



United States Department of Agriculture
National Agricultural Statistics Service



2019 California Almond Objective Measurement Report

Cooperating with the California Department of Food and Agriculture

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2019 CALIFORNIA ALMOND FORECAST DOWN 3.5 PERCENT

California's 2019 almond production is forecast at 2.20 billion meat pounds, down 12.0 percent from May's subjective forecast and down 3.5 percent from last year's crop. The forecast is based on 1.17 million bearing acres. Production for the Nonpareil variety is forecast at 880 million meat pounds, down 1.3 percent from last year's deliveries. The Nonpareil variety represents 40 percent of California's total almond production.

The 2019 almond crop experienced unusual weather. Significant rainfall during the bloom hindered pollination. Strong winds were reported to have damaged trees and knocked off some nuts. Instances of rain persisted through April and May, prompting concerns about disease pressure and warranting extra fungal applications. Cooler than average temperatures have continued throughout the growing season and the crop development is about a week behind last year.

The average nut set per tree is 4,667, down 17.8 percent from 2018. The Nonpareil average nut set of 4,429 is down 10.1 percent from last year's set of 4,924. The average kernel weight for all varieties sampled was 1.54 grams, unchanged from the 2018 average weight. The Nonpareil average kernel weight was 1.63, down 4.1 percent from last year. A total of 98.7 percent of all nuts sized were sound.

SAMPLING PROCEDURES

To determine tree set, nuts are counted along a path within a randomly selected tree. Work begins at the trunk and progresses to the end of the terminal branch. Using a random number table, one branch is selected at each forking to continue the path. A branch's probability of selection is directly proportional to its cross-sectional area. This methodology is

used because of its statistical efficiency. The method also makes it possible to end up at any one of the tree's numerous terminal branches.

Since the selected path has a probability of selection associated with it, this probability is used to expand nut counts arriving at an estimated set for the entire tree.

Along intermediate stages (i.e., the bearing surface between forkings), every fifth nut is picked. All nuts on the terminal branch are picked. These nuts are used to determine size and weight measurements.

FIELD SAMPLING ACTIVITIES

The survey began May 30 and sampling was completed by June 27. There were 1,634 trees sampled for the 2019 survey in 817 orchards. Additional orchards were not sampled for one of the following reasons:

- 1) Orchard had been sprayed.
- 2) Orchard had been recently irrigated and was wet.
- 3) Orchard had been pulled.
- 4) Grower would not grant permission or could not be contacted.

The Objective Measurement Survey is funded by the Almond Board of California.

DATA RELIABILITY

The 80 percent confidence interval is from 2,050 million meat pounds to 2,350 million meat pounds. This means that the results of our sampling procedures will encompass the true mean 80 percent of the time.

**TABLE 1: JUNE OBJECTIVE MEASUREMENT SURVEY COUNTS; COMPARISON OF NUT ESTIMATES AND ORCHARDS SAMPLED
BY DISTRICT AND VARIETY, 2014-2019**

| District and Variety | 2014 | | 2015 | | 2016 | | 2017 | | 2018 | | 2019 | |
|---|---------------|------------------|---------------|------------------|---------------|------------------|---------------|------------------|---------------|------------------|---------------|------------------|
| | Nuts per tree | Orchards sampled | Nuts per tree | Orchards sampled | Nuts per tree | Orchards sampled | Nuts per tree | Orchards sampled | Nuts per tree | Orchards sampled | Nuts per tree | Orchards sampled |
| ALL DISTRICTS (All Varieties) | 6,646 | 890 | 5,874 | 862 | 6,159 | 873 | 5,714 | 852 | 5,677 | 853 | 4,667 | 817 |
| BY DISTRICTS | | | | | | | | | | | | |
| <u>District I</u> | | | | | | | | | | | | |
| Sacramento Valley | 5,536 | 113 | 6,127 | 119 | 6,114 | 121 | 5,583 | 118 | 5,015 | 117 | 4,401 | 103 |
| <u>District II</u> | | | | | | | | | | | | |
| San Joaquin Valley | 6,802 | 777 | 5,829 | 742 | 6,163 | 752 | 5,735 | 734 | 5,783 | 736 | 4,706 | 714 |
| BY VARIETIES | | | | | | | | | | | | |
| Butte | 7,443 | 114 | 7,034 | 106 | 7,051 | 112 | 6,574 | 97 | 5,989 | 91 | 5,261 | 78 |
| California Types ^{1/} | 6,718 | 291 | 5,737 | 283 | 6,114 | 311 | 5,216 | 306 | 6,354 | 297 | 4,909 | 285 |
| Carmel ^{2/} | 6,962 | 114 | 5,714 | 103 | 5,849 | 105 | 5,456 | 95 | 6,353 | 91 | 4,865 | 83 |
| Monterey ^{2/} | 5,910 | 114 | 5,333 | 119 | 5,739 | 136 | 4,655 | 137 | 5,362 | 138 | 4,426 | 145 |
| Nonpareil | 6,121 | 382 | 5,239 | 382 | 5,583 | 343 | 5,717 | 343 | 4,924 | 333 | 4,429 | 324 |
| Padre | 7,989 | 72 | 9,037 | 66 | 7,788 | 70 | 7,168 | 65 | 6,732 | 63 | 4,928 | 56 |

^{1/} For survey purposes, the California classification includes the following varieties: Aldrich, Ballico, Carmel, Davey, Fritz, Harvey, Le Grand, Mono, Monterey, Norman, Price Cluster, Ruby, Sonora, Tokyo and Yosemite.

^{2/} Carmel and Monterey varieties are also included in California Types.

TABLE 2: WEIGHT, SIZE AND GRADE OF AVERAGE ALMOND SAMPLE, 2014-2019

| District and variety | Kernel weight (grams) | Kernel size (millimeters) | | | Grade (percent of nuts) ^{1/} | | | | | | |
|---|-----------------------|---------------------------|-------|-----------|---------------------------------------|---------|---------------|---------|---------------|---------------|---------------|
| | | Length | Width | Thickness | Edible nuts | | Insect damage | Shrivel | Natural gum | Blank | Other |
| | | | | | Singles | Doubles | | | | | |
| ALL DISTRICTS | | | | | | | | | | | |
| 2014 | 1.45 | 21.42 | 12.69 | 10.06 | 96.3 | 2.4 | ^{2/} | 1.3 | ^{2/} | ^{2/} | ^{2/} |
| 2015 | 1.43 | 21.43 | 12.58 | 9.89 | 96.0 | 2.8 | ^{2/} | 0.9 | 0.1 | 0.1 | ^{2/} |
| 2016 | 1.48 | 22.09 | 12.44 | 9.93 | 95.9 | 2.9 | ^{2/} | 1.1 | ^{2/} | ^{2/} | ^{2/} |
| 2017 | 1.57 | 22.50 | 12.83 | 10.40 | 92.2 | 6.2 | ^{2/} | 1.5 | 0.1 | ^{2/} | ^{2/} |
| 2018 | 1.54 | 21.32 | 12.79 | 10.37 | 90.9 | 7.9 | ^{2/} | 1.0 | ^{2/} | ^{2/} | 0.1 |
| 2019 | 1.54 | 22.89 | 12.86 | 9.93 | 92.7 | 6.0 | ^{2/} | 1.2 | ^{2/} | ^{2/} | ^{2/} |
| BY DISTRICT | | | | | | | | | | | |
| Sacramento Valley ^{3/} | | | | | | | | | | | |
| 2014 | 1.60 | 22.35 | 13.38 | 10.43 | 95.1 | 2.4 | ^{2/} | 2.0 | ^{2/} | ^{2/} | 0.4 |
| 2015 | 1.51 | 21.84 | 13.14 | 9.99 | 95.5 | 2.7 | ^{2/} | 0.3 | 0.6 | 0.7 | 0.2 |
| 2016 | 1.51 | 22.67 | 13.19 | 10.02 | 97.2 | 1.2 | ^{2/} | 1.4 | ^{2/} | ^{2/} | 0.1 |
| 2017 | 1.69 | 23.85 | 13.59 | 10.46 | 88.3 | 9.1 | ^{2/} | 2.3 | 0.3 | ^{2/} | ^{2/} |
| 2018 | 1.61 | 20.91 | 13.26 | 10.45 | 91.6 | 7.4 | ^{2/} | 0.8 | ^{2/} | ^{2/} | 0.2 |
| 2019 | 1.56 | 23.44 | 13.42 | 9.70 | 89.8 | 8.8 | ^{2/} | 1.4 | ^{2/} | ^{2/} | ^{2/} |
| San Joaquin Valley ^{4/} | | | | | | | | | | | |
| 2014 | 1.43 | 21.31 | 12.61 | 10.01 | 96.4 | 2.4 | ^{2/} | 1.2 | ^{2/} | ^{2/} | ^{2/} |
| 2015 | 1.41 | 21.37 | 12.48 | 9.87 | 96.1 | 2.9 | ^{2/} | 1.0 | 0.1 | ^{2/} | ^{2/} |
| 2016 | 1.48 | 22.00 | 12.32 | 9.91 | 95.7 | 3.1 | ^{2/} | 1.1 | 0.1 | ^{2/} | ^{2/} |
| 2017 | 1.55 | 22.29 | 12.71 | 10.39 | 92.8 | 5.7 | ^{2/} | 1.4 | 0.1 | ^{2/} | ^{2/} |
| 2018 | 1.53 | 21.38 | 12.73 | 10.36 | 90.8 | 8.0 | ^{2/} | 1.0 | ^{2/} | ^{2/} | 0.1 |
| 2019 | 1.54 | 22.81 | 12.78 | 9.96 | 93.1 | 5.6 | ^{2/} | 1.2 | ^{2/} | ^{2/} | ^{2/} |
| BY VARIETY | | | | | | | | | | | |
| Butte | | | | | | | | | | | |
| 2014 | 1.20 | 18.46 | 12.04 | 10.01 | 96.7 | 1.8 | ^{2/} | 1.3 | ^{2/} | ^{2/} | 0.1 |
| 2015 | 1.14 | 18.19 | 11.75 | 9.76 | 95.2 | 3.4 | ^{2/} | 0.9 | 0.3 | 0.3 | ^{2/} |
| 2016 | 1.20 | 18.93 | 11.76 | 9.84 | 96.1 | 2.6 | ^{2/} | 1.2 | 0.1 | ^{2/} | ^{2/} |
| 2017 | 1.25 | 19.14 | 11.89 | 10.43 | 89.3 | 9.6 | ^{2/} | 0.9 | 0.2 | ^{2/} | ^{2/} |
| 2018 | 1.19 | 17.97 | 11.97 | 10.09 | 92.9 | 6.0 | ^{2/} | 0.9 | ^{2/} | ^{2/} | 0.2 |
| 2019 | 1.18 | 19.46 | 11.89 | 9.64 | 92.9 | 6.0 | ^{2/} | 1.1 | ^{2/} | ^{2/} | ^{2/} |
| California Types ^{5/} | | | | | | | | | | | |
| 2014 | 1.45 | 22.14 | 12.20 | 10.00 | 95.5 | 3.2 | ^{2/} | 1.2 | ^{2/} | ^{2/} | ^{2/} |
| 2015 | 1.46 | 22.60 | 12.28 | 9.84 | 94.9 | 3.7 | ^{2/} | 1.1 | 0.1 | ^{2/} | 0.1 |
| 2016 | 1.51 | 23.09 | 12.08 | 9.86 | 94.6 | 4.3 | ^{2/} | 1.0 | ^{2/} | ^{2/} | ^{2/} |
| 2017 | 1.62 | 23.51 | 12.52 | 10.43 | 89.3 | 9.3 | ^{2/} | 1.2 | 0.3 | ^{2/} | ^{2/} |
| 2018 | 1.56 | 21.97 | 12.40 | 10.47 | 86.9 | 12.2 | ^{2/} | 0.7 | ^{2/} | ^{2/} | ^{2/} |
| 2019 | 1.58 | 23.71 | 12.54 | 10.06 | 89.0 | 9.9 | ^{2/} | 1.0 | ^{2/} | ^{2/} | ^{2/} |
| Carmel ^{6/} | | | | | | | | | | | |
| 2014 | 1.48 | 22.21 | 12.15 | 10.04 | 95.5 | 3.2 | ^{2/} | 1.3 | ^{2/} | ^{2/} | ^{2/} |
| 2015 | 1.45 | 22.70 | 12.10 | 9.82 | 95.0 | 3.7 | ^{2/} | 1.0 | 0.1 | 0.1 | 0.1 |
| 2016 | 1.51 | 23.08 | 12.07 | 9.86 | 96.0 | 3.0 | ^{2/} | 1.0 | ^{2/} | ^{2/} | ^{2/} |
| 2017 | 1.60 | 23.72 | 12.31 | 10.38 | 89.7 | 9.2 | ^{2/} | 1.0 | 0.1 | ^{2/} | ^{2/} |
| 2018 | 1.61 | 22.43 | 12.52 | 10.57 | 87.0 | 12.6 | ^{2/} | 0.4 | ^{2/} | ^{2/} | ^{2/} |
| 2019 | 1.60 | 23.99 | 12.43 | 10.02 | 89.8 | 9.0 | ^{2/} | 1.1 | ^{2/} | ^{2/} | ^{2/} |
| Monterey ^{6/} | | | | | | | | | | | |
| 2014 | 1.54 | 23.26 | 12.51 | 10.01 | 94.8 | 3.9 | ^{2/} | 1.1 | ^{2/} | ^{2/} | 0.1 |
| 2015 | 1.59 | 23.75 | 12.67 | 9.91 | 94.3 | 4.5 | ^{2/} | 1.0 | 0.1 | ^{2/} | ^{2/} |
| 2016 | 1.69 | 24.68 | 12.49 | 10.03 | 92.1 | 6.9 | ^{2/} | 0.8 | 0.1 | ^{2/} | ^{2/} |
| 2017 | 1.83 | 25.20 | 13.06 | 10.64 | 85.4 | 12.8 | ^{2/} | 1.3 | 0.5 | ^{2/} | ^{2/} |
| 2018 | 1.76 | 23.42 | 12.93 | 10.74 | 83.0 | 16.2 | ^{2/} | 0.8 | ^{2/} | ^{2/} | ^{2/} |
| 2019 | 1.69 | 24.77 | 12.84 | 10.15 | 86.3 | 12.7 | ^{2/} | 0.8 | ^{2/} | ^{2/} | ^{2/} |
| Nonpareil | | | | | | | | | | | |
| 2014 | 1.60 | 22.57 | 13.51 | 10.07 | 96.8 | 2.0 | ^{2/} | 1.1 | ^{2/} | ^{2/} | ^{2/} |
| 2015 | 1.61 | 22.76 | 13.46 | 9.96 | 96.8 | 2.2 | ^{2/} | 0.7 | 0.2 | 0.1 | ^{2/} |
| 2016 | 1.65 | 23.36 | 13.34 | 10.01 | 97.1 | 1.7 | ^{2/} | 1.1 | ^{2/} | ^{2/} | ^{2/} |
| 2017 | 1.70 | 23.50 | 13.60 | 10.32 | 95.1 | 3.0 | ^{2/} | 1.8 | 0.1 | ^{2/} | ^{2/} |
| 2018 | 1.70 | 22.36 | 13.66 | 10.37 | 94.0 | 4.8 | ^{2/} | 1.2 | ^{2/} | ^{2/} | ^{2/} |
| 2019 | 1.63 | 23.46 | 13.48 | 9.85 | 95.4 | 3.2 | ^{2/} | 1.4 | ^{2/} | ^{2/} | ^{2/} |
| Padre | | | | | | | | | | | |
| 2014 | 1.22 | 18.48 | 11.96 | 10.17 | 97.0 | 1.2 | ^{2/} | 1.8 | ^{2/} | ^{2/} | ^{2/} |
| 2015 | 1.07 | 17.71 | 11.41 | 9.85 | 97.6 | 1.5 | ^{2/} | 0.8 | ^{2/} | ^{2/} | ^{2/} |
| 2016 | 1.14 | 18.47 | 11.42 | 9.86 | 96.7 | 1.7 | ^{2/} | 1.4 | 0.1 | 0.1 | ^{2/} |
| 2017 | 1.26 | 19.13 | 11.85 | 10.51 | 94.0 | 4.2 | ^{2/} | 1.7 | ^{2/} | ^{2/} | ^{2/} |
| 2018 | 1.15 | 17.54 | 11.72 | 10.16 | 94.0 | 4.4 | ^{2/} | 1.2 | ^{2/} | ^{2/} | 0.4 |
| 2019 | 1.23 | 19.42 | 11.97 | 9.85 | 97.2 | 2.0 | ^{2/} | 0.6 | 0.1 | ^{2/} | ^{2/} |

^{1/} Percentages may not add to 100 due to rounding.

^{2/} Not shown if less than 0.07 percent.

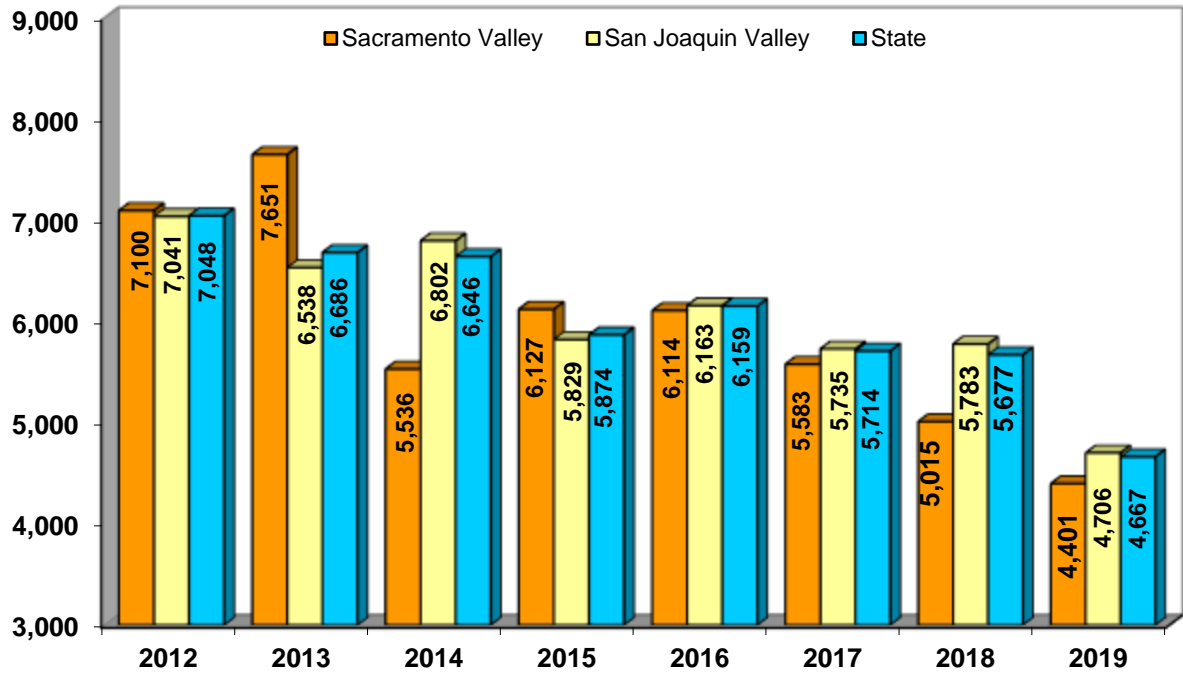
^{3/} Sacramento Valley includes these counties: Butte, Colusa, Glenn, Solano, Sutter, Tehama, Yolo and Yuba.

^{4/} San Joaquin Valley includes these counties: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare.

^{5/} For survey purposes, the California classification includes the following varieties: Aldrich, Ballico, Carmel, Davey, Fritz, Harvey, Le Grand, Mono, Monterey, Norman, Price Cluster, Ruby, Sonora, Tokyo and Yosemite.

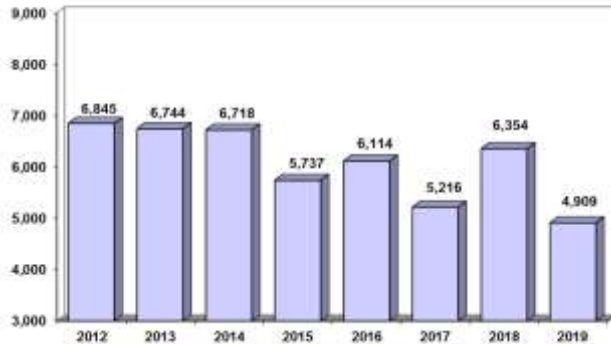
^{6/} Carmel and Monterey varieties are also included in California Types.

ALMONDS Nuts per Tree, by District

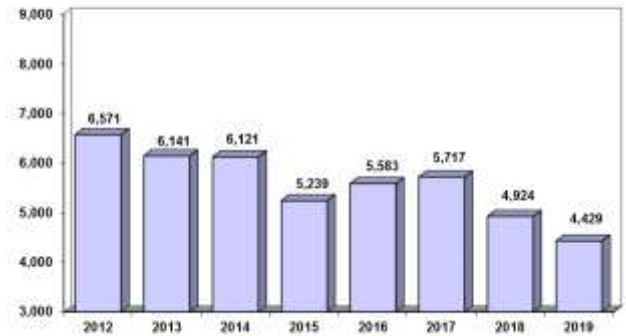


ALMONDS BY VARIETY

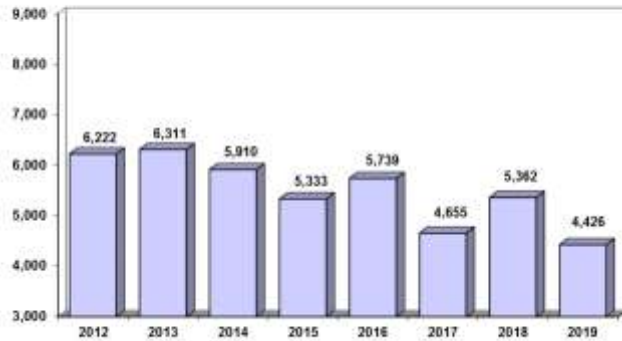
CALIFORNIA TYPE
Nuts per Tree



NONPAREIL TYPE
Nuts per Tree



MONTEREY TYPE
Nuts per Tree



BUTTE TYPE
Nuts per Tree

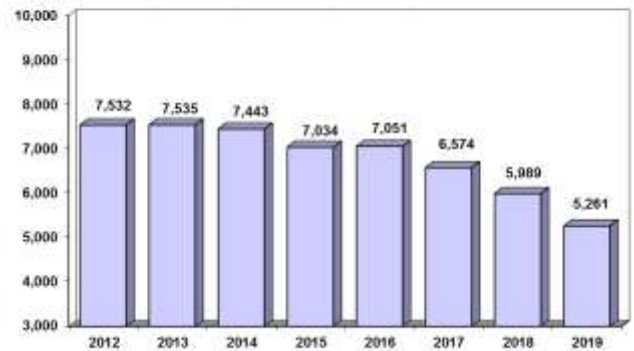


TABLE 3: CALIFORNIA ALMOND ACREAGE, PRODUCTION AND TREES PER ACRE, 1986-2019

| Year | Bearing acres ^{1/} | Trees per acre | Total Meat Production | | | Price per lb. | Value of production |
|-----------------------|-----------------------------|----------------|---------------------------|--------------|---------------|---------------|---------------------|
| | | | Metric Tons ^{2/} | Million lbs. | Lbs. per acre | dollars | 1,000 dollars |
| 1986 | 416,000 | 84.5 | 113,000 | 250 | 601 | 1.92 | 461,568 |
| 1987 | 417,000 | 84.0 | 299,000 | 660 | 1,580 | 1.00 | 648,000 |
| 1988 | 419,000 | 86.3 | 268,000 | 590 | 1,410 | 1.05 | 600,075 |
| 1989 | 411,000 | 87.3 | 222,000 | 490 | 1,190 | 1.02 | 480,930 |
| 1990 | 411,000 | 88.4 | 299,000 | 660 | 1,610 | 0.93 | 597,990 |
| 1991 | 405,000 | 89.6 | 222,000 | 490 | 1,210 | 1.19 | 564,179 |
| 1992 | 401,000 | 90.5 | 249,000 | 548 | 1,370 | 1.30 | 691,340 |
| 1993 | 413,000 | 92.0 | 222,000 | 490 | 1,190 | 1.94 | 930,618 |
| 1994 | 433,000 | 92.6 | 333,000 | 735 | 1,700 | 1.34 | 965,202 |
| 1995 | 418,000 | 93.7 | 168,000 | 370 | 885 | 2.48 | 880,896 |
| 1996 | 428,000 | 94.4 | 231,000 | 510 | 1,190 | 2.08 | 1,018,368 |
| 1997 | 442,000 | 95.5 | 344,000 | 759 | 1,720 | 1.56 | 1,160,640 |
| 1998 | 460,000 | 96.3 | 236,000 | 520 | 1,130 | 1.41 | 703,590 |
| 1999 | 485,000 | 97.3 | 378,000 | 833 | 1,720 | 0.86 | 687,742 |
| 2000 | 510,000 | 99.0 | 319,000 | 703 | 1,380 | 0.97 | 666,487 |
| 2001 | 530,000 | 101.0 | 376,000 | 830 | 1,570 | 0.91 | 740,012 |
| 2002 | 545,000 | 101.0 | 494,000 | 1,090 | 2,000 | 1.11 | 1,200,687 |
| 2003 | 550,000 | 103.0 | 472,000 | 1,040 | 1,890 | 1.57 | 1,600,144 |
| 2004 | 570,000 | 103.0 | 456,000 | 1,005 | 1,760 | 2.21 | 2,189,005 |
| 2005 | 590,000 | 104.0 | 415,000 | 915 | 1,550 | 2.81 | 2,525,909 |
| 2006 | 610,000 | 105.0 | 508,000 | 1,120 | 1,840 | 2.06 | 2,258,790 |
| 2007 | 640,000 | 105.0 | 630,000 | 1,390 | 2,170 | 1.75 | 2,401,875 |
| 2008 | 710,000 | 107.0 | 739,000 | 1,630 | 2,300 | 1.45 | 2,343,200 |
| 2009 | 750,000 | 108.0 | 640,000 | 1,410 | 1,880 | 1.65 | 2,293,500 |
| 2010 | 770,000 | 108.0 | 744,000 | 1,640 | 2,130 | 1.79 | 2,903,380 |
| 2011 | 800,000 | 111.0 | 921,000 | 2,030 | 2,540 | 1.99 | 4,007,860 |
| 2012 | 820,000 | 112.0 | 857,000 | 1,890 | 2,300 | 2.58 | 4,816,860 |
| 2013 | 880,000 | 112.0 | 912,000 | 2,010 | 2,280 | 3.21 | 6,384,690 |
| 2014 | 930,000 | 114.0 | 848,000 | 1,870 | 2,010 | 4.00 | 7,388,000 |
| 2015 | 950,000 | 114.0 | 862,000 | 1,900 | 2,000 | 3.13 | 5,868,750 |
| 2016 | 970,000 | 116.0 | 971,000 | 2,140 | 2,210 | 2.39 | 5,052,460 |
| 2017 | 1,030,000 | 117.0 | 1,030,000 | 2,270 | 2,200 | 2.53 | 5,603,950 |
| 2018 | 1,090,000 | 119.0 | 1,034,000 | 2,280 | 2,090 | 2.44 | 5,468,040 |
| 2019 ^{3/ 4/} | 1,170,000 | 122.0 | 998,000 | 2,200 | 1,880 | — | — |

^{1/} Bearing acreage is defined as plantings four years and older^{2/} Rounded to nearest thousand, metric ton = 2,204.62 pounds.^{3/} Price and value will be available in the annual Noncitrus Fruits & Nuts publication, released in June 2020.^{4/} Preliminary estimate of bearing acres.

— Not available.