

Florida Olives

General Cultivation and Production Information

Disclaimer: The cost estimates and much of the narrative below are based on research done by the University of California (Davis) in 2009-2010. Florida and California have different infrastructure, soils and climate. In that regard any generalization regarding costs or production characteristics, based on the data below, must be heavily caveated to reflect those differences. Other than some basic research by the Florida Olive Council, LAA (Council) and University of Florida IFAS there is little advanced scientific information available on olive (*Olea europaea*) cultivation in Florida.

History: Olives have been cultivated in Florida for over 300 years. The Mediterranean Minorcan settlers planted olives at Dr. Turnbull's New Smyrna plantation (near Daytona Beach) in the 1750s. J.K. Stickney, an early publisher of the Jacksonville Times Union newspaper grew olives in Fernandina in 1864; and a federal government report from the 1920s talks of a "35 foot bearing olive tree" on the Gibson farm near Tampa.

Today: Currently (2019) there are approximately 800 acres of olives under active cultivation in Florida. The groves range from back-yard hobby growers with several trees to 100+ acre commercial operations. In addition, several Florida nurseries propagate and sell olive trees for fruit production and ornamental purposes. While this diversity of Florida olive plantings is encouraging and recent successes with olives in South Georgia are of note; more hard science is warranted before significant investments of capital can be considered.



Blooming Olive St. Augustine, FL 2011

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

The UC-Davis model *medium-density* grove is planted on 9 X 18 foot spacing. With room to grow and good maintenance, olive trees can have a long production life (40+ years). Groves with higher densities might require thinning or replanting after 10-15 years. Higher density groves may be on 5'-6' centers and 12'-18' rows. Wider spacing is suggested in regions with higher humidity or where organic cultivation methods preclude use of certain chemicals.

Grove Density Considerations for Florida

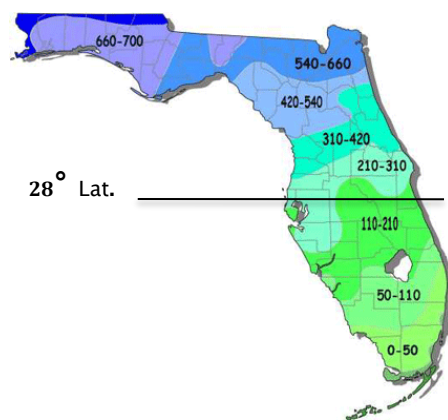
Olive grove density decisions must consider Florida's generally higher humidity and summer rainfall - two conditions that usually don't exist in other olive growing regions. Olives are generally wind-pollinated, however, bees have been observed working blossoms in one Florida grove. Olives set fruit on less than 5% of the blossoms; therefore, it is important to maximize bloom and fruit set using appropriate densities and pruning methods. Untimely heavy rainfall and/or high humidity could have an adverse effect on yield due to reduction of available pollen and damage to blossoms. Insufficient wind penetration in dense groves may also impact pollination. There is some agreement amongst Florida and Georgia high-density growers that a spacing of at least 6 feet between trees is desirable. Below are photographs of a super high-density (SHD) grove in California. These are five-year-old trees are on five-foot (5') centers.



Super High Density Grove



Super High Density Tree Spacing



Chill Hours

The olive tree must accumulate a certain number of *chill hours*¹ in winter (November-March) in order to bloom. Most of the olive varieties currently available to Florida growers originated along the northern rim of the Mediterranean Sea (Spain, Italy, Greece) at 40° north Latitude. As such these varieties are adapted to winters in those regions which are cooler than most of Florida. While requisite chill hour requirements for most olive varieties are met in Northwest Florida; some varieties bloom poorly or not at all farther south in the state. The Arbequina, Koroneiki and Arbosona are available varieties that require only 300 chill hours bloom. According to the chill map above, chilling for those

varieties is possible down to 28° N or roughly the I-4 corridor. Chilling is one of the most controversial issues in the Florida olive discussion. While there are several small Florida groves in the 210-310 chill hour zones, significantly more groves are planted in regions above Orlando. The oldest grove in Florida (15 yrs.) is located near Marianna - 660-700 annual chill

¹ One "chill hour" = one hour of temperature between 32° and 45° F. Olives must accumulate requisite chill hours during winter - the hours need not be contiguous but sharp warm ups or extended freezes will reduce or eliminate flowering for that year.

hour region. That grove hosts Leccino, Sevillano, Coratina, Ascolono, Mission and Manzanilla - all varieties requiring 400-700 chill hours. The Florida Olive Council and partners are currently experimenting with 40 olive varieties from the Middle East and North Africa hoping to find a variety that will reliably bloom and fruit south of the I-4 corridor using less than 100 chill hours. Florida Olive Council members will have early opportunity to acquire these varieties when the best low-chill option is identified and propagated in sufficient quantities.

General Maintenance and Harvest

After grove installation, there are on-going expenses to be considered. These expenses include watering, pruning, fertilization, pest control, harvesting, processing and other steps depending on whether production is focused on olive oil or table olive or if the producer is also the bottler and/or packer/retailer. Olives are alternate-bearing having "ON" and "OFF" years. This factor will impact pruning schedules and other cultivation and harvesting operations. Specific major elements of cost are discussed below.

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). Early pruning will focus on creating an 18"- 24" clear trunk at bottom of the tree to facilitate cultivation, enhance airflow and allow irrigation equipment maintenance. 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 in California 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. Photo on right is 50+ year-old olive tree near Episkopi, Crete pruned to facilitate hand harvest.



Heavily Pruned Old Olive Tree - Crete



Multi-Arm pruner

Pruning by hand labor is assumed at 36 hours per acre for experienced fieldworkers. Commercial *high-density* groves often use mechanical pruners (left-right). 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*.



Low branch pruner

Fertilization

Mature trees receive more nitrogen (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 (non-organic operations) is generally applied through drip irrigation from March through October.

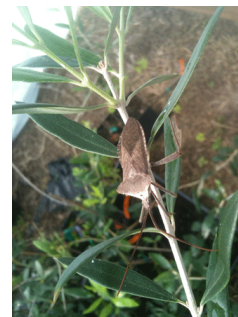
Strategic applications of Potash (K) have been reported to significantly increase yield and copper is also applied. Some Florida organic growers have reported well-leached horse manure mixed with stable straw either incorporated prior to planting or applied post-planting as a mulch has offered very good results. Appropriate plant nutrition is a function of many factors including, but not limited to, soil composition, pH, tree spacing and unique demands of various cultivars. There is no hard and fast rule for fertilization of olives in Florida.

Pest Management in Florida



Olive Fruit Fly Damage

Little is known about pests affecting olive trees in Florida. There are reports of various insects (e.g., glassy-winged sharpshooters, Asian stink bugs, etc.) attacking the trees from time to time but Florida growers do not report significant pest damage, so far. See UF-IFAS publication: [Pests and Fungal Organisms Identified on Olives \(*Olea europaea*\) in Florida.](#)



Stink Bug

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. The fly has not been seen in Florida.

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 applied based on need.

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. Some Florida and Georgia growers use plastic weed block.

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 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 generally \$500 per ton. Custom harvest costs can be higher depending on size of the orchard, density 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. However, early fruit maturation has been noted in north central Florida with *veraison* occurring in early September. The Council plans to collect more accurate blooming, fruiting and harvesting information in 2014. Handling of the fruit is critical. 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.



Overhead Olive Harvester

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. Typical annual yields for olives are measured in tons per acre (3-4T/acre average for SHD) and 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) per acre	Retail Bottle (375 Milliliter)
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



20T/Hr. Olive Mill

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 three mills serving Florida. None is located near Live Oak, another is located in Lakeland, GA (30 miles north of Jasper, FL) and a third mill has been established near Ocala in 2015. Several growers have small homemade mills using garbage disposals and hydraulic jacks.

All processing must be conducted under sanitary conditions. Fresh fruit from the field must be cleaned and washed before crushing (malaxation) and oil extraction (using centrifugal force). Crop washing, leaf and debris removal and olive waste processing considerations are important for quality and inefficiencies drive costs upward. A high standard of cleanliness is required due to the sensitivity of the oil rendering process. Excessive impurities in the final product add costs.



Olive Washing Stations

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 costs. 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 improve delivered cost per unit in the future particularly for oil sold into a local market. In most areas, large growers sell their crop to an olive mill based on pre-harvest yield analysis or other metrics.



Bottling Plant

Research and the Future

While olives grow and fruit in Florida, the range of currently available cultivars is constrained. *Arbequina*, *Arbosona* and *Koroneiki*, the most popular oil producers, bloom and fruit well in northern Florida where average annual chill is above 300 hours; but are not as reliable south of the I-4 corridor (28° north latitude) where chill is rarely above 200 hours. As well, table olive varieties like Mission, Manzanilla, Leccino and Ascolono (400+ chill hours), rarely flower and fruit south of the Florida panhandle.



Assisted by the USDA Olive Germplasm at UC Davis and new cultivar development scientists at University of Cordoba (Spain), the Florida Olive Council and partners have been working to introduce a range of new olive varieties into Florida.

Selected candidate varieties include those from the Middle East and North Africa (MENA) and lower latitudes in South America and Australia. The goal of the research is to find a suitable olive variety for southern Florida, one that would reliably bloom and fruit using less than 100 chill hours.

In 2017 and 2018, the partners acquired 40 candidate varieties from the USDA Germplasm. Cuttings from each variety were grafted onto existing mature olive trees at the Wauchula

research facility (27.5°) and rooted at the LaCrosse facility north of Gainesville. Because the candidates have been grafted to *mature* olive trees it is hoped that one or two of the grafts will display flowers in the next 2-3 years.

The economic impact of a viable olive for south Florida cannot be overstated. Since almost 50% of the citrus land in south Florida has been decimated by disease, thousands of acres of viable land can be available for olive production.



Summary

Olive trees grow and thrive in Florida. The biggest question facing development of a viable Florida olive industry is the ability of a particular olive cultivar to fruit, reliably year-over-year, in sufficient quantities to support the significant infrastructure investment.

Olive oil at the retail level represents a billion dollar industry in the United States. Considering 95% of olive oil consumed in the U.S. last year was imported; the market is unquestioned - all that remains is to conduct the research by planting, observing and documenting olive growing in Florida. In 2018, U.S. consumers purchased 92 million gallons of olive oil. If Florida could produce 1% (920,000 gallons) a \$20 million industry would result.

The Florida Olive Council, LAA seeks partners to promote and fund olive research in Florida.

Contact:

Michael O'Hara Garcia, President
Florida Olive Council, LAA
(202) 246-2001 michael@floridaolive.org