

# Survey

## Super-High-Density Olive Production in California



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This report was prepared by Nicole D. Sturzenberger, with assistance from Dan Flynn and Elizabeth Clow. To access the survey online, go to [www.olivecenter.ucdavis.edu](http://www.olivecenter.ucdavis.edu). Cover photo courtesy of NursTech, Inc.

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## Executive Summary

This survey assesses grower practices in the super-high-density (SHD) olive industry beginning in 1999, when the first SHD olive trees were planted, through 2008, as the industry marks its 10th year in the state. Among the findings, all of which are as of the end of 2008:

- There were 12,138 acres of SHD olive trees planted in California by the end of 2008, with 92 percent of growers reporting that they planted in the four-year period between 2005 and 2008.
- Arbequina is the olive variety most commonly planted in the SHD system, with 78 percent of the SHD acreage.
- The planting density for SHD trees ranges from a low of 453 trees per acre to a high of 908 trees per acre, although 75 percent of all acreage is planted at either 13 feet x 5 feet (670 trees per acre) or 13 feet x 6 feet (553 trees per acre), with a statewide average density of 662 trees per acre.
- Two counties dominate SHD acreage: Glenn County with 4,227 acres (35 percent of the total) and San Joaquin County with 3,713 acres (31 percent of the total).
- Sixty-four percent of the SHD olive growers who responded to the survey rely on well water for their SHD orchards.
- Seventy percent of SHD olive growers that responded to the survey had replaced other crops with SHD olives: 38 percent of growers replaced permanent crops, 32 percent had replaced row crops, 21 percent had replaced dry pasture, 7 percent replaced irrigated pasture, and 2 percent indicated “other.”
- SHD olive growers use drip irrigation nearly exclusively - only one respondent uses micro-spray irrigation.
- Growers who responded to the survey used an average of 21 inches of water per year for their SHD olive trees.
- 2008 was reported as the first year of harvest for 13 percent of respondents with 69 percent of respondents having not harvested as of the fall of 2008.
- For those growers who harvested from their SHD orchards in 2007:
  - The first day of harvest ranged between October 10 and October 29;
  - The median harvest yield from SHD olive trees was four tons per acre; and
  - The median oil yield was 40 gallons of olive oil per ton.
- Sixty-two percent of respondents cited “favorable income potential” as the most important reason they planted SHD olive trees.

The SHD olive sector has achieved impressive growth after 10 years in California, and if the trends of recent years continue, olive oil will be a major California crop in the future.

# Survey: Super-High-Density Olive Production in California

## Introduction

Super-high-density olive trees were first planted in California in 1999. This survey, the first conducted exclusively of the SHD olive industry in California, assesses grower practices as the industry marks its 10th anniversary in the state. This is also the first survey conducted of California olive oil growers since 2004 and assesses industry practices from 1999 to 2008.

## Methodology

The UC Davis Olive Center compiled a list of 69 SHD olive growers identified by California nurseries that sell SHD cultivars Arbequina, Arbosana, and Koroneiki. In late August 2008 we mailed potential respondents a postcard to notify them that we would be sending a survey the following week. We mailed the survey on September 4, 2008 and indicated that the survey applied solely to super-high-density olive plantings of at least 500 trees per acre. We mailed one additional reminder postcard over the next two weeks, and called any potential respondents that had not mailed a survey back to the UC Davis Olive Center by September 19. We called up to four times any potential respondent who had not returned the survey by September 19 and, when necessary, interviewed respondents on the phone to get their answers to the survey questions.

Of the 69 potential respondents, we received 54 completed surveys by January 22, 2008. Of the 15 potential respondents that did not return a survey, seven either had not planted SHD olives or were accounted for in surveys returned by other respondents, and eight persons did not respond.

Thus the final response rate was 54 of 62 possible respondents (87 percent). We then surveyed the nurseries to identify growers and acreage that was missing from our data, calculating that trees sold by nurseries were planted at an average of 650 trees per acre (a density based on the average of the most common tree-spacing dimensions reported by survey respondents). Based on our survey of growers and nurseries, we have a high degree of confidence that the survey provides an accurate accounting of SHD olive acreage in California as of the end of 2008.

We divided growers into three groups based on acreage to allow examination of potential differences among the three groups:

- Large growers: 201 or more acres.
- Medium growers: between 81-200 acres.
- Small growers: 80 acres or less.

We found that the total acreage reported by nurseries exceeded the total acreage reported by growers by 759 acres. We attribute most of the difference to grower replanting, and some to small growers that we may have missed in this survey. All of the data reported in the survey is based on data reported by the grower respondents, except for the data concerning acreage planted by year, by county, and by variety, which is a combination of data reported by growers and nurseries.

## Survey Results

### Acreage

The survey revealed that 12,138 SHD acres were planted in California between 1999 and 2008. Table 1 shows the number of acres of SHD olive trees planted by year as reported by growers and nurseries. Ninety-two percent of the acreage (11,110 acres) was planted from 2005 through 2008. Large growers represented a total of 78 percent of all acreage planted with small growers following at 12 percent and medium growers with 10 percent.

**Table 1: SHD acreage planted by year**

Year	Total acres	Large growers	Medium growers	Small growers
1999	50	50	0	0
2000	200	200	0	0
2001	238	233	0	5
2002	40	0	0	40
2003	36	6	0	30
2004	464	456	0	8
2005	1106	1060	0	46
2006	3491	2938	214	339
2007	2642	1728	566	348
2008	3872	2741	483	646
Total acres	12138	9413	1264	1461
Total (%)	100	78	10	12

### Variety

The survey found that 78 percent of the SHD acreage (9,400 acres) was planted in Arbequina, followed by Arbosana at 16 percent (1,688 acres) and Koroneiki at 6 percent (681 acres). Table 2 displays the percentage of SHD trees planted by variety based on the results reported by growers and nurseries. Arbequina dominates large growers' plantings at 80 percent (7,266 acres) with Arbosana following at 14 percent (1,227 acres) and Koroneiki finishing at 6 percent (574 acres). For medium growers 90 percent of plantings were Arbequina (1,130 acres), eight percent Arbosana (100 acres), and two percent Koroneiki (31 acres). Small growers have 70 percent of their plantings in Arbequina (1,004 acres), followed by 25 percent in Arbosana (361 acres), and five percent in Koroneiki (76 acres).

**Table 2: SHD acres by variety**

	Total acres (%)	Large Growers (%)	Medium Growers (%)	Small Growers (%)
Arbequina	9400 (78)	7266 (80)	1130 (90)	1004 (70)
Arbosana	1687 (16)	1227 (14)	100 (8)	361 (25)
Koroneiki	681 (6)	574 (6)	31 (2)	76 (5)
Total*	11769 (100)	9067 (100)	1261 (100)	1441 (100)

\*Totals may vary slightly due to rounding

### Density

Growers have adopted a number of planting densities, but 75 percent of the acreage reported by growers is planted at either 13 feet x 5 feet or 13 feet x 6 feet.

**Table3: Density of SHD acres**

As shown in Table 3, the density for SHD olive orchards ranges from a low of 453 trees/acre to a high of 908 trees/acre, with an average density of 662 trees/acre. Those density figures do not include orchard roads, harvest staging areas or the like. The most common spacing of the trees was 13 feet x 5 feet (15 respondents), followed by 13 feet x 6 feet (13 respondents) and 12 feet x 5 feet (10 respondents).

For large and medium growers the most common spacings were 13x5 (six large growers and three medium growers) and 13x6 (six large growers and three medium growers). The most common spacing for small growers was 12x5 (eight respondents) followed by 13x5 (six respondents).

Spacing (feet)	Density (trees/acre)	Acres # (%)	Large Growers	Medium Growers	Small Growers
10x5	871	10 (<1)	0	0	1
11x6	660	214 (2)	1	0	0
11x7	565	40 (<1)	0	0	1
11.5x5	757	55 (1)	0	0	1
12x4	908	284 (3)	1	0	2
12x4.5	807	693 (7)	1	0	0
12x5	726	717 (7)	2	0	8
12x6	605	182 (2)	0	1	2
12x8	453	10 (<1)	0	0	1
12.5x5.5	634	30 (<1)	0	0	1
13x5	670	5006 (51)	6	3	6
13x5.5	609	112 (1)	0	1	0
13.5x4.75	679	65 (1)	0	0	1
13x6	558	2323 (24)	6	3	4
Total*	662 avg	9741 (100)	17	8	28

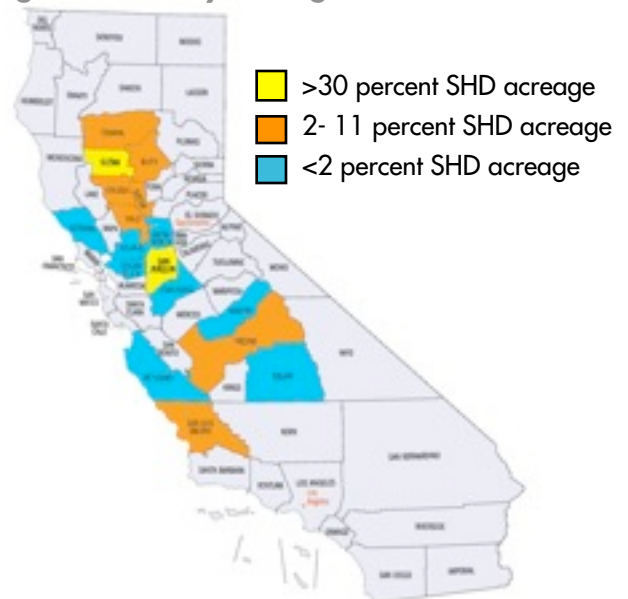
\*Percentages may not total 100 percent due to rounding.

**Location**

Super-high-density trees have been planted in 17 California counties. Figure 1 shows the location of these counties and their percentage of the total acreage. Counties in yellow represent 30 percent or more of California total SHD acreage, counties in orange represent between 2 and 11 percent of SHD acreage, and blue counties represent less than 2 percent of SHD acreage.

Table 4 indicates the number of acres planted by county. Glenn County accounts for 4,227 acres (35 percent of the total), followed by San Joaquin County at 3,713 acres (31 percent of the total). The remaining acres are spread among 15 counties and account for 34 percent of the total acreage.

**Figure 1: County acreage**



### Irrigation

Nearly all of the respondents indicated that they used drip irrigation for their super-high-density olive orchards, with just one large grower indicating the partial use of micro-spray irrigation.

As shown in Chart 1, 64 percent of respondents indicated that they rely on well water for irrigating their super-high-density trees, with 20 percent using district water and 16 percent using surface water. The majority of large growers, 67 percent, indicated that they rely on well water for irrigation with the remaining growers relying on district water (24 percent), and surface water (10 percent). Forty-five percent of medium growers indicated that they rely on well water, with the remaining 55 percent split evenly between surface and district. Sixty-nine percent of small growers indicated that they rely on well water, with the remaining 31 percent split evenly between surface and district water.

The survey asked respondents to report on their water usage as calculated in inches. Only 25 of the 54 respondents could report irrigation information in inches, with the remaining 29 either not responding, not knowing how to calculate the data, or not having adequate information due to planting in 2008. The lack of responses on this issue may indicate that the university and its farm advisors need to provide additional assistance to help growers learn how to calculate water usage in inches.

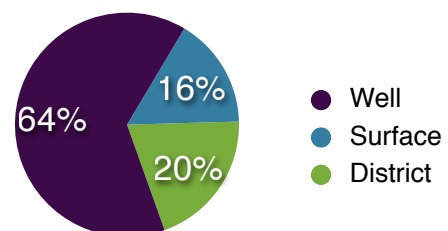
Chart 2 indicates the inches of water provided annually for SHD orchards based on the answers provided by respondents. Of the 25 respondents who did respond to the question, the median number of inches used per year was 20 and the average was 21 inches per year.

**Table 4: Acreage planted by county**

County	SHD Acres	%	Large Growers	Medium Growers	Small Growers
Glenn	4227	35	3972	225	30
San Joaquin	3713	31	2698	368	647
Butte	1128	9	975	83	70
Yolo	680	6	483	0	197
Tehama	600	5	400	200	0
Sutter	512	4	218	178	116
Fresno	369	3	214	0	154
San Luis Obispo	303	3	278	0	25
Colusa	219	2	0	210	9
Tulare	143	1	0	0	143
Stanislaus	90	<1	90	0	0
Madera	45	<1	0	0	45
Sacramento	29	<1	0	0	29
Contra Costa	27	<1	0	0	27
Solano	20	<1	0	0	20
Monterey	15	<1	0	0	15
Sonoma	1	<1	0	0	0.75
Total*	12119	100	9328	1264	1526

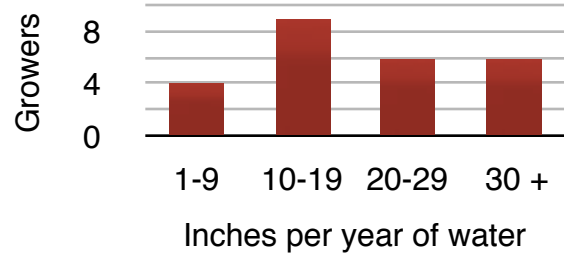
\*Totals may vary slightly due to rounding

**Chart 1: Water source**



The majority of respondents who could respond to this question were large growers (87 percent of this group knew their annual water usage). Only 33 percent of medium growers and 29 percent of small scale growers answered the question on their annual water usage. Based on those respondents who were able to respond, large growers used on average 19 inches per year, medium growers 15 inches per year, and small growers an average of 27 inches per year.

**Chart 2: Annual water usage**



### Previous Land Use

When asked about the previous land use for the acreage planted in SHD olives, 38 percent of respondents indicated permanent crops (orchards or vineyards), 32 percent reported row crops, 21 percent dry pasture, 7 percent irrigated pasture, and 2 percent “other” (which in this case was a duck-hunting club). The percentages of previous land use are displayed in Table 5.

**Table 5: Previous land use (% of respondents)**

	Total	Large Growers	Medium Growers	Small Growers
Permanent crops	38	38	22	39
Row crops	32	43	56	18
Dry pasture	21	14	11	32
Irrigated pasture	7	5	11	7
Other	2	0	0	4

Forty-three percent of large growers reported their previous land use to have been row crops, followed by permanent crops at 38 percent, dry pasture at 14 percent, and irrigated pasture at 5 percent. Fifty-six percent of medium growers indicated the previous land use to have been row crops, 22 percent indicated permanent crops, 11 percent dry pasture, and 11 percent irrigated pasture. Thirty-nine percent of small growers responded that previous land use was permanent crops, followed by 32 percent who indicated previous land use was dry pasture, 18 percent indicated row crops, 7 percent indicated irrigated pasture, and 4 percent indicated “other.”

### Harvest

With most SHD acreage planted only in the past three years, many growers have yet to carry out their first harvest. Table 6 indicates that 69.1 percent of respondents have yet to harvest and that 2008 represented the year with the largest percentage of first harvests at 12.7 percent. Forty-one percent of large growers had not harvested to date, with the largest percentage of growers harvesting for the first time in 2008 at 29 percent, followed by 2006 at 12 percent. No medium growers had harvested to date, and 76 percent of small growers had also not harvested to date. The majority of those small growers who had harvested started in 2005 with 10 percent, followed by 2008 at seven percent.

The survey asked a series of questions about the 2007 harvest. Just 18.2 percent of the respondents (10 out of 54) harvested in that year. The ten respondents reported the following (keeping in mind that the tonnage per acre and gallons per ton will change as orchards mature):

- First harvest day: The dates ranged from October 10 through October 29.
- Tonnage per acre: 4 tons per acre (median), with a range between 0.2 and 6.5 tons. The low end of the range represents growers who harvested for the first time in 2005 with trees that were planted in 2003.
  - Large growers reported a median of 4.5 tons per acre with a range between 0.74 and 6.5 tons.
  - Small growers reported a median of 3.25 tons per acre with a range between 0.2 and 4 tons.
  - No medium growers reported tonnage per acre.
- Gallons per ton: Forty gallons per ton (median) with a range between 28 and 47 gallons.
  - Large growers reported a median of 41 gallons per ton with a range between 33 and 47.
  - Small growers reported a median of 39 gallons per ton with a range between 28 and 45.5.
  - No medium growers reported their gallons per ton.

**Table 6: First year of harvest**

First harvest	%
2001	1.8
2002	0
2003	0
2004	1.8
2005	7.3
2006	5.5
2007	1.8
2008	12.7
No harvest to date	69.1
Total	100

### Reasons for Planting SHD Olive Trees

The survey asked growers to identify the most important reason for planting SHD olive trees. “Favorable income potential” was cited by 62 percent, followed by “low production costs” (14 percent), “reduced water usage” (8 percent), “diversity” (8 percent), and “other” (8 percent). Those that answered “other” identified “low labor input,” “low maintenance,” “best use of land,” “good product,” “experiment,” and “attractive” as their reasons for planting SHD olive trees.

The majority of large growers (68 percent) indicated that they decided to plant SHD olives for favorable income potential, followed by plant diversity, (14 percent), lower production costs (9 percent), reduced water usage, (5 percent), and other (5 percent). The majority of medium growers, 64 percent, indicated that they chose to plant SHD olives for favorable income potential, followed by reduce water usage (14 percent), lower production costs (7 percent), plant diversity (7 percent), and other (7 percent). The majority of small growers indicated that they chose to plant SHD trees for favorable income potential (54 percent), followed by reduced water usage (10 percent), lower production costs (18 percent), other (13 percent), and diversity (5 percent).

## **Comments and Concerns**

The survey allowed respondents to identify comments or concerns related to SHD olives, which elicited the following responses:

- Interest in converting to organic production
- Currently using organic practices
- Need for more olive oil mills in northern part of state
- Desire to discontinue super-high-density production but continue traditional planting
- Desire to convert further acreage into super-high-density
- Loss of acreage due to frost

## **Conclusion**

The SHD olive sector has achieved impressive growth after 10 years in California, and if the trends of recent years continue, olive oil will be a major California crop in the future.