

Florida Olive Council, LAA

General Cultivation and Production Information

Introduction: The cost estimates and much of the narrative below is based on University of California (Davis) research done in 2009-2010. Florida and California have different infrastructure, soils and climate. In that regard any generalization regarding costs or production, based on the data below, must be heavily caveated to reflect those differences. Other than work by the Council and a few hobby growers, there is little research available on olive (*Olea europaea*) cultivation in Florida.

UC-Davis developed the estimates below for a *medium-density* olive grove (269 trees per acre). Olive grove densities vary depending on the grower's environmental conditions, desired crop and method of harvest. Super High Density (SHD) groves, generally developed for oil production and machine-harvested, may contain more than 700 trees per acre. Conventional density groves, hand-harvested, may contain 100-150 trees per acre.



High Density Grove - 5' centers

The UC-Davis *medium-density* grove configuration is planted on 9 X 18 foot spacing. With room to grow, olive trees can have a long production life (40 years) if they are well maintained. Groves with higher densities might require thinning or replanting after 10-15 years. Higher density groves can be on 4'-6' centers by 12'-14' rows. Note width of harvesting machine in photo on right. Wider spacing is suggested in areas with higher humidity.



Olive Harvestina Machine

Grove Density Considerations for Florida

Olive grove density decisions must consider Florida's generally higher humidity and summer rainfall - two conditions that usually don't exist in other olive



Olives in Bloom, St. Augustine, FL 2011

growing regions. Olives are wind pollinated and often only set fruit on 5% of the blossoms therefore it is important to maximize bloom and fruit set.

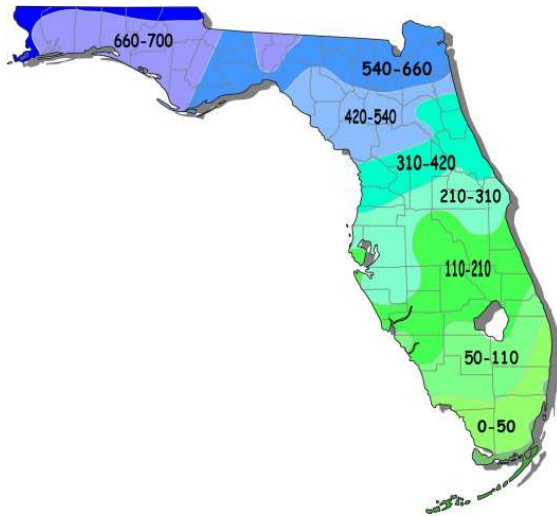
Untimely rainfall and/or resultant high humidity could have an adverse effect on yield due to reduction of available pollen and damage to blossoms from hard rain.



Olive fruit set, Lakeland, GA 2013



Chill Hours



Agricultural scientists believe olives need a minimum of 300 chill hours ($<47^{\circ}\text{F.}$) to produce blossoms. However, some USDA research conducted at McAllen, TX (Lat. 27°N.) suggests controlling for heat in Arbequina olives during summer may have a positive effect on fruiting. There are several small Florida groves in the 210-310 chill hour zones and more groves as one moves North. The oldest grove (15+ years) in Florida is located near Marianna in the 660-700 annual chill hour region. The Council is collecting some production data from Florida and south Georgia growers but there is insufficient information at this time on which to base credible yield estimates.

General Maintenance and Harvest

After grove installation at \$5-7K/acre (less land costs), there are on-going expenses to be considered. They include pruning, fertilization, pest control, harvesting, processing and other steps depending on whether production is focused on olive oil or table olives. Olives are alternate-bearing having "ON" and "OFF" years.

Pruning

Depending on the quality and age of the nursery stock and the desired grove configuration, young trees should generally be pruned once per year up to the age of three (3). Considering a *medium density* grove, in year five (5) or when the trees reach greater than 6' wide, the central leader is sawed out. In years six (6) to nine (9), one or two internal branches are removed each year to gradually form an open vase shape with 3 to 4 main scaffold branches. Normal pruning is conducted in April on trees that have a heavy bloom ("ON" year) and are expected to have a heavy crop by keeping the centers open and thinning out tall upright branches to an outward facing lateral.



Pruning by hand labor is assumed at 36 hours per acre for experienced fieldworkers. Commercial *high-density* groves often use mechanical pruners (left). In *medium-density* groves, Maximum tree height is kept at 14 feet. In high-density groves, where well-formed hedgerows are encouraged, pruning occurs at a height accommodated by the overhead harvester. Little pruning is conducted on "OFF" year trees; consequently average pruning over two years is 18 hours per acre per year for *medium-density*.

Fertilization

Mature trees receive more N in “ON” years with heavy bloom and heavy crop set (100 lbs. of actual N per acre) and much less (40 lbs. of actual N per acre) in years with light bloom and low crop load (average 70 lbs. per acre per year). The fertilizer is generally applied to the trees through the drip irrigation system from March through October. Strategic applications of Potash (K) have been reported to significantly increase yield.

Pest Management in Florida

Little is known about pests affecting olive trees in Florida. There are reports of various insects (e.g., glassy-winged sharpshooters, etc.) attacking the trees from time to time but Florida growers do not report significant pest damage, so far. UC (Davis) olive pest information at: <http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html>.

Weed Control

Weeds in mature *non-organically* cultivated orchards are controlled using a combination of herbicides and mowing. Weeds within the tree rows are controlled with a mixture of residual pre-emergent herbicides (Goal, Surflan) and a contact herbicide (Roundup) in the fall or winter. During the growing season, three strip or spot sprays are made within the tree row. In addition to shredding the pruned cuttings, the row centers are mowed three times during the spring and summer.

Insect and Disease Management in General



Olive Fruit Fly: In some areas of California regular control of the olive fruit fly (OLF) is recommended. McPhail pheromone traps are placed in the orchard and Spinosad (GF-120) bait is sprayed eight times (twice per month to alternate rows) from June/July thru November. A post harvest treatment is made to all rows in late November or early December to reduce overwintering populations - for a total of nine applications.

Black Scale: Black scale is occasionally a concern to olive growers, but specific control measures are not understood for Florida. Pruning will control the black scale insect in most years. Following cool years or in orchards with dense foliage, an insecticide treatment may be required to reduce the population to manageable levels.

Fungus: The fungal disease *peacock spot* and the bacterial disease *olive knot* usually require two copper sprays in rainy coastal areas. Kocide (copper) is also applied based on need.



Vertebrates

Rodents such as gophers are controlled through baiting. Deer can cause damage, particular in rutting season and are generally controlled through fencing. Birds do not generally present a problem.

Harvest

While some production may occur in the third year, and may or may not be harvested, the first significant harvest begins in the fourth year. Costs for contracted harvest operations and are based on a set rate of \$500 per ton. The range in custom harvest costs can be from \$350 to \$1,000 per ton depending on size of the orchard and topography. Olives in most small and mid-sized groves are harvested by knocking, shaking, or raking fruit into nets for collection and subsequently emptied into field hampers. Overhead harvesters are used for large commercial high-density groves.

Fruit is picked at the color change (*veraison*) stage of yellow-green to red-purple skin color with white-green flesh, usually in late Autumn. Care is taken when harvesting so that the skin of the fruit is not broken nor the flesh excessively bruised, especially for table olives. Harvested olives are transported from the field directly to the mill for immediate processing. Oil quality and flavor is best served by prompt processing.

Yield

Medium-density planted olives begin bearing an economic crop in the fourth year after planting and maximum yield is reached in the ninth to tenth year. (Note: consistent yield is difficult to maintain in olive orchards due to normal alternate bearing and occasional detrimental weather that reduces fruit set.) Olives can yield 21% oil per fresh weight and the oil weighs 7.61 pounds per gallon. Most oil olives produce about 40 gallons per ton. Typical annual yields for olives are measured in tons per acre roughly equivalent to 40 gallons of oil per ton. Many cultivars used for olive oil (Arbequina, Arbosona, Koroneiki) will produce 30 to 50 gallons of oil per ton. A *farm gate* price for oil is \$9-12 per gallon. Private bottlers get \$30-45 per gallon. Annual olive yield in tons, gallons, and retail bottles (375 ml size) for a *medium density* grove in California are shown in Table D below.

Table D. Average Yields			
Year	Tons of fruit (Fresh weight)	Oil extracted (Gallons)	Retail Bottle (375 Milliliter)
		per acre	
4	1.00	40	403
5	1.25	50	504
6	1.50	60	605
7	2.00	80	807
8	2.50	100	1,008
9	3.00	120	1,211



Processing



In California, the cost to process fruit varies from mill to mill and can range from \$250 to \$475 per ton. An average price is approximately \$380 per ton of fruit. There is only one mill serving Florida, located in Lakeland, GA (30 miles north of Jasper, FL). The Council is seeking grant funding to secure a mill to be established for research and small grove use near the University of Florida in Gainesville. A two-ton/hour mill (photo on left) costs \$250-\$350K. Smaller mills may cost \$50-\$100K. Large mills require three-phase power and all processing must be conducted in sanitary conditions. Fresh fruit from the field must be cleaned and washed before crushing (malaxation) and oil extraction (using centrifugal force). Waste processing considerations are important.

Bottling and Packaging

The average cost to take the oil from bulk storage to a finished product ready for retail sale can vary considerably. Bottling equipment and associated labor costs include bulk oil storage, oil transport, storage of cased bottles, washing, filling and packing. The cost of glass bottles is very different if sourced locally or from overseas. The quality of the label paper, number of labels per bottle and printing can significantly impact hard costs and labor. While 375 ml is a standard retail size, the increased use of olive oil for cooking is driving larger packaging (3 liter), and in some stores, bulk sale. These retail trends may significantly impact delivered cost per unit of measurement in the future particularly for oil delivered to a local/state market. In most areas, large growers simply sell their crop to an olive mill based on pre-harvest yield analysis.

Summary

Olive trees grow and thrive in Florida. The biggest question facing development of a Florida olive industry is the ability of a particular olive cultivar to fruit, reliably year-over-year, in sufficient quantities to support the infrastructure investment. Olive oil at the retail level represents a \$5 billion industry in the United States. Considering 98% of the 80 million gallons of olive oil consumed in the U.S. last year was imported; the market availability aspect is unquestioned - all that remains is to conduct the research by planting, observing and documenting.

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