1988 through 2000, there were 32.7 million net new trees planted. In 1990. 35% of the tree inventory consisted of newly planted, non-bearing trees. By 2000. the tree inventory was at its peak with 32 percent of trees between the ages of 9- to 13-years old. It is important to note, however, yields were much higher than they are today. In 1990, total production from 40.7 million bearing trees was 110.2 million boxes. With production the next year reaching 151.6 million boxes. And, by 2000, the industry boasted 78.7 million bearing round orange trees with production reaching 233 million boxes of round oranges.

The Florida citrus industry today would need only to benefit from a fraction of the replant effort from that decade in the 1990s with a modest replanting effort under favorable conditions. Reduced mortality involves sustained efforts to control the psyllid; the application of current/future research to maintain tree health and HLB resistance. As new measures are being developed to hinder the impact of HLB on the trees, there is promise of better fruit yields. Increased plantings will be influenced by on-tree prices high enough to attract investment and an expectation that trees will survive to generate returns over time.

FIGURES

Figure 1. Replacement rate for Florida round orange trees and acreage for season 1993-94 through 2019-20.

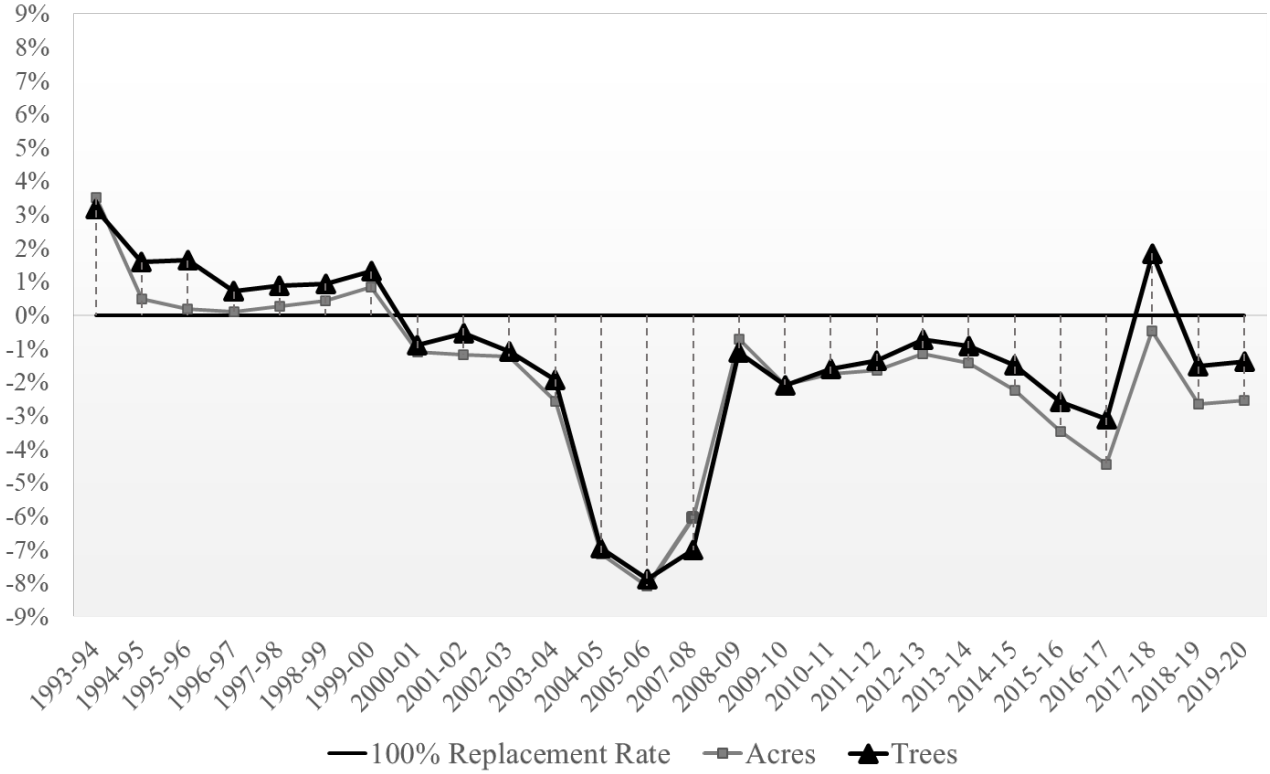


Figure 2. Replacement rate for Florida grapefruit trees and acreage for season 1993-94 through 2019-20.

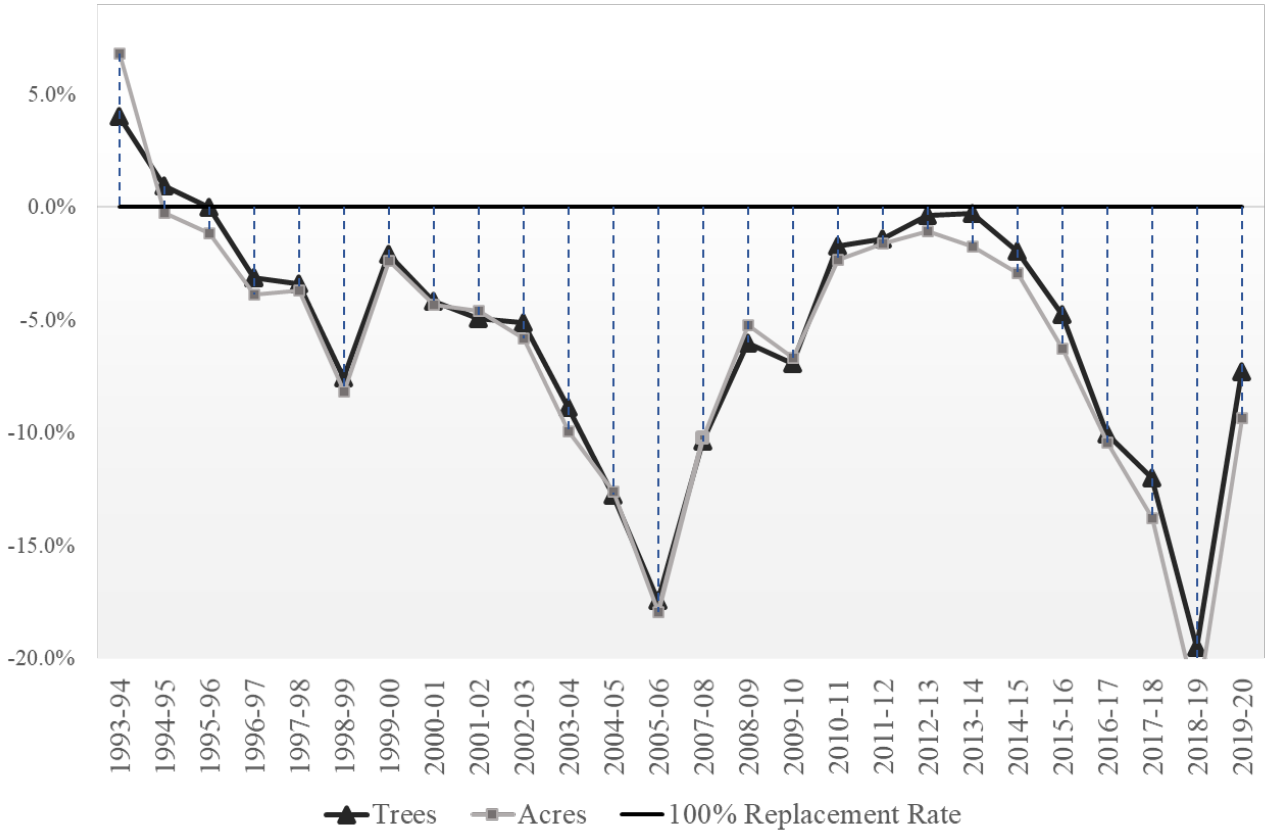


Figure 3.Historical Early-Mid Orange Tree Density, by Age of Tree.

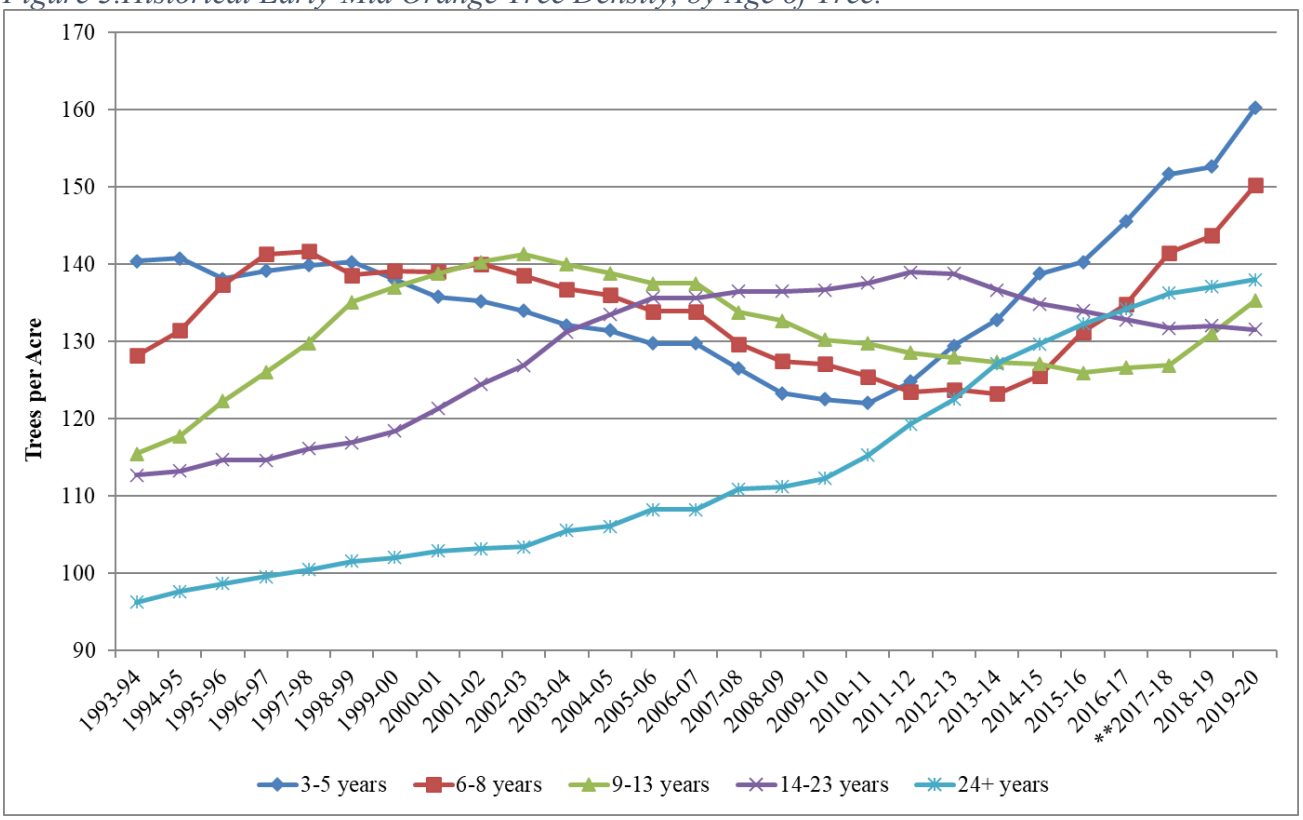


Figure 4. Historical Valencia Orange Tree Density, by Age of Tree

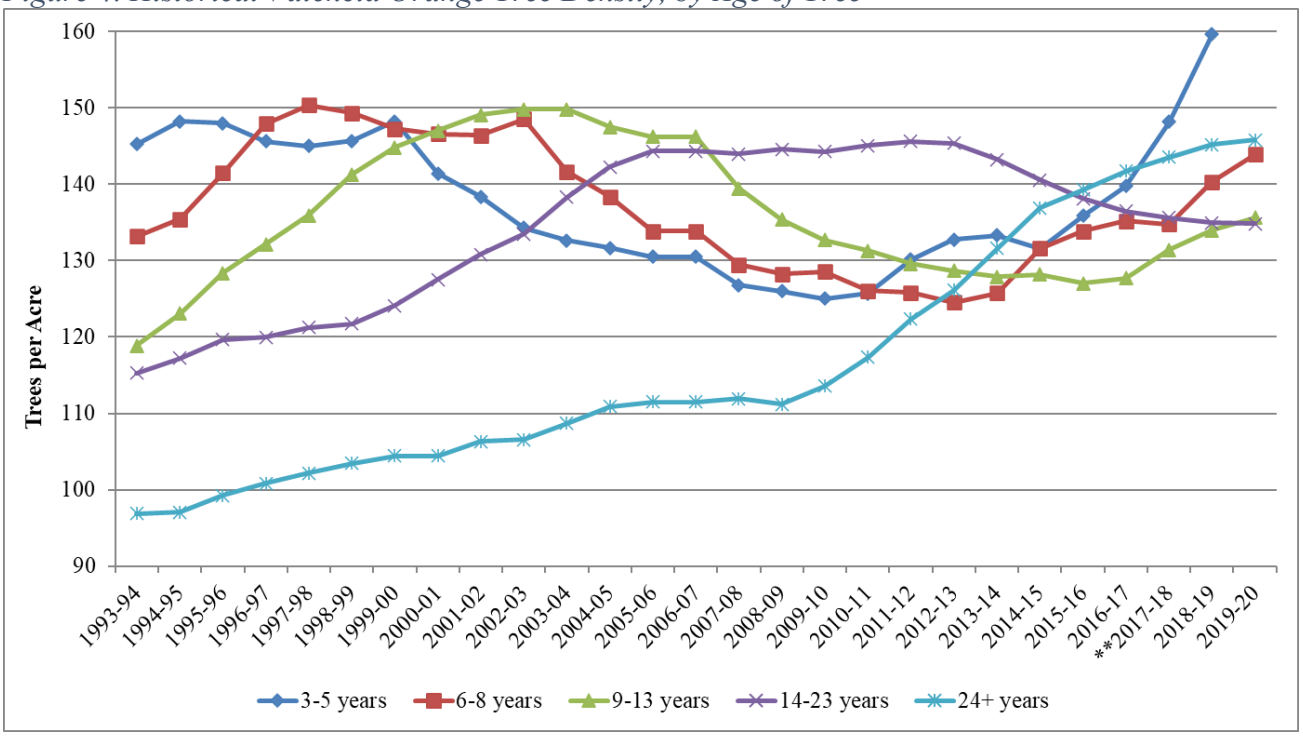


Figure 5. Historical Early-Mid Orange Tree Yields, by Age of Tree.

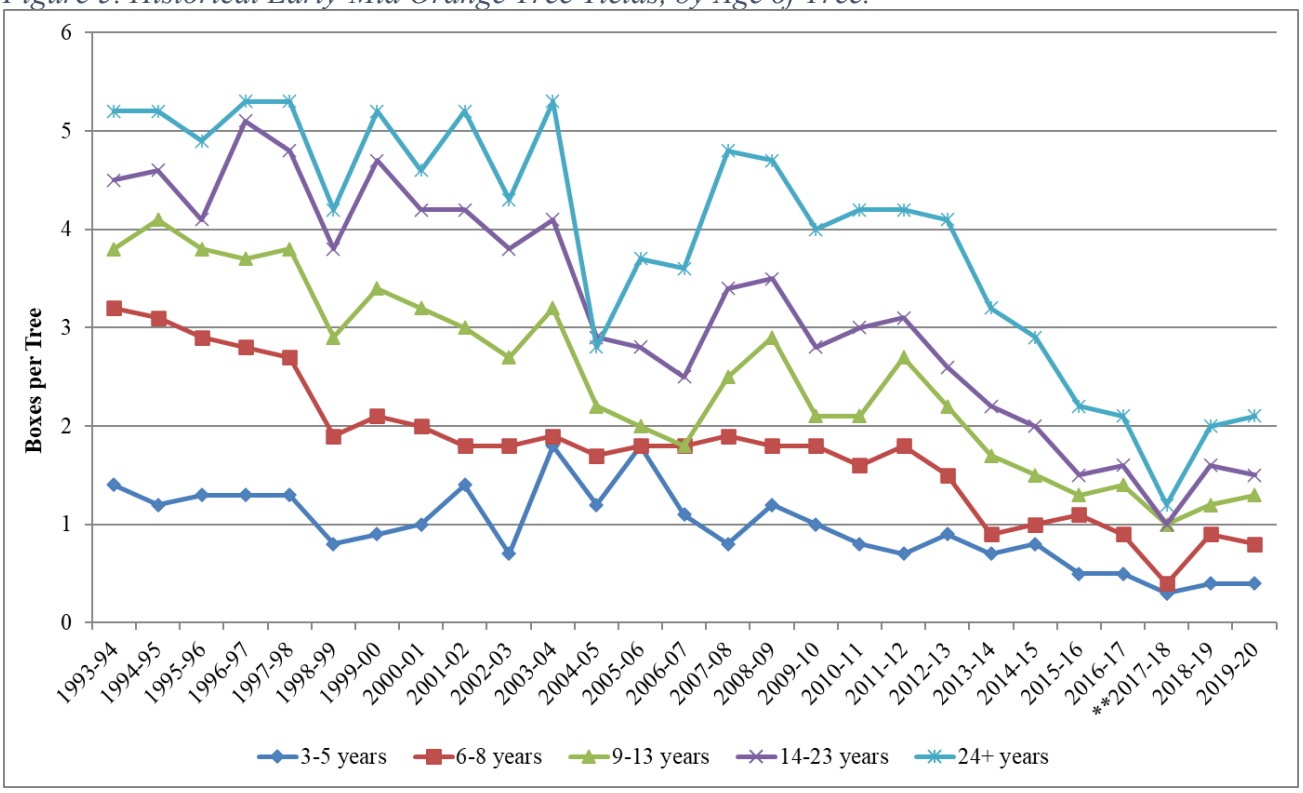


Figure 6. Historical Valencia Orange Tree Yields, by Age of Tree.

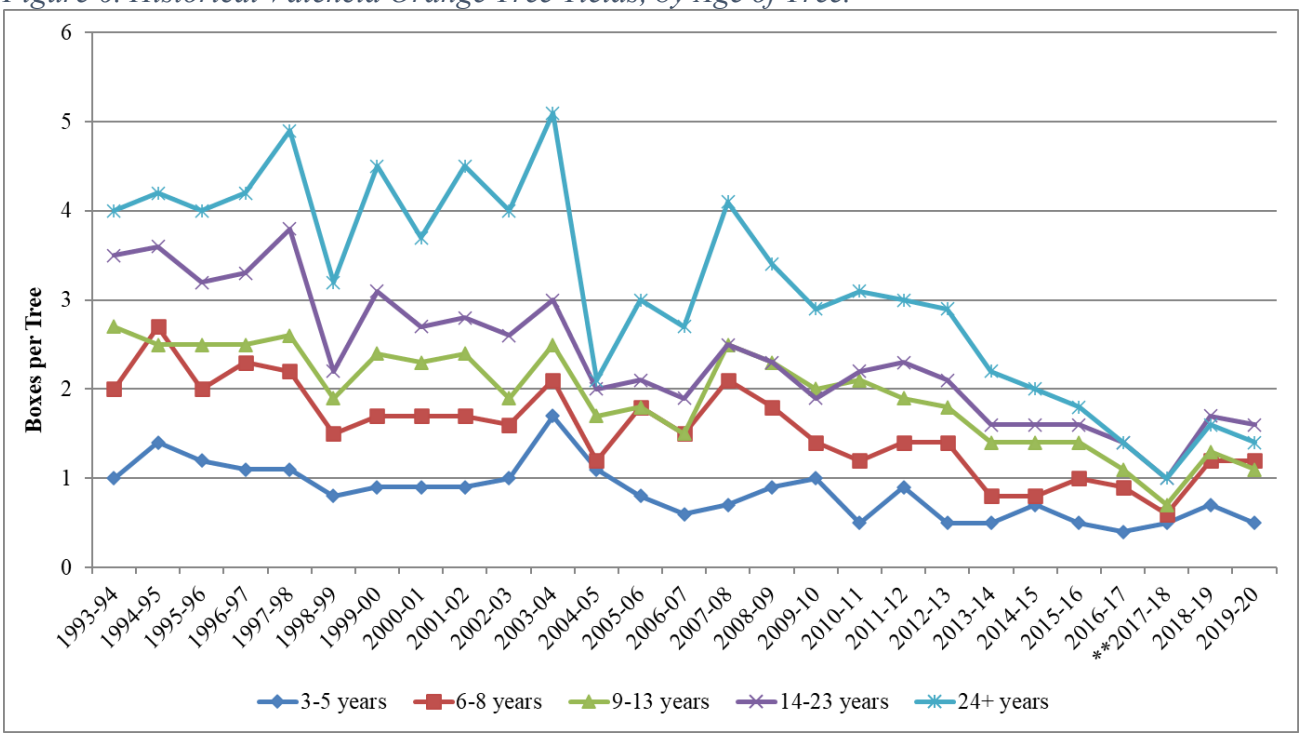


Figure 7. Historical Early-Mid Orange Acreage Yields, by Age of Tree.

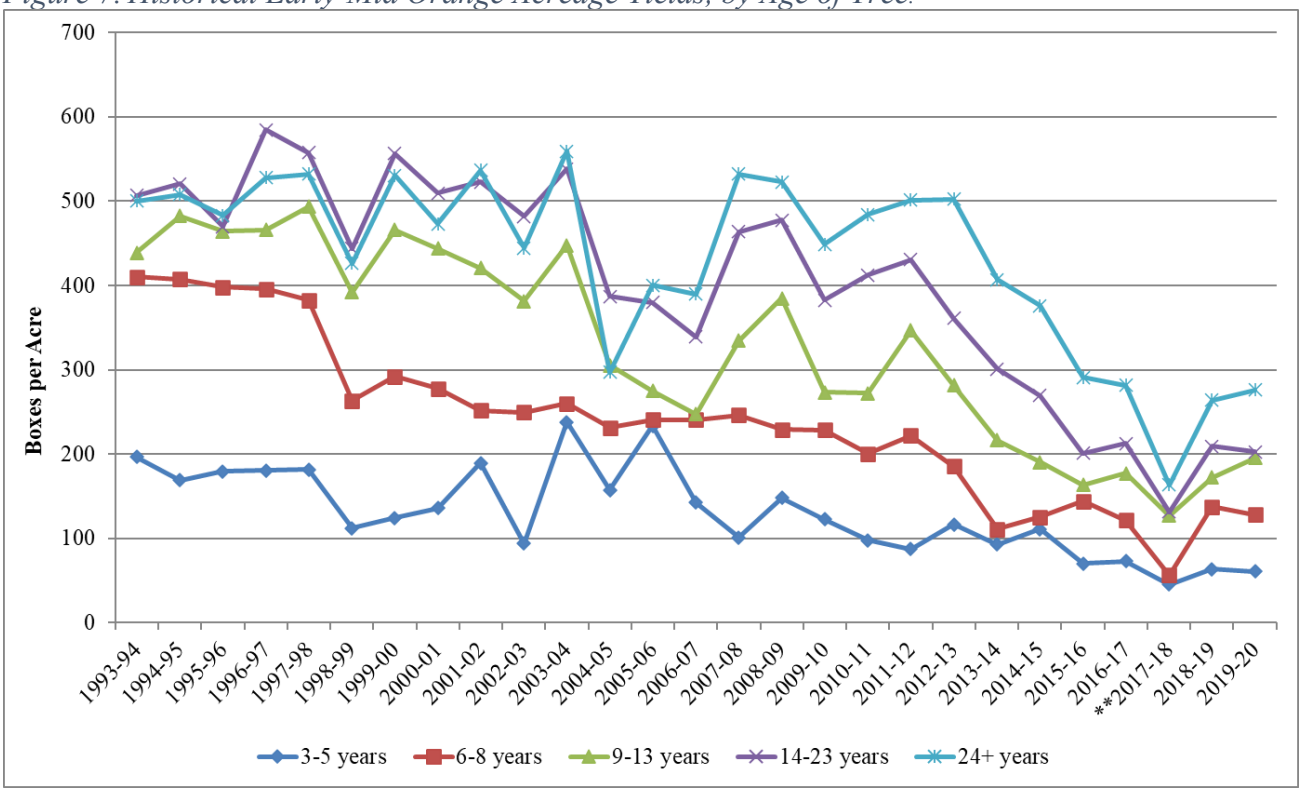


Figure 8. Historical Valencia Orange Acreage Yields, by Age of Tree

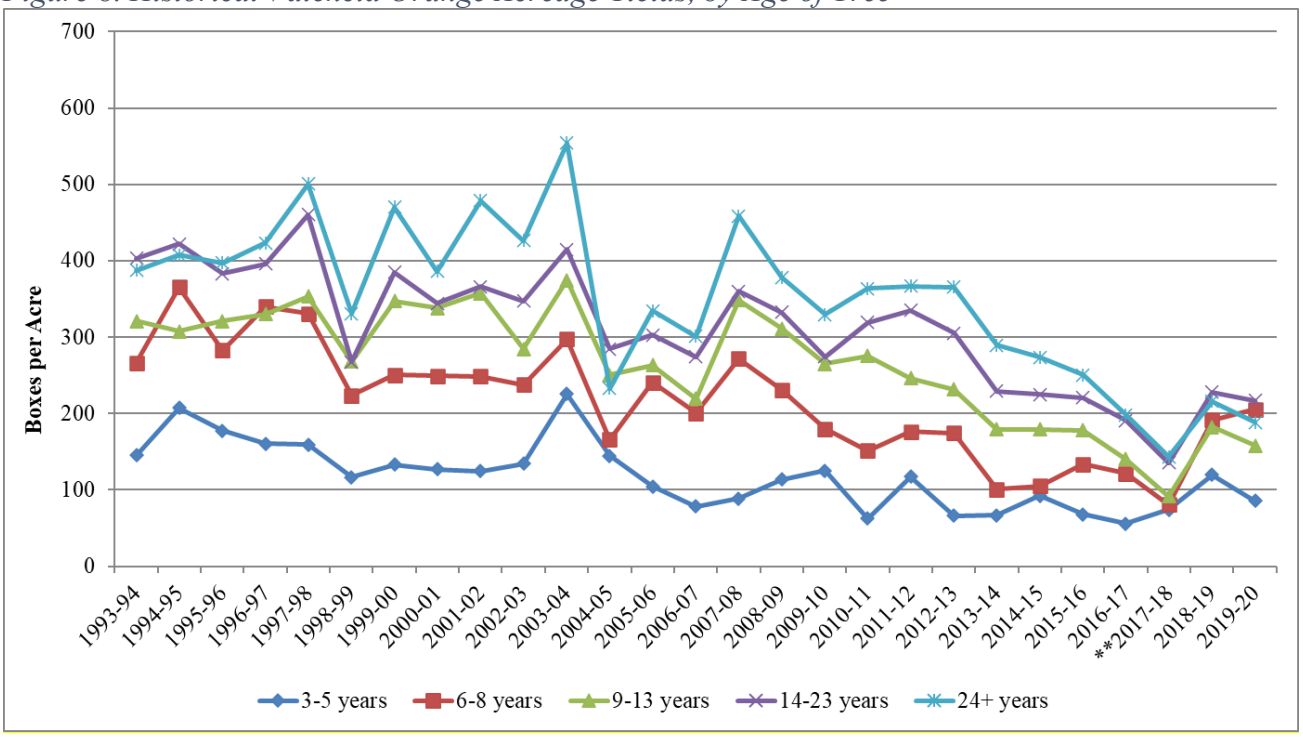


Figure 9. Historical Red Grapefruit Tree Density, by Age of Tree.

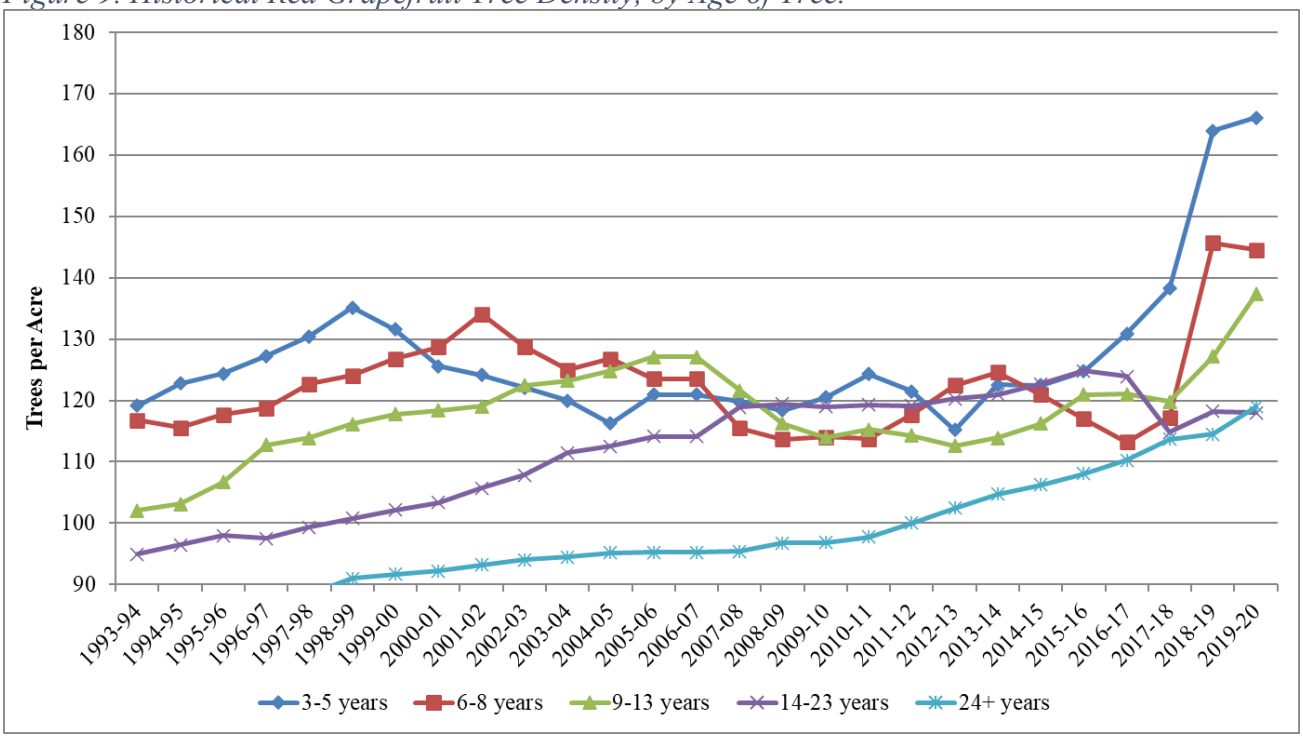


Figure 10. Historical Red Grapefruit Tree Yields, by Age of Tree.

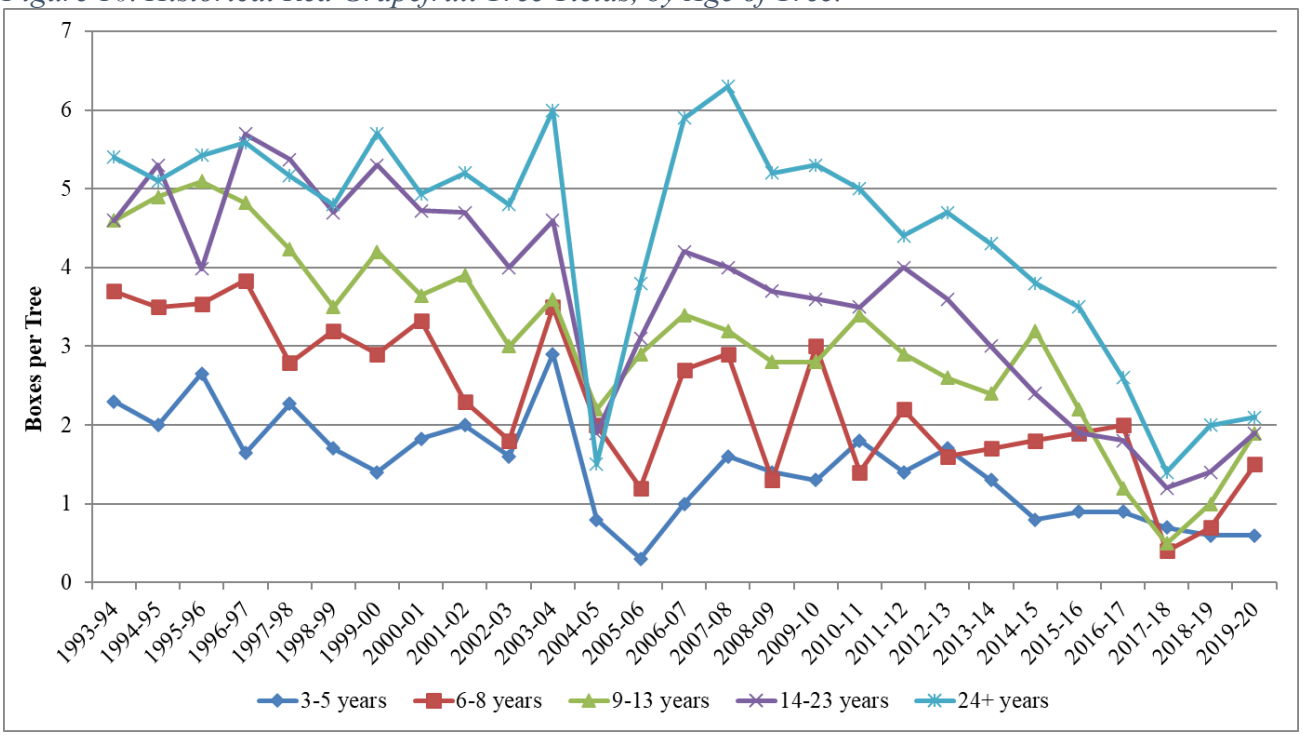
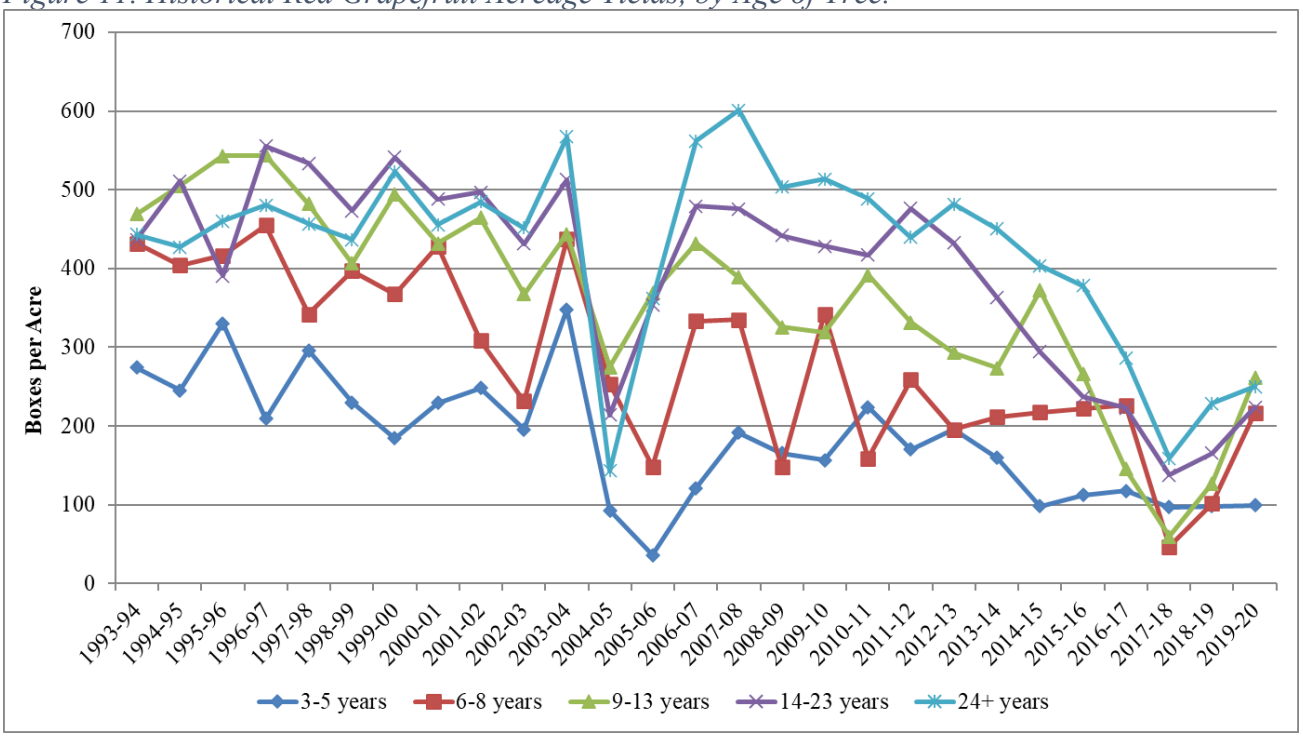


Figure 11. Historical Red Grapefruit Acreage Yields, by Age of Tree.



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 -
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	-1.8	133.4
2016	480.1	- 4.2	64.7	-3.3	134.8
2017	455.0	-5.2	62.2	-3.9	136.7
2018	447.0	-1.8	62.7	+0.8	140.2
2019	430.6	-3.7	61.4	-2.1	142.5
2020	419.5	-2.6	60.6	-1.3	144.4

SOURCE: USDA/NASS 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 -
1980	627.2	1.8	52.0	2.2	82.9
1982	636.9	1.5	53.5	2.9	84.0
1984	574.0	-9.9	49.9	-6.8	86.9
1986	466.3	-18.8	43.5	-12.9	93.3
1988	536.7	15.1	54.5	25.5	101.5
1990	564.8	5.2	62.6	14.9	110.8
1992	608.6	7.8	72.8	16.3	119.6
1994	653.4	7.4	81.6	12.1	124.9
1996	656.6	0.5	84.2	3.1	128.2
1998	658.4	0.3	85.4	1.5	129.8
2000	665.5	1.1	87.2	2.1	131.0
2002	648.8	-2.5	85.8	-1.7	132.2
2004	622.8	-4.0	83.0	-3.2	132.2
2006	529.2	-15.0	70.9	-14.6	133.9
2008[a]	496.5	-11.3	65.8	-7.2	132.5
2009[a]	492.5	-0.8	65.0	-1.2	132.0
2010[a]	483.4	-1.8	63.8	-1.9	131.9
2011[a]	473.4	-2.1	62.5	-2.0	132.2
2012[a]	464.9	-1.7	61.6	-1.4	132.6
2013[a]	459.3	-1.2	61.2	-0.8	133.2
2014[a]	452.4	-1.5	60.5	-1.0	133.8
2015[a]	441.6	-2.4	59.6	-1.5	134.9
2016	425.7	-3.6	58.0	-2.7	136.2
2017	405.8	-4.7	56.0	-3.3	138.0
2018	403.5	-0.6	57.0	+1.8	141.3
2019	392.5	-2.7	56.1	-1.5	143.0
2020	382.4	-2.6	55.3	-1.4	144.7

[a] Includes Temples oranges; in other years, Temple oranges included with specialty citrus.
SOURCE: USDA/NASS Florida Agricultural Statistics Service, *Commercial Citrus Inventory,* various issues.

Table 3. Florida grapefruit 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
	- thousand -	- % -	- million -	- % -	- trees/acre -
1980	139.9	2.6	10.77	3.4	77.0
1982	139.9	NC	10.83	0.6	77.4
1984	134.7	-3.7	10.58	-2.3	78.5
1986	117.8	-12.5	9.62	-9.1	81.7
1988	119.6	1.5	10.08	4.7	84.3
1990	125.3	4.8	11.19	11.0	89.3
1992	135.2	7.9	13.12	17.2	97.0
1994	146.9	8.7	15.00	14.3	102.1
1996	144.4	-1.7	15.12	0.8	104.7
1998	132.8	-8.0	14.08	-6.9	106.0
2000	118.1	-2.6	12.67	-2.3	107.2
2002	105.5	-10.7	11.33	-10.6	107.4
2004	89.0	-15.6	9.75	-14.0	109.5
2006	63.4	-28.8	6.97	-28.5	109.9
2008	56.9	-10.3	6.24	-10.5	109.7
2009	53.9	-5.3	5.86	-6.1	108.8
2010	50.2	-6.9	5.45	-7.1	108.5
2011	49.0	-2.4	5.35	-1.8	109.2
2012	48.2	-1.6	5.27	-1.4	109.4
2013	47.7	-1.1	5.25	-0.4	110.2
2014	45.9	-3.6	5.19	-1.2	113.1
2015	43.96	-4.3	4.93	-5.0	112.1
2016	40.3	-8.3	4.58	-7.1	113.4
2017	36.1	-10.5	4.12	-10.0	114.1
2018	30.9	-14.3	3.59	-12.9	116.2
2019	25.3	-18.0	3.01	-16.0	118.7
2020	22.5	-11.0	2.71	-10.0	120.9

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

Table 4. 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 - - - -	
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	8.7	8.2	7.0	12.7	31.2	32.3	59,571.2	54,383.3
2016	9.9	8.3	7.5	11.3	27.3	35.7	57,982.1	52,202.8
2017	10.6	9.5	8.2	10.6	24.1	36.9	56,022.3	50,082.6
2018	12.3	10.6	7.9	10.2	22.3	36.6	57,021.3	50,033.1
2019	11.4	12.1	7.9	10.9	22.2	35.5	56,134.6	49,708.6
2020	9.4	13.5	9.0	11.5	21.6	35.0	55,343.2	50,146.1

[a] Temple oranges were included in the round orange category from 2008-2017.
SOURCE: USDA/NASS Florida Agricultural Statistics Service, *Commercial Citrus Inventory,* various issues.

Table 5. Age distribution of Florida grapefruit 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 - - - - -	
1982	7.5	7.4	12.8	12.6	29.1	30.6	10,833.2	9,753.9
1984	11.4	6.7	7.5	15.7	32.1	26.7	10,582.9	9,192.8
1986	9.7	7.8	7.9	17.0	35.7	22.0	9,624.0	8,367.7
1988	11.0	9.7	6.5	13.8	38.3	20.7	10,081.2	8,654.7
1990	21.8	6.2	8.0	9.1	31.4	23.5	11,193.2	8,748.5
1992	27.2	14.0	5.5	8.6	19.1	25.6	13,119.2	9,556.9
1994	23.3	21.3	7.6	8.3	16.0	23.5	15,004.0	11,514.1
1996	9.8	25.3	17.8	8.2	15.3	23.6	15,116.9	13,632.8
1998	4.3	16.7	24.6	13.8	14.8	25.8	14,079.1	13,469.6
2000	3.7	6.2	22.7	27.2	13.6	26.7	12,668.6	12,204.1
2002	4.1	4.7	9.7	38.3	16.7	26.5	11,329.2	10,869.7
2004	8.0	4.0	4.9	32.1	27.0	24.1	9,748.3	8,967.9
2006	6.1	5.9	3.8	18.5	41.8	23.8	6,971.4	6,543.2
2008	4.0	6.9	4.3	7.7	50.8	26.2	6,241.0	5,989.7
2009	3.9	6.3	4.8	6.4	49.8	28.8	5,861.0	5,633.8
2010	4.5	5.5	5.5	5.7	50.1	28.8	5,445.9	5,201.0
2011	5.9	4.4	5.4	6.2	48.3	29.8	5,349.6	5,036.4
2012	6.4	4.2	5.7	6.3	44.9	32.5	5,272.3	4,934.6
2013	6.8	5.4	5.0	6.5	40.3	36.1	5,251.2	4,896.10
2014	7.3	6.3	4.4	7.6	31.5	42.9	5,118.0	4,744.0
2015	9.5	7.3	4.2	7.3	24.1	47.6	4,933.1	4,462.3
2016	8.4	10.2	4.4	7.1	20.1	49.8	4,582.0	4,198.5
2017	77	9.8	6.9	6.5	11.4	57.7	3,797.8	4,116.6
2018	4.3	13.1	7.7	5.8	9.0	60.1	3,597.9	3,440.8
2019	2.7	11.0	9.9	5.2	6.9	64.3	3,008.4	2,908.7
2020	4.0	7.2	10.6	8.3	9.2	60.7	2,714.9	2,594.1

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

Table 6. Annual citrus planting by variety.

Variety	Annual Plantings[a] 1000 Trees							
	2012	2013	2014	2015	2016	2017	2018	2019
ORANGES								
Early & Midseason	320.7	580.9	481.6	440.9	534.6	345.5	325.5	207.5
Late	422.1	499	564.8	603	771.6	1,139.90	877.1	614.3
Unidentified[b]	232.4	445.1	587.3	285.3	504.7	391.1	251.4	264.0
TOTAL	975.2	1525	1633.7	1329.2	1810.9	1876.5	1454.0	1085.8
GRAPEFRUIT								
White Seedless	2.3	0.2	3.5	0.6	1.4	D	D	D
Red Seedless	99.8	55.3	71.4	53.9	12.5	26.9	19	35.8
Unidentified[b]	15.7	27.7	44.7	4.5	12.6	4.6	D	D
TOTAL	117.8	83.2	119.6	59	26.5	31.5	37.3	49.7

[a] Based on various *Commercial Citrus Inventories*. May underestimate actual new plantings in year 0.
[b] Orange and grapefruit trees listed as "unidentified" by the USDA/USDA/NASS will later be classified into one of the other categories.

Table 7. Average round orange yields by 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											
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[b]	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	0.5	1.1	1.3	1.5	2.2	1.6	0.5	1.0	1.4	1.6	1.8	1.5
2016-17	0.5	0.9	1.4	1.6	2.1	1.6	0.4	0.9	1.1	1.4	1.4	1.2
2017-18	0.3	0.4	1.0	1.0	1.2	0.9	0.5	0.6	0.7	1.0	1.0	0.9
2018-19	0.4	0.9	1.2	1.6	2.0	1.5	0.7	1.2	1.3	1.7	1.6	1.4
2019-20	0.4	0.8	1.3	1.5	2.1	1.5	0.5	1.2	1.1	1.6	1.4	1.3
20-21est	0.35	0.76	1.01	1.18	1.29	--	0.29	0.74	0.97	1.07	1.18	--

Source: USDA/NASS Florida Citrus Statistics, Various Issues; 20-21est yields were extrapolated using statistical methods to account for degraded yields over time. As with average yields applied, the estimated yields varied by region and within each age bracket.

Table 8. Average red grapefruit yields by age.

Season	Red Grapefruit					
	3-5	6-8	9-13	14-23	24+	wt avg[a]
	- - - - - - - - - - 1-3/5 bushel boxes per tree - - - - - - - - -
1992-93	2.5	4.9	5.6	5.7	6.4	5.6
1993-94	2.3	3.7	4.6	4.6	5.4	4.6
1994-95	2.0	3.5	4.9	5.3	5.1	4.9
1995-96	2.7	3.5	5.1	4.0	5.4	4.3
1996-97	1.6	3.8	4.8	5.7	5.6	5.2
1997-98	2.3	2.8	4.2	5.4	5.2	4.9
1998-99	1.7	3.2	3.5	4.7	4.8	4.4
1999-00	1.4	2.9	4.2	5.3	5.7	4.9
2000-01	1.8	3.3	3.6	4.7	4.9	4.4
2001-02	2.0	2.3	3.9	4.7	5.2	4.5
2002-03	1.6	1.8	3.0	4.0	4.8	3.9
2003-04	2.9	3.5	3.6	4.6	6.0	4.8
2004-05	0.8	2.0	2.2	1.9	1.5	1.7
2005-06	0.3	1.2	2.9	3.1	3.8	3.0
2006-07	1.0	2.7	3.4	4.2	5.9	4.3
2007-08	1.6	2.9	3.2	4.0	6.3	4.4
2008-09	1.4	1.3	2.8	3.7	5.2	3.8
2009-10	1.3	3.0	2.8	3.6	5.3	3.8
2010-11	1.8	1.4	3.4	3.5	5.0	3.9
2011-12	1.4	2.2	2.9	4.0	4.4	3.8
2012-13	1.7	1.6	2.6	3.6	4.7	3.7
2013-14	1.3	1.7	2.4	3.0	4.3	3.3
2014-15	0.8	1.8	3.2	2.4	3.8	2.9
2015-16	0.9	1.9	2.2	1.9	3.5	2.6
2016-17	0.9	2.0	1.2	1.8	2.6	2.1
2017-18	0.7	0.4	0.5	1.2	1.4	1.1
2018-19	0.6	0.7	1.0	1.4	2.0	1.5
2019-20	0.6	1.5	1.9	1.9	2.1	1.9

Source: USDA/NASS Florida Citrus Statistics, Various Issues.

Table 9. Projected round orange production under various replant rates and yields scenarios, 2022-23 through 2031-32 Seasons.

	80% Replant Rate with 20-21 yields			80% Replant Rate with declining yields			125% Replant Rate with 20-21 season yields		
	Baseline Production – 52.782 million boxes								
	---------- thousands 1-3/5 bushel boxes ----------								
Season	E-M	Valencia	Total	E-M	Valencia	Total	E-M	Valencia	Total
2022-23	21,776	29,530	51,307	20,644	27,448	48,092	21,855	29,625	51,480
2023-24	21,436	29,271	50,707	19,922	26,600	46,521	21,670	29,554	51,224
2024-25	21,173	29,016	50,189	19,252	25,852	45,105	21,625	29,581	51,206
2025-26	20,986	28,750	49,735	18,639	25,165	43,805	21,709	29,677	51,387
2026-27	20,804	28,513	49,317	18,053	24,530	42,583	21,823	29,876	51,699
2027-28	20,653	28,311	48,964	17,491	23,912	41,403	21,988	30,160	52,148
2028-29	20,509	28,128	48,637	16,956	23,296	40,253	22,170	30,474	52,645
2029-30	20,383	27,971	48,354	16,488	22,658	39,145	22,382	30,826	53,208
2030-31	20,270	27,823	48,094	16,024	21,998	38,023	22,616	31,184	53,800
2031-32	20,155	27,685	47,840	15,610	21,360	36,970	22,859	31,547	54,405

Table 10.Projected Red Grapefruit Production under Varying Replant Rates, 2022-23 through 2031-32 Seasons.

	50% replant	100% replant
	Baseline Production – 3.84 million 85-lb boxes	
Season	---------- thousands 1-3/5 bushel boxes ----------	
2022-23	3,163	3,163
2023-24	3,066	3,093
2024-25	2,974	3,039
2025-26	2,887	2,999
2026-27	2,800	2,960
2027-28	2,714	2,926
2028-29	2,633	2,896
2029-30	2,555	2,873
2030-31	2,482	2,857
2031-32	2,414	2,847