Florida Round Orange and Red Grapefruit Production Projection Scenarios 2020-21 Through 2029-30

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Introduction

In this report production projection scenarios for Florida round oranges and red grapefruit are provided for the 2020-21 through 2029-30 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 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 the actual

[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.
[2] The complete disaggregated regional data was not provided.

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 10-11, 2017 just as the 2017-18 Florida citrus season was about to begin. The timing of the hurricane served to disrupt efforts to forecast the size of the crop for the 2017-18 season, and the resulting fruit drop rates negatively impacted fruit yields. Trees recovered remarkably well and the current estimate for the 2018-19 season is 71.4 million boxes for round oranges – a figure slightly higher that the crop produced in 2016-17. Historically, the production trends analysis does not provide a production forecast for the next season. The first official forecast for the 2019-20 season will be made in October 2019, 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 uneconomic. 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 as more is learned about the disease. The 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. There are a number of short-term solutions including heat treatment and broadening the establishment of Citrus Health Management Areas

[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 .

(CHMAs)[4] and could offer some relief from the deleterious effects of HLB. Longer-term solutions included several initiatives to replant the commercial citrus tree inventory.

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, reduced per tree yields, and, consequently, reduced crop size. The 2018-19 orange crop, currently estimated to be 71.4 million boxes, is substantially smaller than that realized 10 years ago when production for the 2008-09 season was 162.5 million boxes. The red grapefruit crop declined by nearly 80 percent over the same time frame from 21.7 million boxes in the 2008-09 season to 3.74 million boxes in the 2018-19 season.

2018 Commercial Citrus Inventory Overview

The September 2018 *Commercial Citrus Inventory* suggests that Florida's total citrus acreage has continued a downward trend with a decrease of 1.7% from 454,973 acres in 2017 to 447,012 acres in 2018 (Table 1). The decline in commercial acreage has occurred incrementally since 1996 when Florida commercial acreage peaked at 857.7 million acres. Over the last decade total commercial acreage declined by 130,000 acres. Similarly, the number of citrus trees decreased by 1.2% from 55.6 million in 2017 to 54.9 million in 2014. The rate of decline for commercial acreage outpaced the rate of decline for the commercial tree inventory. Tree density has increased from an average of 136.7 trees per acre in 2016 to 140.2 trees per acre in 2018. 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 57.02 million trees in 2018 (Table 2). As indicated in

[4] 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.

Table 4, the orange tree population is relatively mature with nearly 60% of the tree population being age of 14 years or older although this proportion has declined 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 acres lost (Figure 1). The reversal of ever declining tree numbers is significant event as declining tree numbers has been a significant factor in the over decline in Florida orange production over the past 10 years.

The USDA/NASS commercial citrus inventory indicates that the population of bearing and non-bearing grapefruit trees was 3,597,900 trees in 2018, of which approximately 2.9 million trees are red grapefruit. As indicated in Table 5, the grapefruit tree population is highly 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.

Both the orange production and red grapefruit projections are made using the same methodology that has been used by the Florida Department of Citrus for the past 45 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 2018-19 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 as reported by USDA/NASS are shown in Table 8. Average tree yields by tree age by variety are illustrated in Figures 5 and 6.

Planting Assumptions

Production projections are dependent upon assumed future acreage-planting rates. In past reports, citrus prices have been important factors in projecting planting levels, but recently the risk of 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% tree replacement for every tree lost to production since the 2000-01 season with exception of last season. 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 2017-18. The replacement rate is the difference in the loss rate and the replanting rate. 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% for the commercial tree inventory the first time during the 2017-18 season when the rate was 3.4% compared to the loss rate of a 1.5%. The commercial acreage rate remained just below a 100% replacement rate, indicative of the higher tree densities with recent replanting efforts.

Three planting scenarios are considered in this report. The first scenario assumes the planting level will be 75% 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.

In the case of red grapefruit, the tree planting assumptions analyzed are 50%, 100%, and 150% of the replacement. A wider spread of planting assumptions is considered given the faster contraction of the red grapefruit bearing area.

Production Projections

Orange production projections from the FDOC model are shown in Tables 10. Under the assumption of 100 percent replant of lost trees, round orange production is expected to decline modestly from 69 million boxes in 2020-21 67.3 million boxes in the 2029-30 season. Under the 75 percent replant assumption, production to decline from approximately 69 million boxes in the 2020-21 season to 63.7 million boxes in the 2029-30 season. Under the 125 percent

replant assumption, production increases from 69 million boxes in 2020-21 to nearly 71 million boxes by 2029-30.

Red grapefruit production projections from the FDOC model are shown in Table 11. Under the assumption of 100 percent replant of lost trees, red grapefruit production is expected to decline slightly from 3.6 million boxes in 2020-21 to 3.25 million boxes in 2029-2030. Under the 50% replant assumption projected production declines from 3.6 million boxes in 2020-21 to just under 2.8 million boxes in 2029-30. Under the 150% replant assumption, production remains relatively flat fluctuating from 3.6 million boxes in 2020-21, declining slightly to just under 3.5 million boxes then increasing to 3.7 million boxes in 2029-30.

Conclusions

The 2019 Florida Citrus Tree inventory[5] provided the baseline for the projections in this report. Three different replant assumption were used to make production projections for both Florida round oranges and red grapefruit. The FDOC model suggests that Florida orange production is expected to decline modestly over the next ten years under constant yields and recent rates of tree loss and new plantings. A similar forecast is presented for red grapefruit.

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 increased economic impact can be realized with reduced tree mortality, improved per tree yields, new tree plantings, and modest market growth.

[5] Again, the authors thank the Florida Agricultural Statistics Service (USDA/NASS) for making this data available.

Reduced mortality involves sustained efforts to control the Asiatic citrus psyllid; the application of current/future research to maintain tree health, and HLB resistance. As new measures are being developed to at least mute the impact of HLB, 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. Market growth will depend on effective marketing programs by the FDOC and the brands to maintain and grow the market for Florida citrus.

FIGURES

Figure 1. Replacement rate for Florida round orange trees and acreage for season 1993-94 through 2017-18.

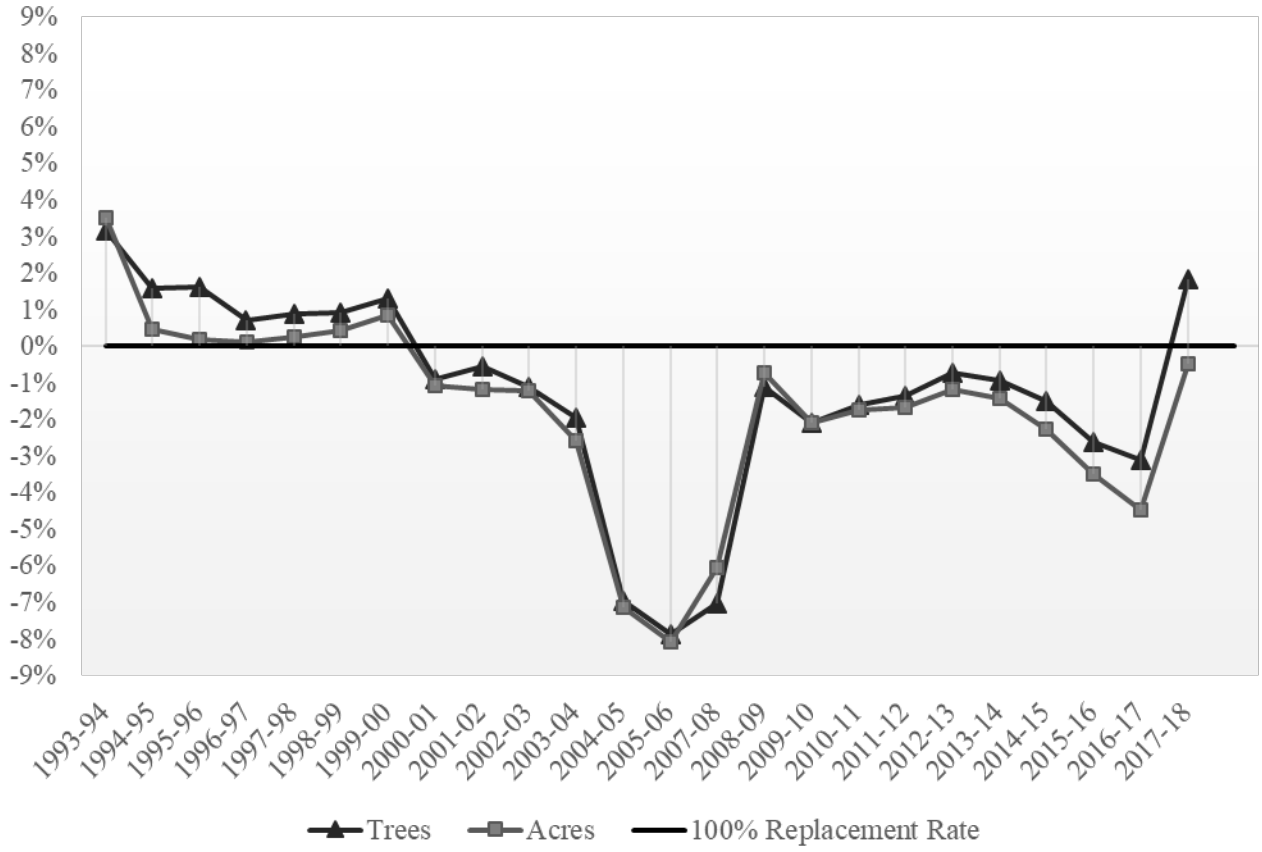


Figure 2. Replacement rate for Florida grapefruit trees and acreage for season 1993-94 through 2017-18.

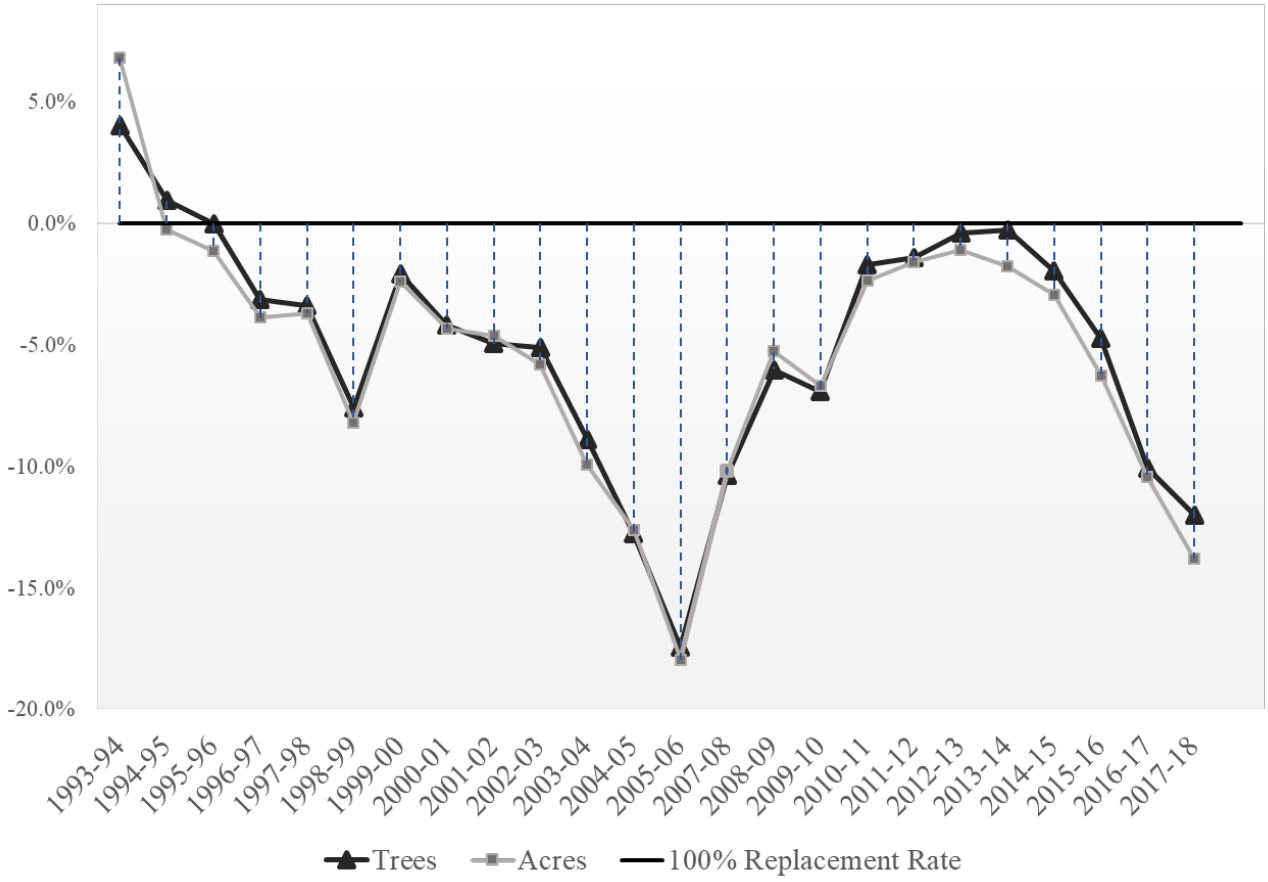


Figure 3.Historical Early-Mid Orange Tree Density, by Age of Tree.

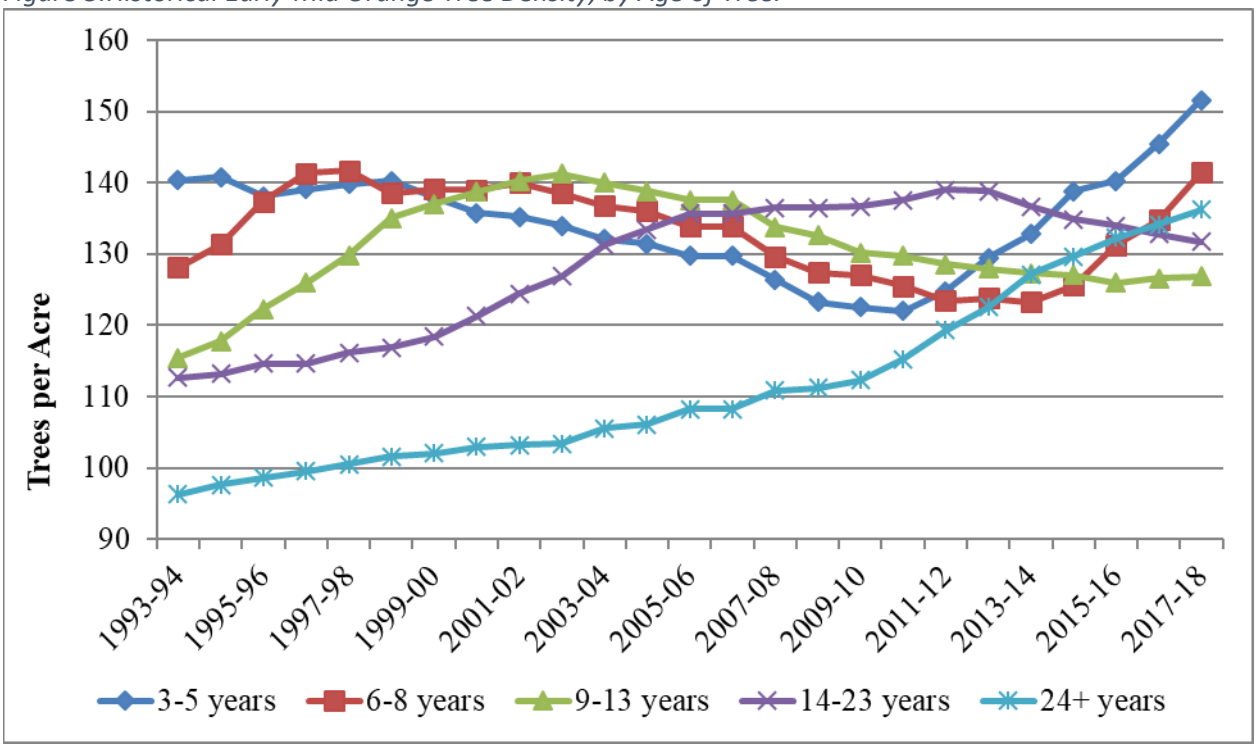


Figure 4. Historical Valencia Orange Tree Density, by Age of Tree

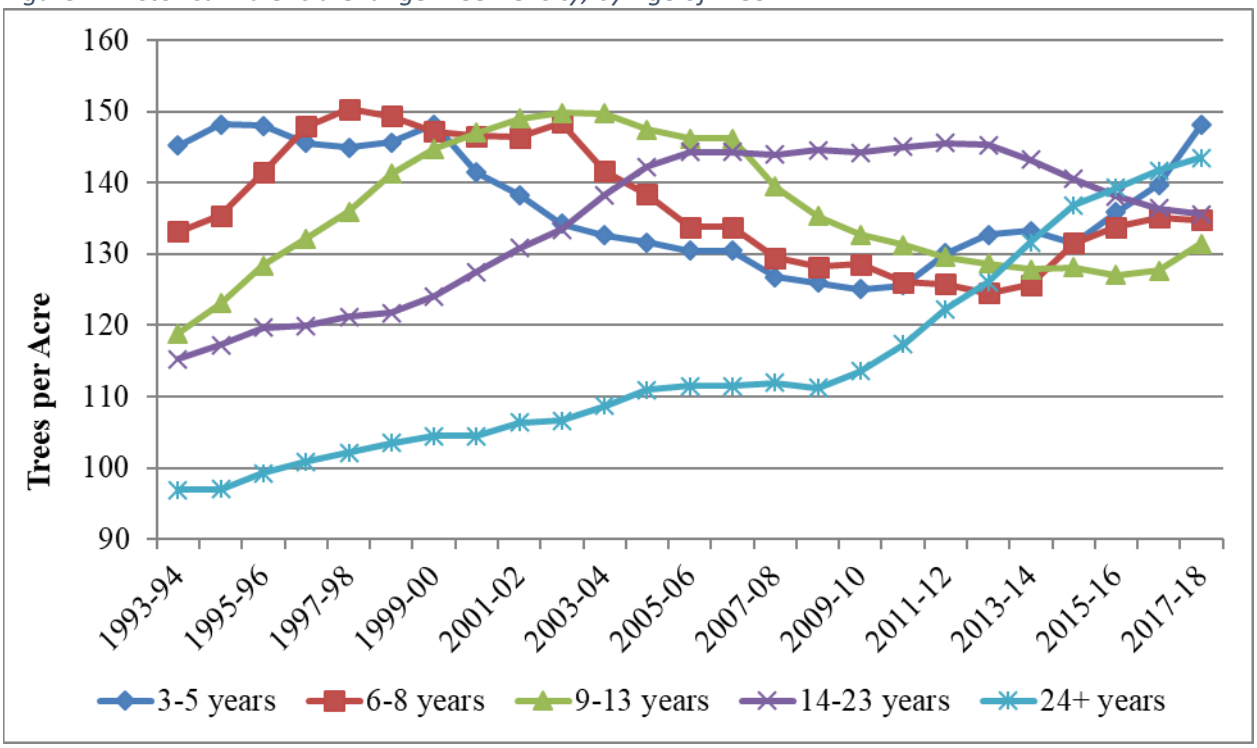


Figure 5. Historical Early-Mid Orange Tree Yields, by Age of Tree.

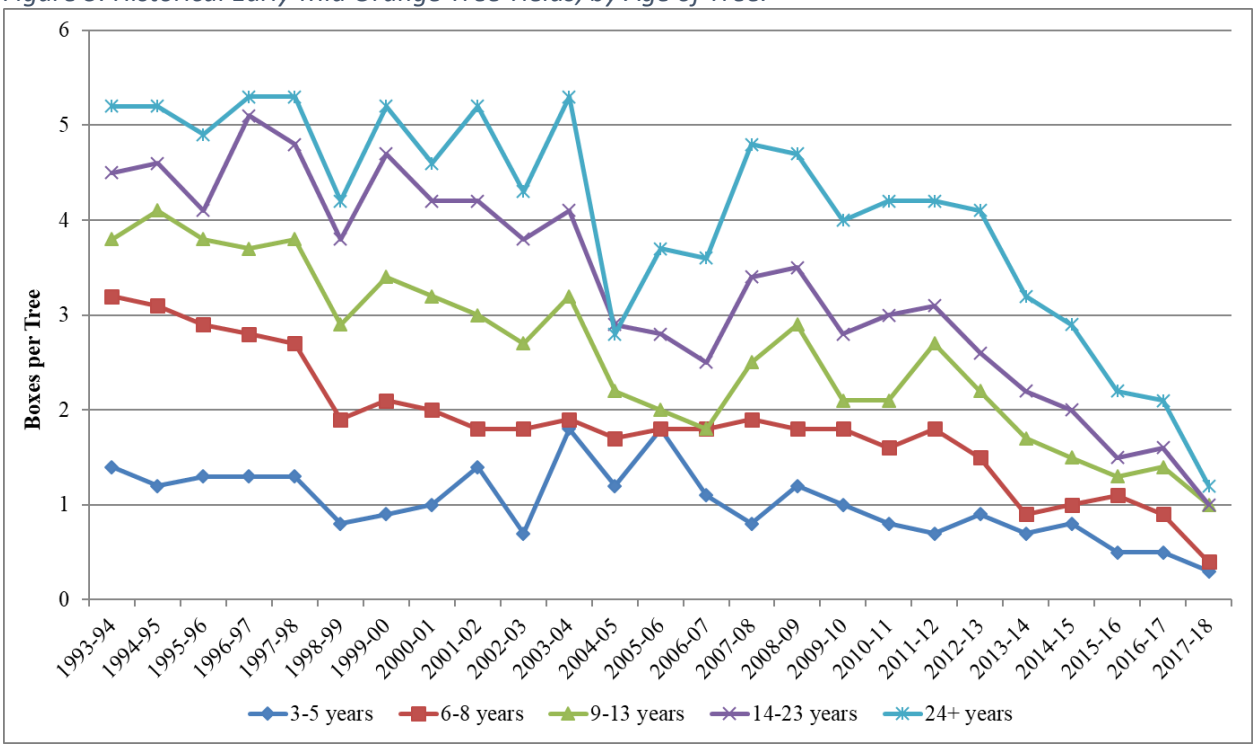


Figure 6. Historical Valencia Orange Tree Yields, by Age of Tree.

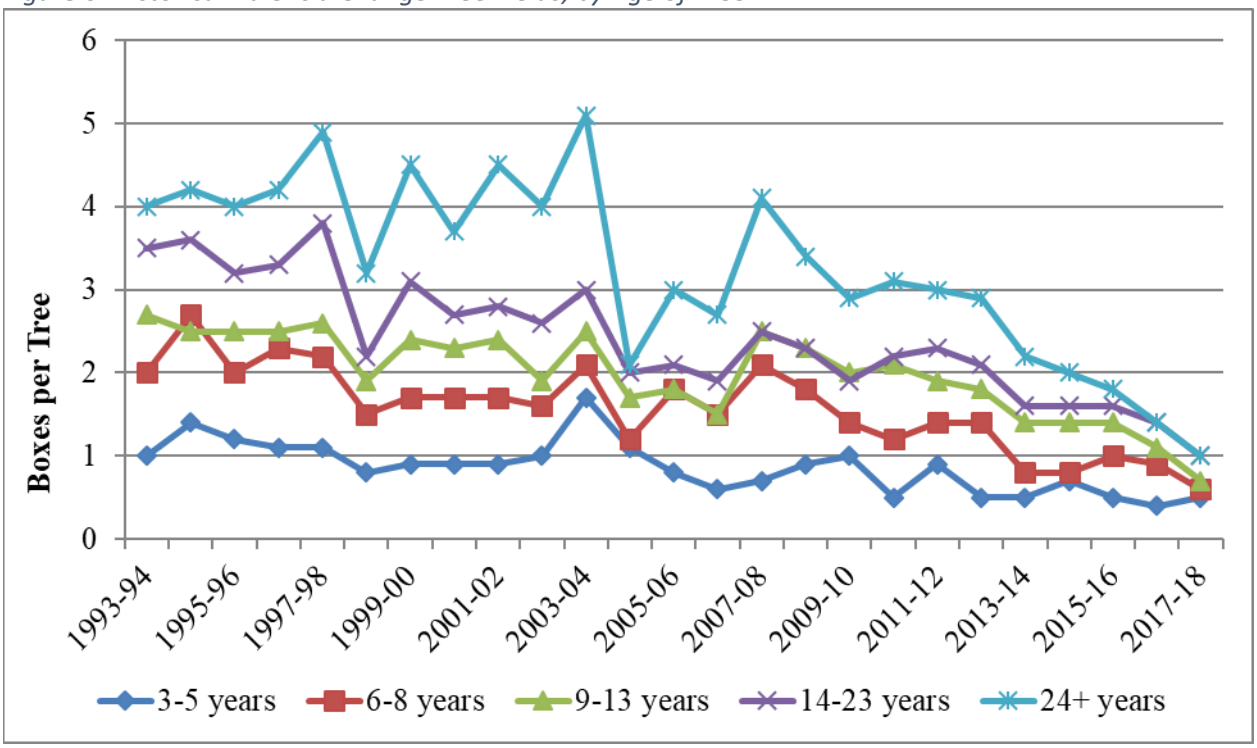


Figure 7. Historical Early-Mid Orange Acreage Yields, by Age of Tree.

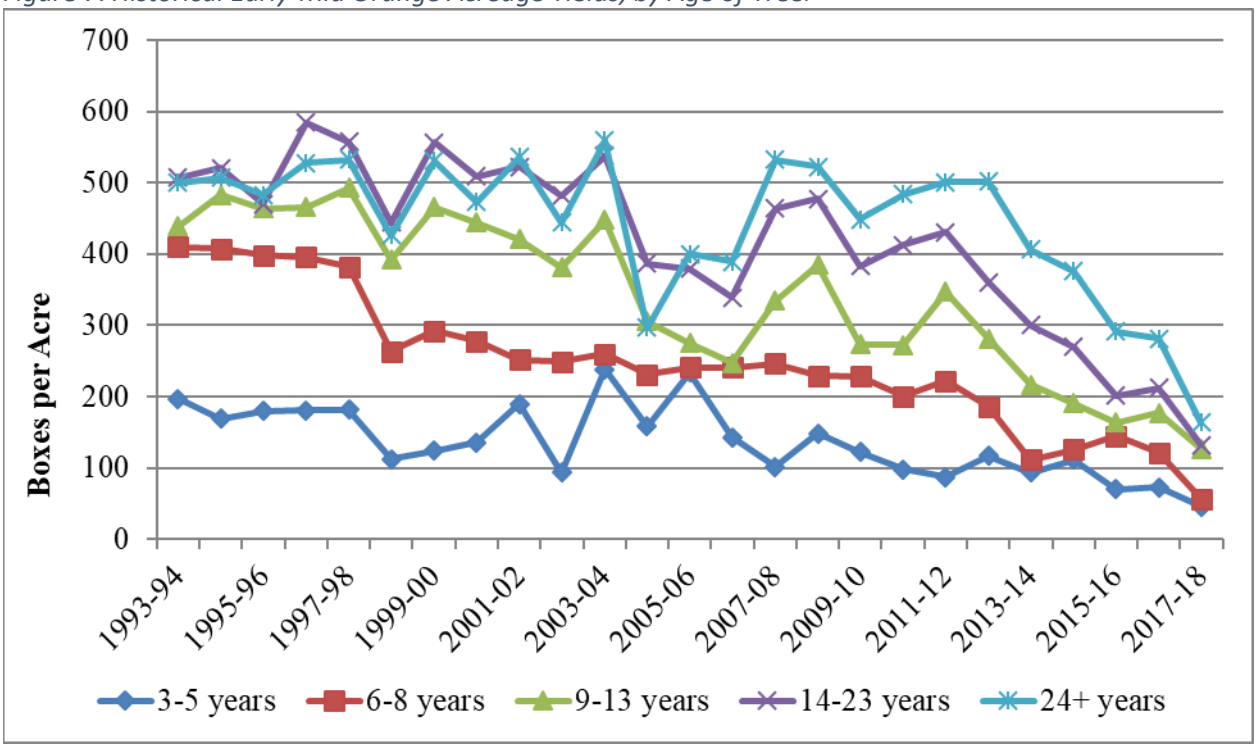


Figure 8. Historical Valencia Orange Acreage Yields, by Age of Tree

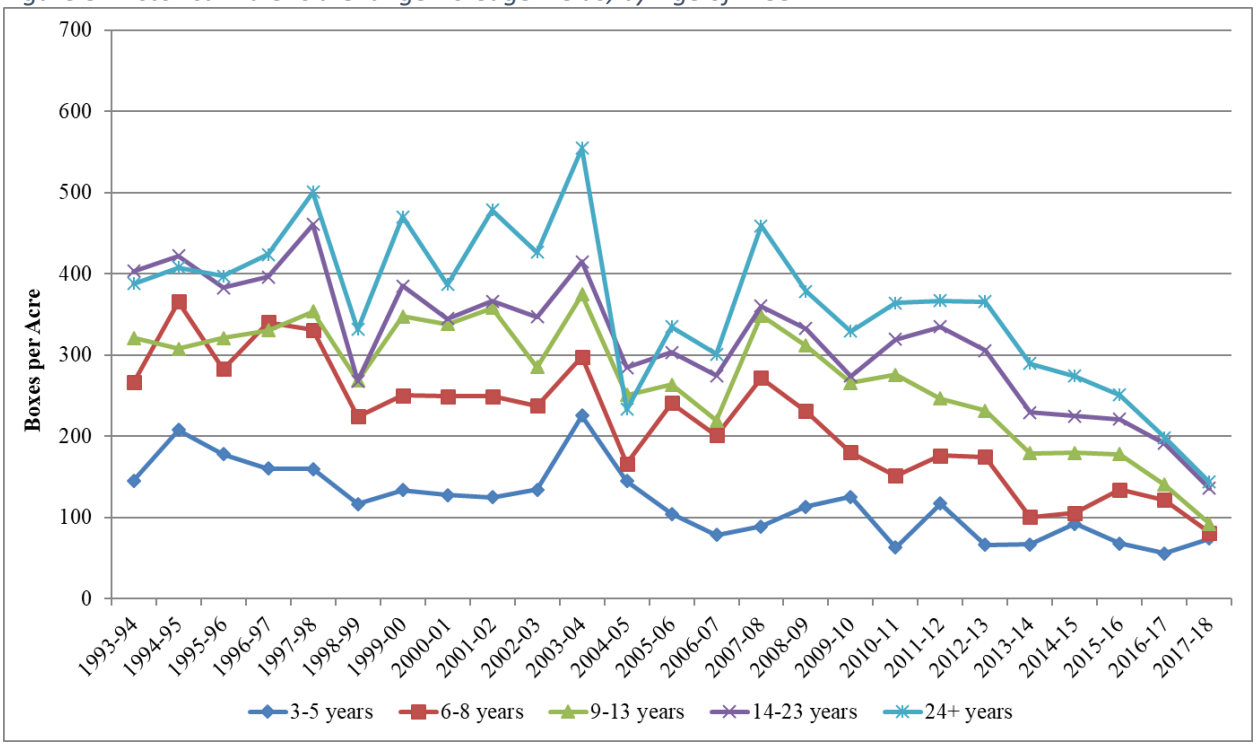


Figure 9. Historical Red Grapefruit Tree Density, by Age of Tree.

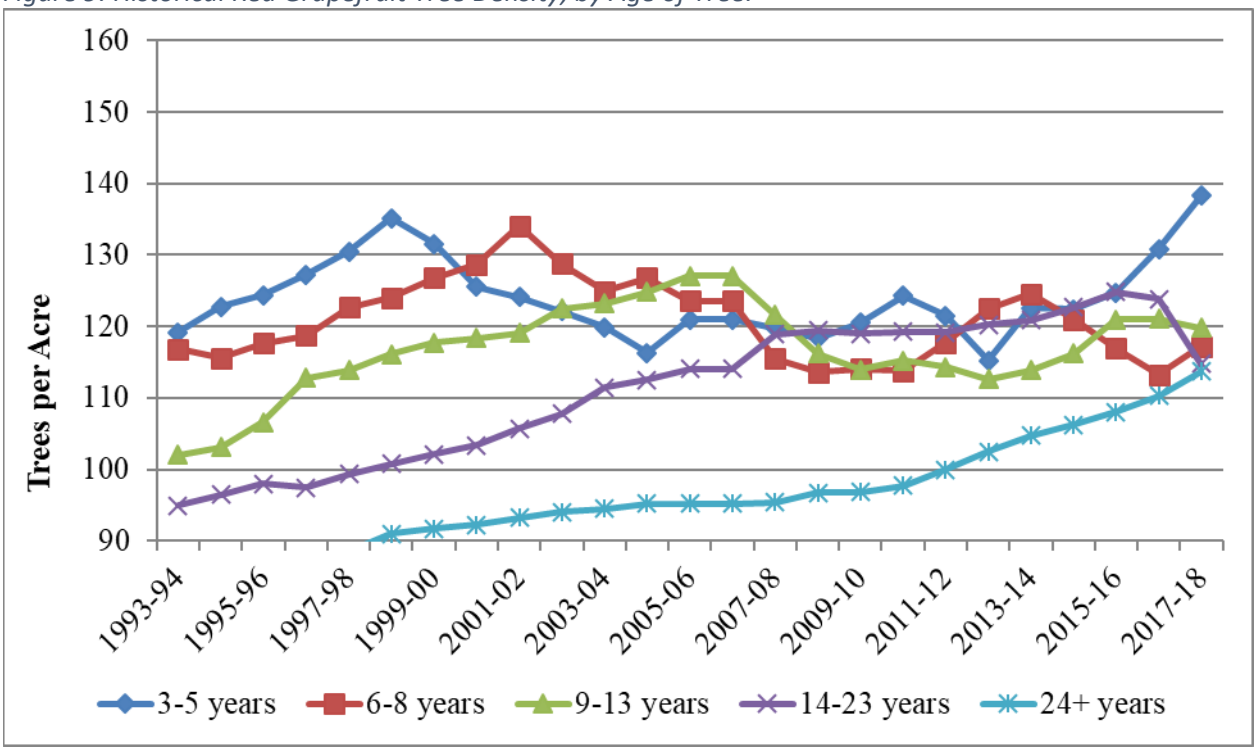


Figure 10. Historical White Grapefruit Tree Density, by Age of Tree.

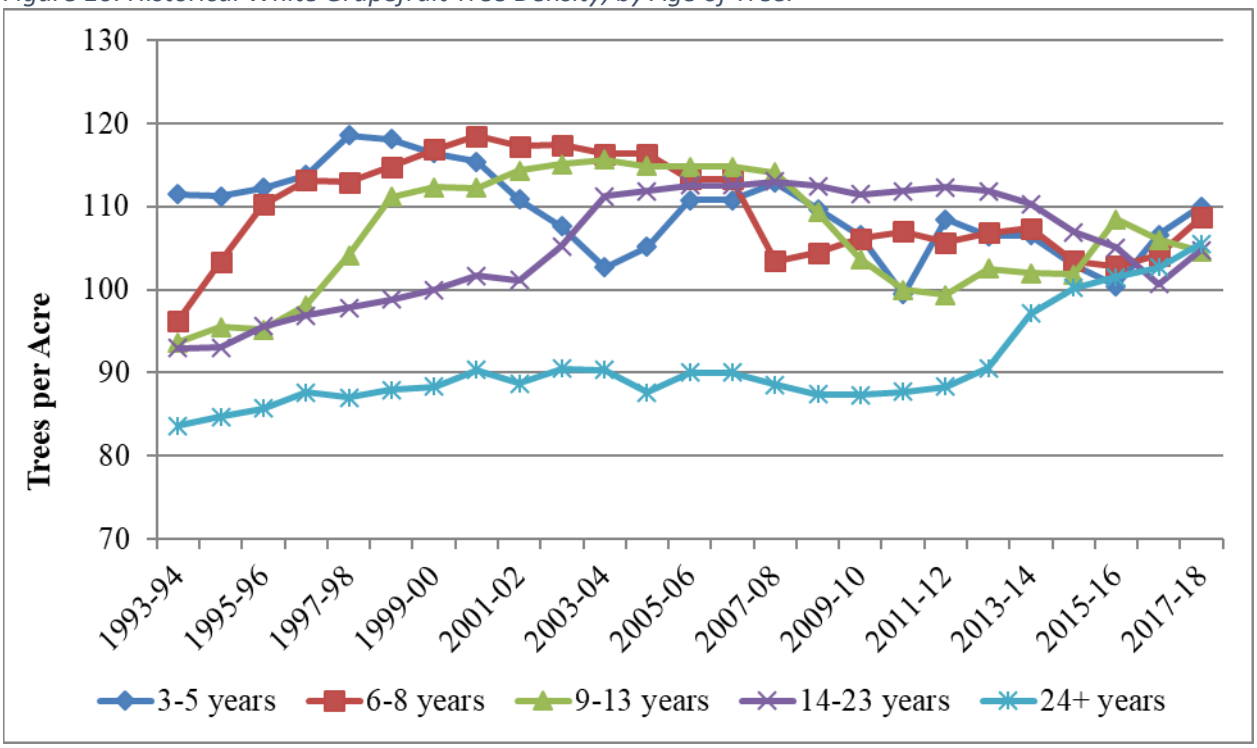


Figure 11. Historical Red Grapefruit Tree Yields, by Age of Tree.

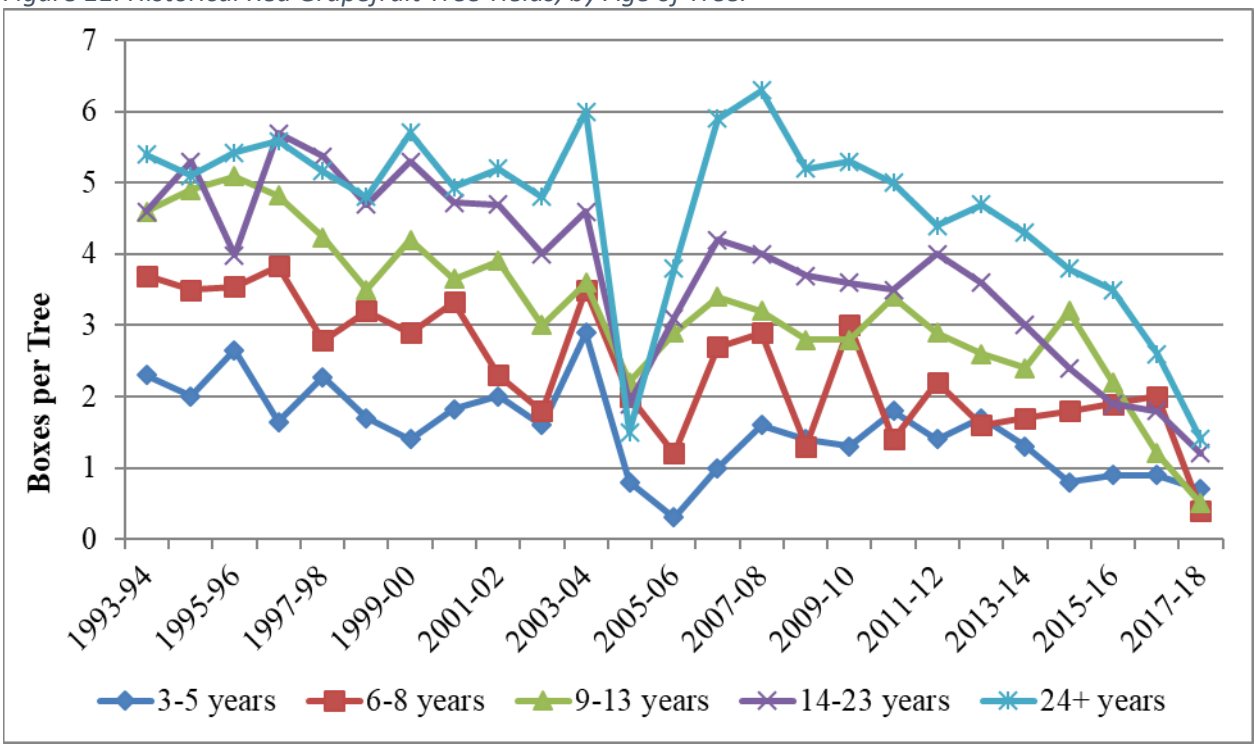


Figure 12. Historical White Grapefruit Tree Yields, by Age of Tree.

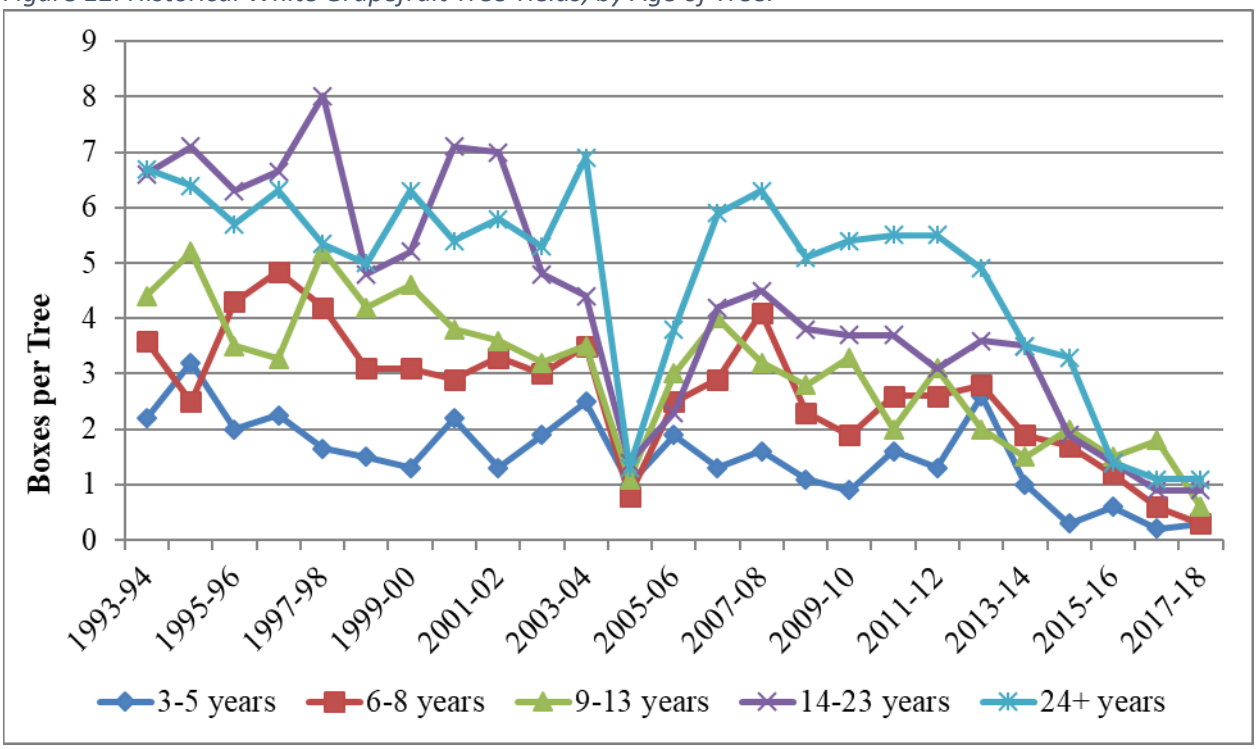


Figure 13. Historical Red Grapefruit Acreage Yields, by Age of Tree.

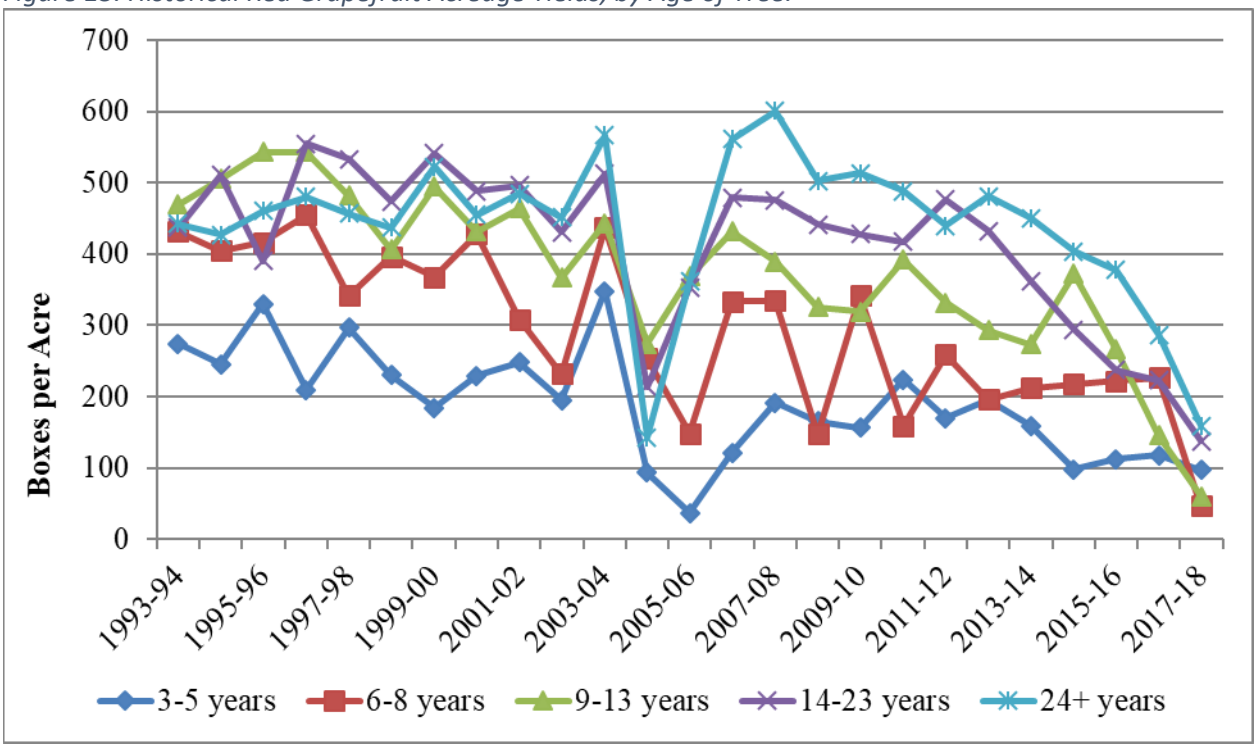
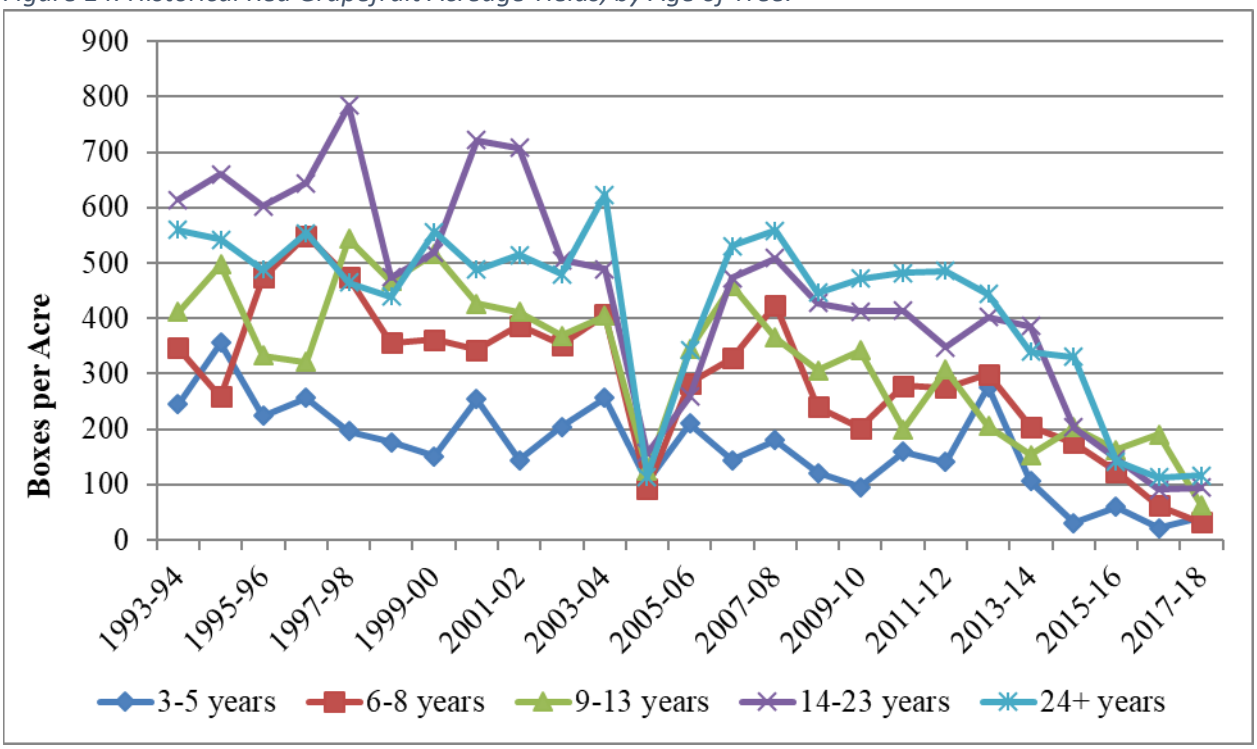


Figure 14. Historical Red Grapefruit Acreage Yields, by Age of Tree.



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

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

[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

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 - - - -	
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	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

[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 - - - - -	
1980	8.9	10.5	10.7	21.6	15.8	32.5	10,768.7	9,586.2
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

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

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Table 6. Annual citrus planting by variety.

Variety	Annual Plantings[a] 1000 Trees					
	2012	2013	2014	2015	2016	2017
ORANGES						
Early & Midseason	320.7	580.9	481.6	440.9	534.6	345.5
Late	422.1	499.0	564.8	603.0	771.6	1,139.9
Unidentified[b]	232.4	445.1	587.3	285.3	504.7	391.1
TOTAL	975.2	1525.0	1633.7	1329.2	1810.9	1876.5
GRAPEFRUIT						
White Seedless	2.3	0.2	3.5	0.6	1.4	1.8
Red Seedless	99.8	55.3	71.4	53.9	12.5	103.1
Unidentified[b]	15.7	27.7	44.7	4.5	12.6	4.6
TOTAL	117.8	83.2	119.6	59.0	26.5	109.5

[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 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											
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[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

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

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

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

Table 9. Projected round orange production under various Replant Rates, 2020-21 through 2029-30 Seasons.

	75% Replant Rate			100% Replant Rate			125% Replant Rate		
	Baseline Production – 72 million boxes								
	---------- thousands 1-3/5 bushel boxes ----------								
Season	E-M	Valencia	Total	E-M	Valencia	Total	E-M	Valencia	Total
2020-21	29,990	39,220	69,210	29,990	39,220	69,210	29,990	39,220	69,210
2021-22	29,585	38,853	68,438	29,585	38,853	68,438	29,585	38,853	68,438
2022-23	29,180	38,535	67,715	29,254	38,606	67,860	29,328	38,678	68,005
2023-24	28,787	38,232	67,020	28,992	38,442	67,433	29,197	38,651	67,848
2024-25	28,402	37,920	66,322	28,791	38,330	67,120	29,181	38,741	67,921
2025-26	28,054	37,582	65,637	28,665	38,251	66,916	29,279	38,923	68,202
2026-27	27,689	37,234	64,922	28,536	38,217	66,754	29,391	39,208	68,599
2027-28	27,306	36,875	64,181	28,406	38,196	66,601	29,519	39,531	69,049
2028-29	26,930	36,479	63,408	28,297	38,158	66,455	29,687	39,862	69,550
2029-30	26,546	36,028	62,574	28,196	38,087	66,283	29,881	40,186	70,068

Table 10.Projected Red Grapefruit Production under Varying Replant Rates, 2020-21 through 2029-30 Seasons.

	50% replant	100% replant	150% replant
	Baseline Production – 3.74 million boxes		
Season	---------- thousands 1-3/5 bushel boxes ----------		
2020-21	3,602	3,602	3,602
2021-22	3,503	3,503	3,503
2022-23	3,409	3,438	3,467
2023-24	3,316	3,388	3,460
2024-25	3,223	3,348	3,473
2025-26	3,133	3,316	3,502
2026-27	3,042	3,291	3,545
2027-28	2,954	3,270	3,596
2028-29	2,872	3,258	3,661
2029-30	2,796	3,254	3,738