University of California Cooperative Extension

First Press

Newsletter of Olive Oil production and evaluation

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Harvest Efficiency for Small-Scale Oil Olive Growers

Harvest costs have typically been about half of the total production cost for olives, and even more for small-scale growers with low volume. The actual cost will vary by tree size, variety, hourly wage rates, experience of the laborers, and if any harvest assistance devices are used. I have been working with several growers over the last two years to document the cost and efficiency of various harvest methods. Comparisons were made within each orchard on the same day with the same variety and labor crew. We also measured the amount of tree and fruit damage.

We compared hand harvest into buckets, and various methods of getting the fruit off the trees down onto nets: hand "milking", using poles to knock the fruit off, a mini-shaker to shake it off, and pneumatic combs to comb it off. Each method was compared in efficiency (pounds of fruit harvested per man hour) to hand picking into buckets. Picking or "milking" off the olives onto nets on the ground by hand was not found to be significantly different from picking the fruit directly into buckets because of the time required for manipulating the nets (Table 1). Using pneumatic combs was found to be almost twice as efficient (1.8) as picking into buckets, and harvest with mini-shakers plus poles was found to be 2.6 times more efficient. The last method, harvesting with poles alone to knock the olives onto nets, was not significantly different from using the mini-shaker and pole combination method.

The two hand harvest methods had the least number of small broken limbs

Mini-shaker/pole combination

per tree. Although the number of broken shoots from the other three methods was 4-5 times greater, the amount of limb breakage was not sufficient to be harmful to the trees or next year's crop production. The least amount of fruit damage occurred when the fruit was harvested directly into buckets because almost all of the damage that was measured was not from getting the fruit off the trees, but from the workers stepping on the fruit on the nets.

Briefly, the following are the harvest methods used in this comparison:

(cont. on p.3)

How to get your free subscription

Please send an email to Vivian (vlmorales@ucdavis.edu) requesting that you be placed on the ***First Press*** e-mailing list. Please include your name, business name, address and phone number so that we can update our records. You will be directed to an online site as each issue is published.

Welcome to First Press

First Press has been created to disseminate information of interest to California olive oil growers, producers and enthusiasts. In order to control costs, this is the only issue we will produce on paper; in the future we will publish electronically. The good news is that this will allow us to publish in color, something that otherwise would be prohibitive. ***First Press*** will appear quarterly, and contain news of our latest UC research in the area of olive oil, as well as notices of upcoming events and other items of interest.

I used a recent opportunity to reevaluate my research, education, and public service program in the area of olive oil growing, processing, and sensory evaluation. I will no longer be involved with the California Olive Oil Council (COOC) seal certification program or serve as an adviser to the COOC board of directors.

My current research work includes trials on olive fruit fly control, the effects of irrigation on production and oil quality, the influence of variety and location on oil flavor, comparing organic and conventional farming for olives, evaluating the sensory effects of processing methods, and the featured harvest efficiency work. I am also evaluating super-high-density production at Santa Rosa Junior College (SRJC) . I hope this first issue of ***First Press*** is helpful.

I welcome your input.

–Paul Vossen, Farm Advisor
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Dealing with Olive Fly Damage

How to minimize the impact of olive fly at harvest

In a perfect world, we all get our monitoring traps hung early, start a regular spray program right on time, and have virtually no olive fly damage at harvest. If this describes you, Congratulations, well done! And you can skip the rest of the article.

If, on the other hand, you don't fall into the above category, it's time to quantify the damage and figure out what you can do at this stage of the game. The place to start is with an assessment of the amount of olive fly damage you have sustained. In order for your assessment to be accurate, you need a random sample of olives. Ideally you would pick a few hundred olives, evenly distributed from throughout the trees, with your eyes closed.


Olive fly damage

Unfortunately, this is hard to do without tripping and hurting yourself. As a compromise, I try to use my peripheral vision, let my eyes go out of focus, or look away as I pick, so that I can't tell which olives are damaged. I move around the trees, gather high and low, and try to cover a large area.

Once you have your sample, go through and separate the damaged olives from the sound ones. I use an X-acto knife and a 10x hand lens (okay, and my reading glasses) to help determine which fruit has been hit, and how badly. (A detection tip: shave thin slices off the olive where the sting is to see small tunnels, don't cut down toward the pit.)

Divide the number of damaged olives by the number of sound ones to get your damage percentage.

If you are under 10%, you're in good shape. The olives will still require prompt processing, but all olives deserve that. If you have a higher level of damage, it is time to look at some mitigation measures. The "cut-off" point for damage is a moving target. If you have a small crop with 80% damage, it's probably not worth trying to salvage it. But a bigger crop with something like 50% damage might be worth the effort. Each grower needs to make that determination individually.

In our sensory evaluation of olive fly-damaged oil we found that fairly high levels of damage were acceptable as long as no rotting had occurred. As soon as the fruit showed brown, rotten patches, the oil was awful. If it is to produce usable oil, damaged fruit needs to be handled even more carefully, and processed more promptly, than sound fruit.

Another noticeable effect of fly damage is that it increases the ripeness of the fruit. If you have fly damage, you may want to harvest your olives at a greener stage than you would ordinarily consider. In addition to avoiding further damage, which tends to increase as the season goes on, you will find that the fly-damaged olives contribute "ripeness" to the flavor.

One final note about oil from fly-damaged olives: it does not keep well. Samples of oil in which the fly damage was almost undetectable when it was fresh had developed a whole raft of off-flavors a year later. The oil tasted fusty, winey and rancid—in other words, not good. So fly-damaged oil should be treated as a super-perishable product, and used as close to its production date as possible.

–Alexandra Devarenne

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UC Davis Extension Sensory Evaluation of Olive Oil
March 10 & 11, 2006

This two-day course is designed to teach you how to evaluate olive oils objectively according to international standards, and subjectively as to their use with food. The course is a blend of tastings and lectures to teach theory and provide applied experience in evaluating oils. Lecture topics include the mechanics of how to formally taste olive oil, identify sensory defects in olive oil, the role of maturity and variety in oil flavor and style, sensory evaluation as a science, and an overview of processing alternatives and their effects on oil style. You will learn about the multitude of flavor attributes of olive oil, how to distinguish between ripe and green fruitiness, the aromatics of olive oil, undertone flavors, and the subtleties of complexity, depth and harmony in olive oil.

Activities include blind tastings of newly made oils from California and Europe plus oils from South Africa, Chile, Argentina, Australia and New Zealand. Several tastings will focus on the flavor profiles of specific olive varieties and how they are influenced by fruit ripeness. One tasting focuses on regionality and typicity and how these ideas interact with price and consumer perceptions of olive oil quality. Another will feature how several styles of oil complement or detract from the foods they are paired with. The last tasting is a test of the student's abilities to distinguish and differentiate oil flavor intensities.

This course is led by UCCE farm advisor Paul Vossen, who has been trained and certified by the International Olive Oil Council as a taste panel leader.

For information and registration, contact UC Davis Extension at 800-752-0881, or online at www.extension.ucdavis.edu.

(Harvest cont. from p.1)

Hand harvest into buckets: The workers use both hands to rake the fruit off between their fingers into plastic buckets. Picking buckets used for olives are lightweight plastic, fit over the shoulders, and hold about 40 pounds. This method requires no ground nets, but does require ladders to reach into the tops of taller trees.

Hand picking onto nets: Uses no buckets, but requires the placement of nets on the ground and collection of fruit. The fruit is "milked" off the branches with the fingers directly onto the nets. This method also requires ladders for tall trees, but eliminates the fatigue of carrying around buckets laden with fruit.

Pole harvest: Uses lightweight poles of wood, fiberglass, plastic, or aluminum 7-12 ft. long to knock the fruit off the branches onto the ground. Although widely used worldwide, this method is fatiguing and harvest speed decreases as the day progresses.

Mini-shaker plus poles: Mini-shakers are motorized shakers with a shaft about 7 ft. long that has a hook on one end which is placed around a branch about 1.5" to 2.0" in diameter. The motorized end looks a bit like a weed whacker with a two-stroke engine that is slung over the shoulder with a wide strap. Fruit removal with a mini-shaker alone is not complete with most varieties, so one person with a pole on each side of the mini-shaker operator usually knocks off any fruit remaining on the tree. As far as I know, the only brand currently available in California is Stihl.

Pneumatic combs: This system uses a motorized air compressor that serves 1-4 pneumatic combs on poles 5-8 ft. long. Two plastic combs about 12" long and 3" wide swing back and forth. The comb operators run the moving combs down through the foliage to rake the fruit onto nets.

I also conducted a small survey among California producers to determine the efficiency of their harvest methods. In a Sierra Foothills Mission orchard using poles, they could harvest about 63 lbs. of fruit per person per hour (Table 2). These trees were very tall and most of the fruit was in the tops of the trees. In a coastal orchard with large Frantoio trees, it was found that the average fruit harvest rate was about 29 lbs. per person per hour when picking by hand onto nets. In that same orchard, two men, one with a pole and one with a mini-shaker, could harvest fruit at over six times that rate for 151 lbs. per person per hour. In another coastal orchard with mixed Tuscan varieties and a heavy crop, they were able to harvest at a rate of 327 lbs. of fruit per person per hour when using a mini-shaker and poles. Those were medium sized trees and all the fruit could easily be reached. When that same crew harvested fruit by hand they were only able to pick at about one tenth that rate. When they used poles alone, without the mini- shakers, their efficiency dropped by almost half. In another coastal Tuscan variety orchard, I measured their crew picking about 22 lbs. of fruit per person per hour harvesting by hand into buckets. When they used the mini-shakers and poles they were able to harvest over 5 times as much fruit in an hour's time (115 lbs.). A recently completed two-year trial in Italy comparing vibrating combs and mini-shakers provides an additional picture of the differences in efficiency between those harvest methods.

In the Italian trial, the harvester crew's labor was measured according to specific tasks. Moving and positioning nets took from about 20% to 30% of the labor force, even for the net systems that were rolled up mechanically; another 10% to 20% was spent removing the fruit from the nets. Only 4% to 11% of the time was used to actually shake the fruit down onto nets by the mini shakers, but the vibrating combs took much longer (26% of the time) to remove the fruit from the trees. All of the methods required anywhere from 24% to 41% of the time to remove the fruit remaining on the trees with poles.

For the complete article, see "Oil Olive Harvest Methods Compared" http://cesonoma.ucdavis.edu/hortic/research_pubs.html.

–Paul Vossen

Table 1: COMPARISON OF HAND HARVEST METHODS IN ONE ORCHARD ON THE LECCINO VARIETY ON THE SAME DAY WITH THE SAME LABORERS – YIELD 3.5 TONS/ACRE

Tree canopies 11-12 ft. high and 7-8 ft. in diameter	Hand Pick Into Buckets	Hand Pick Onto Nets	Pneumatic Combs	Mini Shaker + Poles	Poles Alone
No. shoots broken/tree	4.16 (a)	3.75 (a)	18.7 (b)	22.3 (b)	28.0 (b)
No. fruit damaged/lb.	0.1 (a)	4.0 (b)	4.2 (b)	3.5 (b)	5.3 (b)
Pounds of fruit/man/hr.	39.8 (a)	47.8 (a)	71.6 (b)	103.5 (c)	111.4 (c)
Efficiency compared to hand pick into buckets	1.0	1.2	1.8	2.6	2.8

Numbers followed by the same letter are not significantly different statisically

Table 2: COMPARISON OF HAND HARVEST METHODS IN FIVE DIFFERENT ORCHARDS 2003 & 2004 (POUNDS OF FRUIT PER PERSON PER HOUR)

Orchard Description	Hand Pick In Buckets	Hand Pick (Nets)	Pneumatic Combs (Nets)	Mini Shaker + Poles (Nets)	Poles (Nets)
Very large Mission trees 70/acre (light crop)	-	-	-	-	62.5
Large Frantoio trees 155/acre (medium crop)	25.0	28.8	-	150.5	-
Medium Tuscan trees 155/acre (heavy crop)	-	28.9	-	326.5	182.1
Small-med Tuscan trees 272/acre (medium crop)	22.2	-	-	115.1	-
Trial trees in Italy (medium crop)	-	-	68.9	170.2	-

Source: Panaro et al 2003 and Vossen unpublished data

Upcoming Educational Events

Olive Oil Production & Evaluation (SUSAG 118)–Thurs 6–9pm,
Oct. 27 to Nov. 17, 2005, plus Sat. 10/29 9am-3pm. Santa Rosa Junior College
www.santarosa.edu or call 707-525-3800 to register or for info.

Harvest Efficiency Field Day–Nov. 18, 2005, 9 to 11am on the North Coast
Call Vivian 707-565-2303 for reservations and information

Sensory Evaluation of Olive Oil–Mar. 10 & 11, 2006 at UC Davis
For info or to register: www.extension.ucdavis.edu or call 800-752-0881

Olive Pruning Demonstration, Sonoma Valley–April 29, 2006
For info and reservations, call Vivian at 707-565-2621. Space is limited.

Pneumatic comb harvesters in action

In the News

The Secretary of the Economy of Mexico recently imposed tariffs of 19.31 to 30.78% on olive oil imported from Europe to protect their domestic producers. The Mexican government determined that the companies Aceites del Sur, Borges, Carapelli Firenze, Carbonell, Monterreal, Oleicola Hojiblanca, Salov, Toledo, and Ybarra were dumping olive oils on the market and hurting Mexico's olive oil businesses. (El Sol De Mexico 8-2-05).