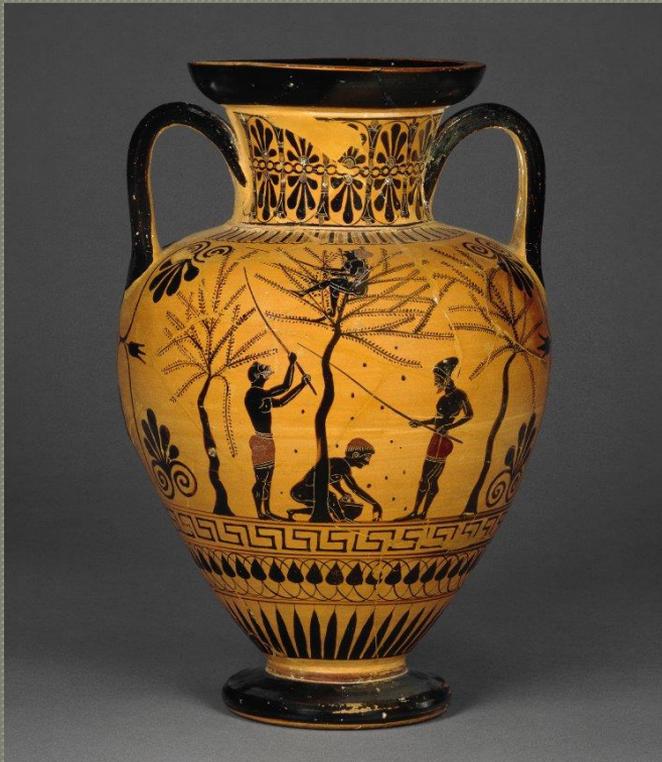


Growing Olives in the Desert Southwest



Dr. Glenn C. Wright
University of Arizona
Yuma Agriculture
Center



AGRICULTURE
& LIFE SCIENCES

COOPERATIVE EXTENSION
Yuma Agricultural Center

Olives in Antiquity



- Olive tree of Vouves (Crete) – 2000 to 3000 years old
- The olive, (*Olea europaea*) dates back to 17th century B.C. where it first appeared in print in Egyptian records and was mentioned numerous times in the Bible.
- The word comes from the Latin “olivea” which first appeared in English around 1200 A.D.
- Since the olive is native to the Mediterranean area, it's no surprise to learn the largest producers in the world are Italy and Spain, where olives are a diet mainstay.

Olives in the Southwest



- Father Eusebio Kino likely brought olives to Arizona during his missionary trips through southern Arizona beginning in 1687.
- Additional selections were brought by Fr. Serra into California beginning in 1769.
- DNA analysis suggests that 'Mission', commonly thought to be a US selection is likely the 'Picholine marocaine' cultivar from Morocco.

Table Olives in Arizona and California



- Arizona was host to a small table olive industry in the 1980's and 1990's.
- Cultivars were 'Mission', 'Manzanillo' and 'Sevillano'
- Industry failed due to:
 - High cost of hand harvest
 - Low prices due to competition
 - Orchard mismanagement
 - Pollination issues with 'Sevillano'
- California table olive industry is not thriving
 - because of high labor and water costs and falling prices, table olives have become less profitable, and many orchards are being removed in favor of higher value crops like almonds or citrus
- However...

The US consumes a lot of olive oil, and we do not produce a lot of it!

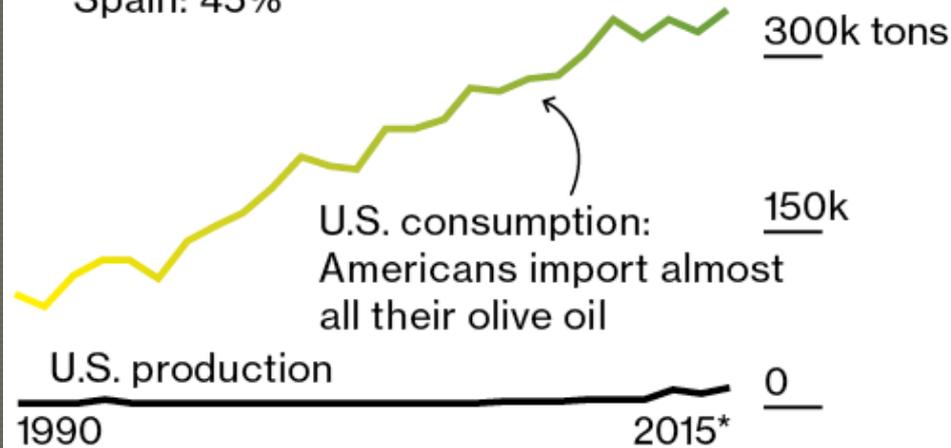
Where the U.S. gets its olive oil

Italy: 43%



Rest of world: 8%
Tunisia: 4%

Spain: 45%



*PROJECTED. DATA: INTERNATIONAL OLIVE COUNCIL, USDA

The Mediterranean Diet

○ Mediterranean Diet Shown to Ward Off Heart Attack and Stroke



About 30 percent of heart attacks, strokes and deaths from heart disease can be prevented in people at high risk if they switch to a Mediterranean diet rich in olive oil, nuts, beans, fish, fruits and vegetables, and even drink wine with meals, a large and rigorous new study has found.

New study reports that Spaniards will have the world's longest lives by 2030 (85.8 years)

Olive oil vs. Table olives

TABLE OLIVES

- Competes against inexpensive imports
- Must be hand harvested (perhaps some harvest aids)
- Most pruning done by hand

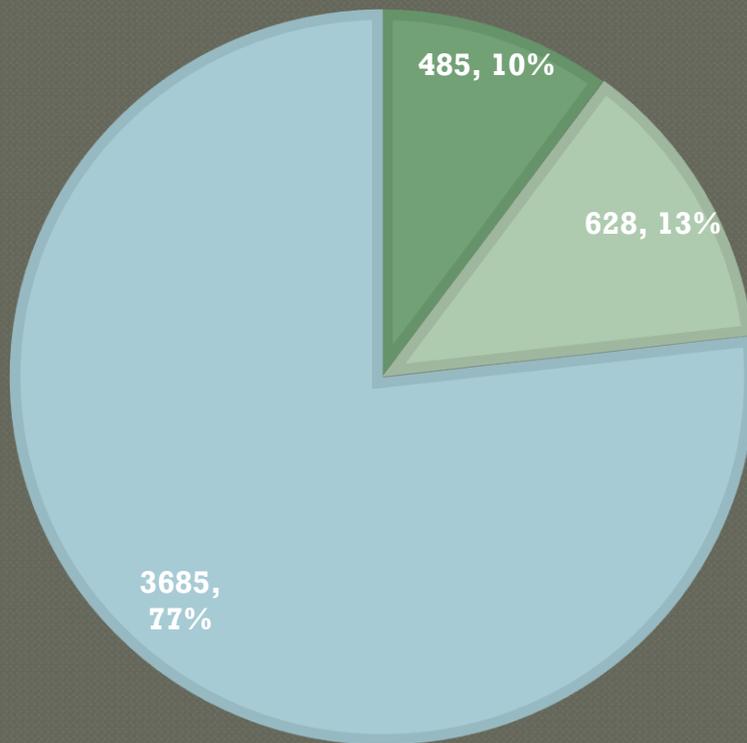
OLIVES FOR OIL

- Competes against inexpensive imports
- There are higher value markets
- There can be value-added products
- May be machine harvested if SHD or HD
- Some pruning may be done mechanically

Acres of Olives in Southern California, Arizona and Mexico - 2016

4800 ACRES

■ Arizona ■ California ■ Mexico



- Most of the Mexican production is regular density, situated along the coast.
- Most of the Arizona production is SHD.
- All So. Cal. Production is SHD

Traditional Olive Orchards (Table or Oil) – 20 to 35 ft spacing





Super High Density Olives

Introduced by Spanish nurserymen and the University of Cordoba researchers in the early 1990's. Now the most common density for new plantings in Spain, Australia, Argentina, Arizona and California.

“Established” SHD Varieties



Arbequina –I18

- Spanish variety
- Low vigor, self-fertile
- Precocious, productive
- Resistant to leaf spot, susceptible to olive knot and Verticillium
- High quality oil that is not stable



Arbosana I-43

- Spanish variety
- Low vigor requires cross pollination
- Very precocious, productive
- Late ripening
- Resistant to leaf spot, susceptible to olive knot and Verticillium
- High quality oil



Koroneiki

- Greek variety
- Average vigor, requires cross pollination
- Very precocious, productive
- Drought resistant, but cold sensitive
- Resistant to leaf spot, susceptible to olive knot and Verticillium
- High quality, stable oil

“New” SHD Varieties



Sikitita

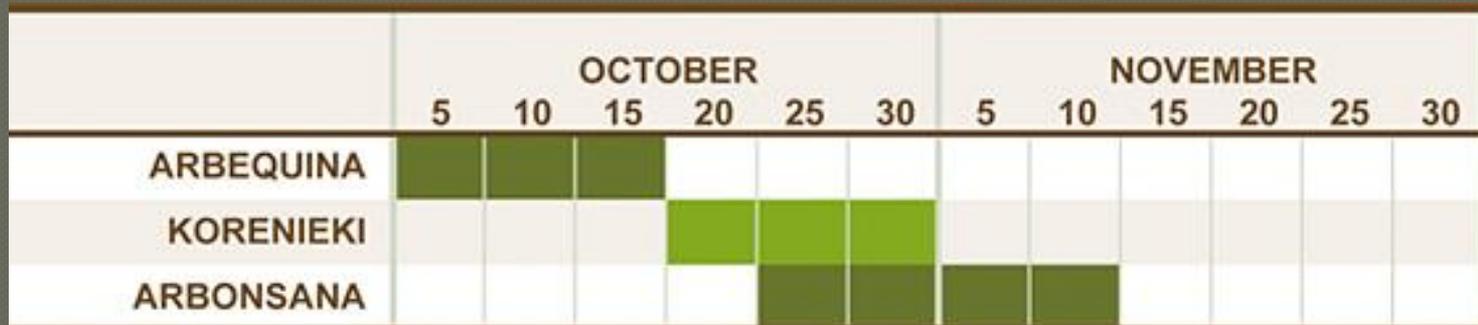
- Spanish variety
- ‘Picual’ x ‘Arbequina’ hybrid
- Low vigor, weeping, canopy is 70% of that of ‘Arbequina’
- Requires cross pollination
- Precocious, productive
- Resistant to leaf spot
- Cold tolerant
- High quality oil that is stable



Tosca 07 Vas 1

- Italian variety
- Very low vigor requires cross pollination
- Very precocious, productive
- Tolerant of leaf spot,
- Tolerant of cold and drought
- High quality oil

Ripening times in Central California



This chart has been developed from our own observations as well as from information found in trade and scientific publications. However its accuracy cannot be guaranteed and is subject to change as new information is made available to us.

* Source: *University of California Agricultural Extension Service*

Ripening times found to be later in the desert

Tree Spacing

Tree spacing is typically 4-6 x 10-12 ft. in Central California (500 to 800 trees per acre)
A less dense planting is better for the desert (7 ft. because of growth rates)



Trellising

SHD olives will require a trellis for support and training. One or two wires and wooden or metal posts is sufficient



Bloom

Bloom appears in April and May

Flowers are perfect and imperfect

Flowers are wind pollinated

Alternate bearing can be a problem



Tree costs are \$6.00 each and up.
Trees must be trained by hand to a central leader
Hand pruning must control vigor and maximize fruiting wood
Olives bear fruit on one year old wood

Planting and Training



Pruning

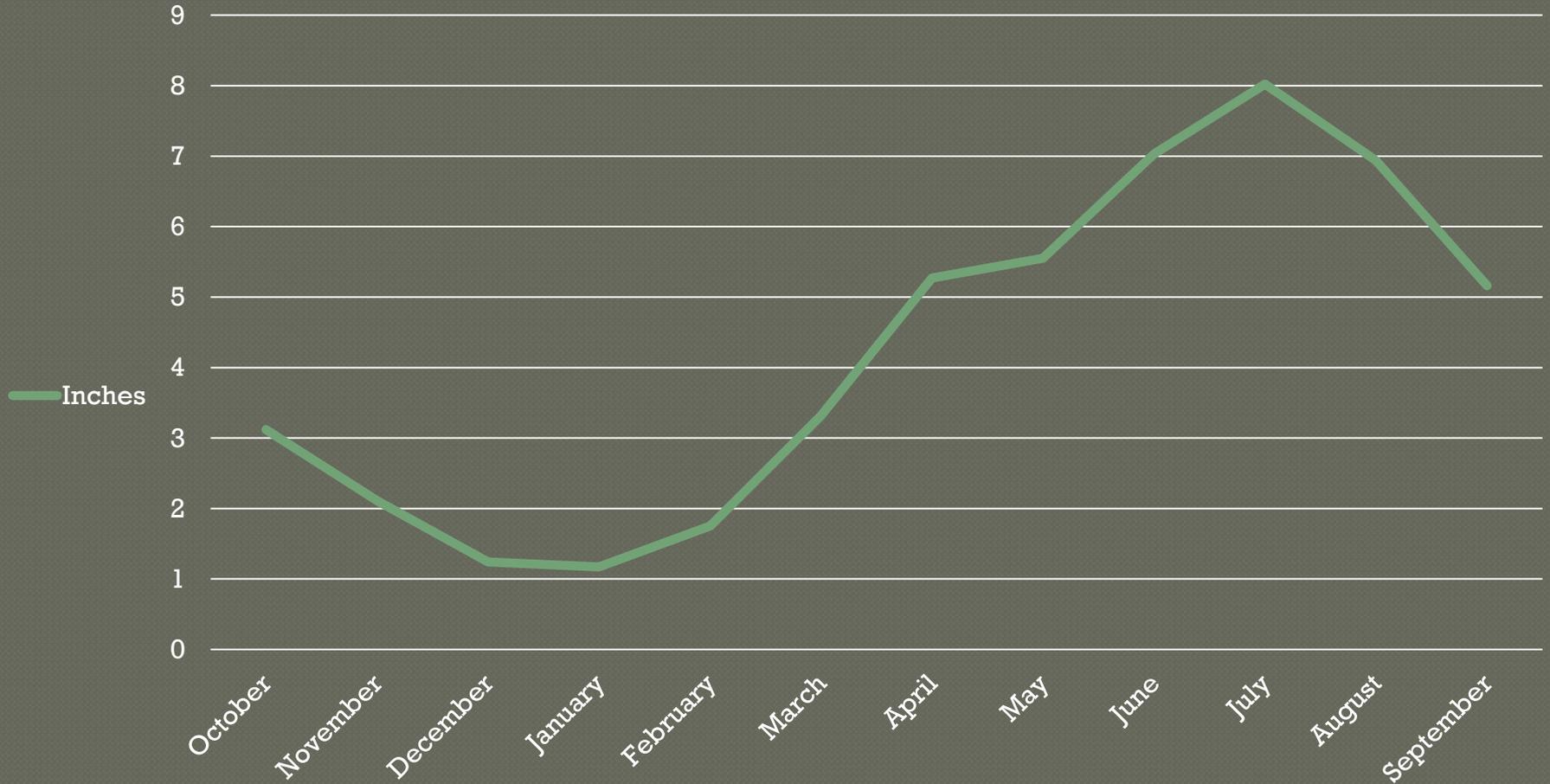
- Maintenance pruning can be done with a hedger, but some hand pruning will be needed.
- Two flat planes (flat sides must be developed) – must prune off branches that extend out too far into row.
- Trees must be skirted so that branches do not interfere with fruit collectors on harvester.
- Trees must be kept smaller than the harvester opening

Irrigation

Olive irrigation needs are about 3-4 acre feet per year at maturity (40 inches in SJV and Sacramento Valley)
Over-irrigation will lead to excessive growth at the expense of fruit.
Irrigation is most important after bloom, up to pit hardening and after color change
Drought stress at harvest will adversely affect oil quality



Olive Evapotranspiration (E_t_c) – Roll AZ – October 2016 to September 2017 – 50.69 inches



Fertilization, Pests and Diseases

1.6 to 1.7% leaf N is sufficient for olives

Too much N causes excessive fruit drop, vigor at the expense of fruiting, increases the need for pruning. Olives require less N than citrus

0.2% leaf P is best for superior yield and oil content .

K has little effect on yield and oil yield. 0.8 to 2.0% is best

B also necessary



Nutrient	Critical Level (July)
N	1.5 to 2.0%
P	0.1 to 0.3%
K	>0.8%
Ca	>1.0 %
Mg	>0.1%
Na	<0.2%
Cl	<0.5%
B	19-150 ppm
Cu	>5 ppm
Mn	. 20 ppm
Zn	Unknown

Pests and Diseases

There are no significant pest or disease threats for olives in the desert (as yet).

- Olive knot (*Pseudomonas savastanoi*)
- Olive fruit fly (*Bactocera oleae*)
- Verticillium
- Leaf spot (*Spilocaea oleaginea*)

Weeds are not serious problem



Harvesting

Harvesting must be done mechanically
Original machines were grape harvesters
New machines are now specifically designed for olives



The Colossus



The effect of olive fruit maturity on various characteristics of the oil

Oil Characteristics	Green	Veraison	Black
Organoleptic	Bitter and grassy with unripe and vegetative characteristics	Some ripe-fruitiness. Some bitterness and pungency	Sweet Oils
Yield	Low	Close to maximum per dry weight	High
Anti-Oxidants	Highest	High	Lower
Shelf-Life	Highest	High	Lower
Color	More green	Variable	More golden
Ease of Milling	Longer malaxation needed, can be difficult	Normal	Overripe, overwatered fruit can create problems

Olive Harvest

- 5 tons per acre (conservative est.) expected for SHD.
- 12-50 gallons per ton (40 to 50 expected at maturity)
- Olives must be kept chilled after harvest to maintain quality.

Sample Costs

Planting Costs Per Acre at 6' x 17' Spacing	\$4,800 - \$5,800 (including ground preparation, trellis, irrigation, trees, bamboo, planting, and tying)
Maintenance Cost per Acre (First Three Years)	\$2,800 - \$3,300 (including pruning, tying, maintenance, fertilizing, weed-control, and cultural costs)
On-Going Annual Costs per Acre	\$1,100 - \$1,500
Contract Harvest Costs per Acre	\$250 - \$400 depending on what services, materials, and equipment
Harvesters	\$125,000 - \$350,000 Normally, an orchard of 200 acres or more can support the cost of owning a harvester.

Oil Quality and Milling



- Olive oil is typically blended to taste by the miller.
- Extra Virgin Oil is the highest quality and the grade that must be achieved to be profitable.
 - No defects
 - Free acidity percentage of less than 0.8
 - Conform to all the standards listed in its category (Fatty acid profile must be correct)
- There is no obligatory enforcement of quality standards in the US.
- There is a voluntary USDA certification program, with standards

Olive Oils are different

TABLE 1.1 Olive oil grade descriptions

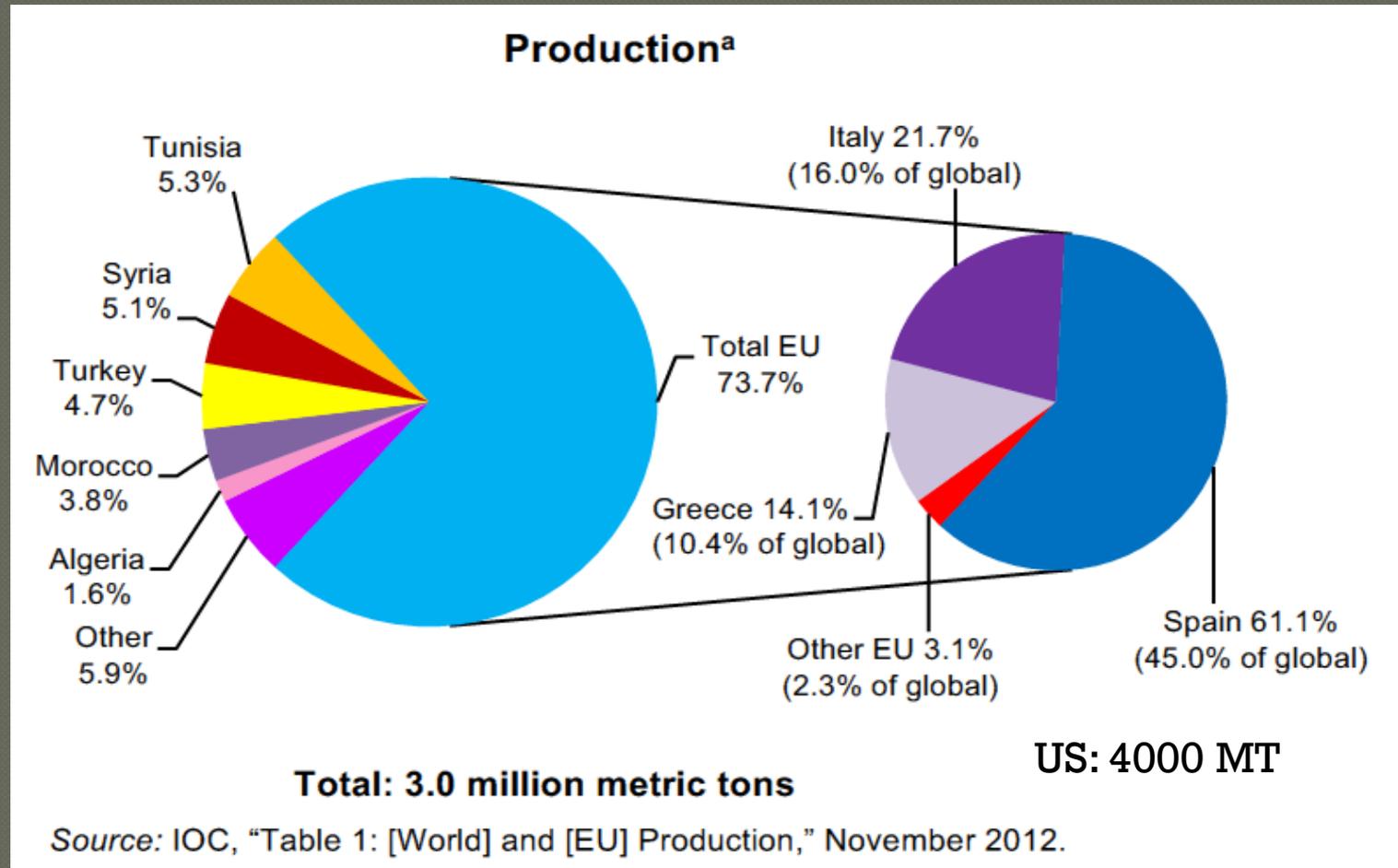
Grade	Description and notes
Virgin	Oils obtained from olives that have not undergone any treatment other than washing, decanting, centrifugation, and filtration. Virgin oil is obtained during the first pressing of whole olives.
Extra virgin	<ul style="list-style-type: none">○ The highest grade of virgin olive oil, which exhibits some fruitiness and is free of taste defects.
Virgin	<ul style="list-style-type: none">○ Oil that is fit for human consumption, has reasonably good flavor, but may exhibit taste defects.
Lampante virgin	<ul style="list-style-type: none">○ Virgin oil that is not fit for human consumption without further processing and contains flavor and odor defects.
Olive oil	Oil that is made from blending virgin and refined olive oil. This oil is fit for human consumption and makes up the majority of global olive oil sales.
Refined olive oil	Olive oil that has been refined into an edible product yet maintains the initial glyceridic structure of olive oil. The refining process heats the oil to rid it of flavor flaws such as rancidity. Refined oil does not contain the same beneficial nutrients as virgin oil.
Olive pomace oil	Olive pomace is the solid remains (skins, pulp, seeds, etc.) left over from the first press of olives for oil. Olive pomace oil is extracted from the pomace using chemical solvents and must be refined to be fit for human consumption. Once refined, it is typically mixed with virgin oils for consumption.

Source: Compiled by USITC staff.

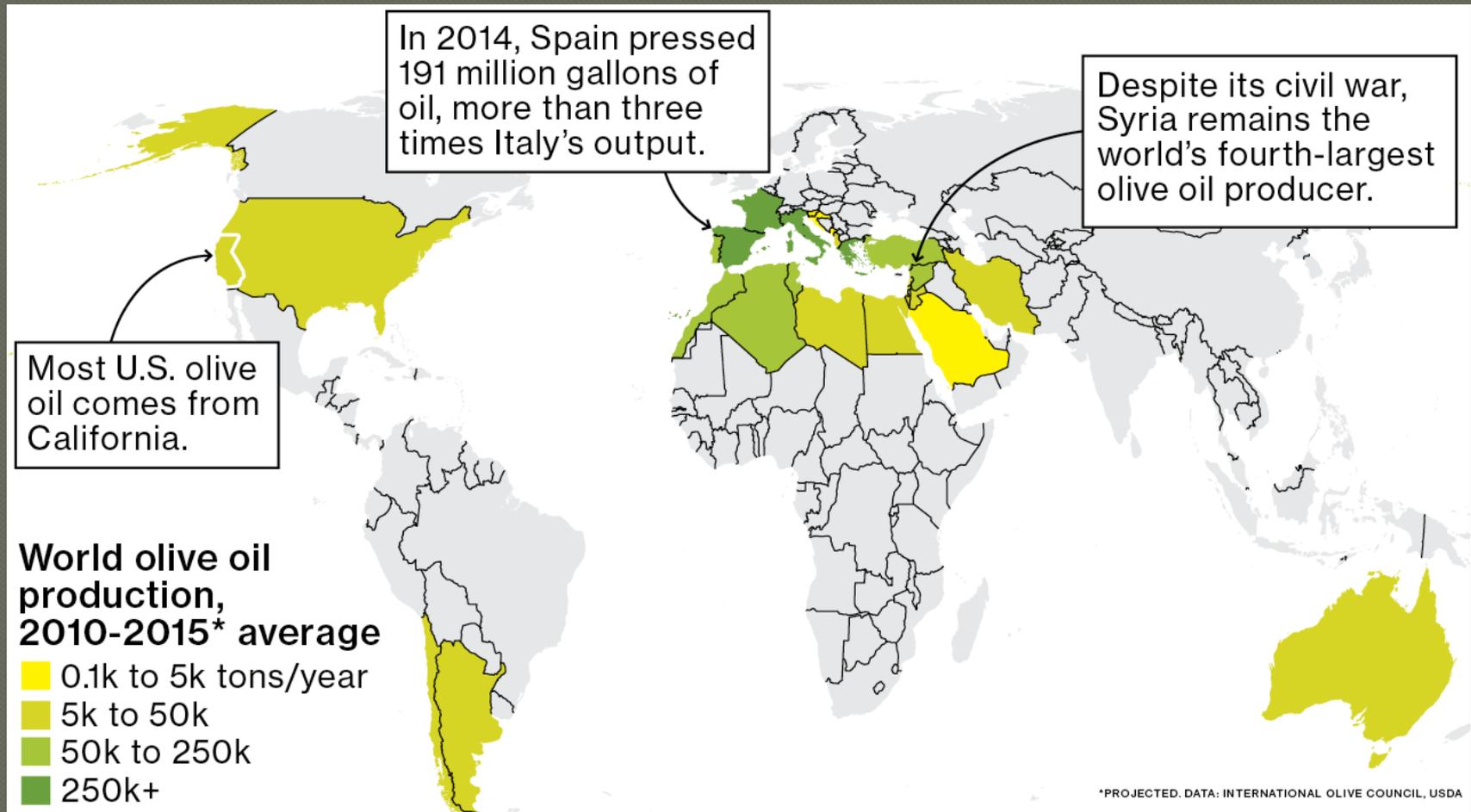
Olive Oil Grade Comparison Chart

Olive Oil Grade	Extra Virgin	Olive Oil	Light Tasting Olive Oil
Ingredients	Extra Virgin Olive Oil	Refined olive oil and virgin or extra virgin olive oil (commonly about 90% refined and 10% virgin/EVOO)	Refined olive oil and virgin or extra virgin olive oil (commonly about 98% refined and 2% virgin/EVOO)
Free Acidity	≤0.8%	≤1.0%	≤1.0%
Organoleptic	Zero Defects and Fruity Score > 0	Good flavor/aroma; light yellow to green color	Acceptable flavor, light yellow color
Flavor	Most Flavorful - has a broad range and is highly versatile. Varies from Mild & Delicate to Robust & Intense	Mild Flavor - won't overpower food	Almost no flavor

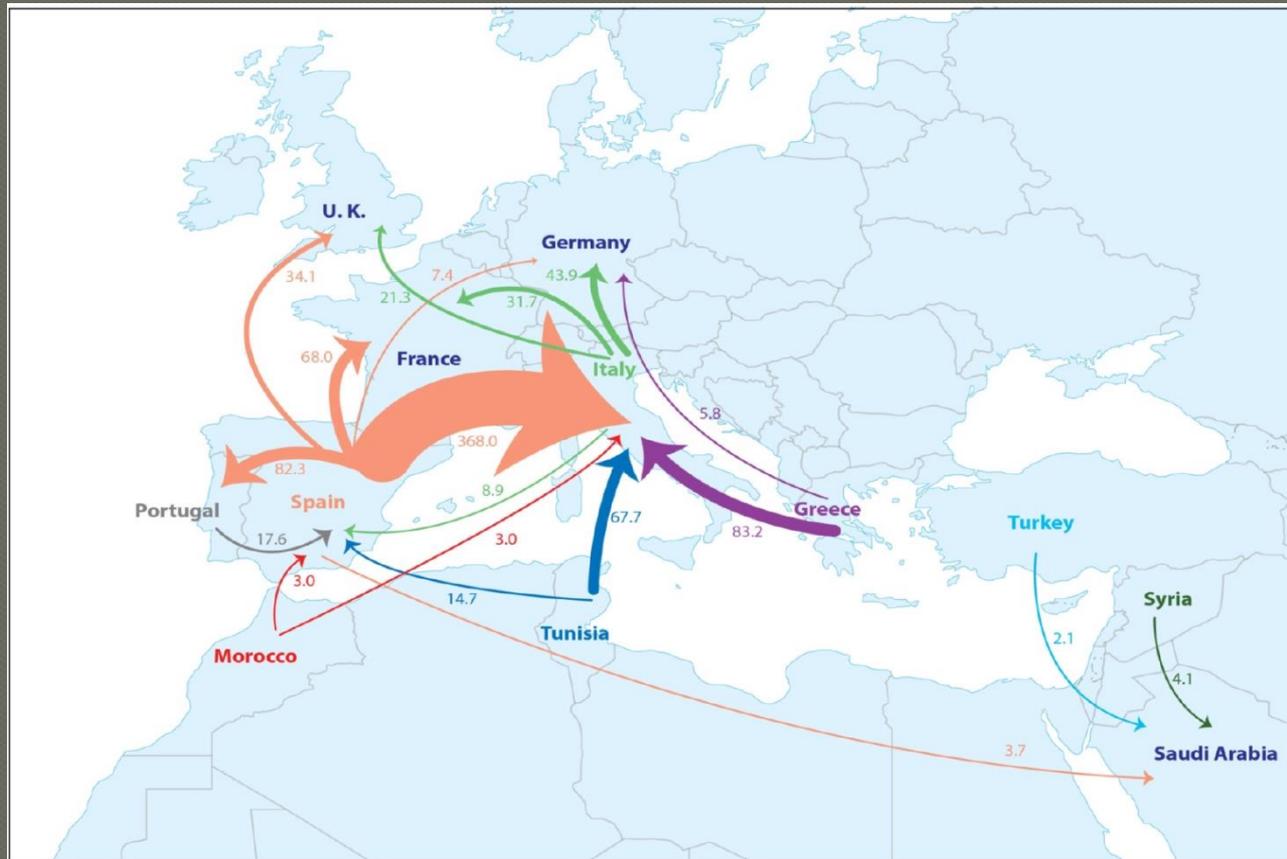
Most Olive Oil Production is in the Mediterranean Basin



Most Olive Oil Production is in the Mediterranean Basin



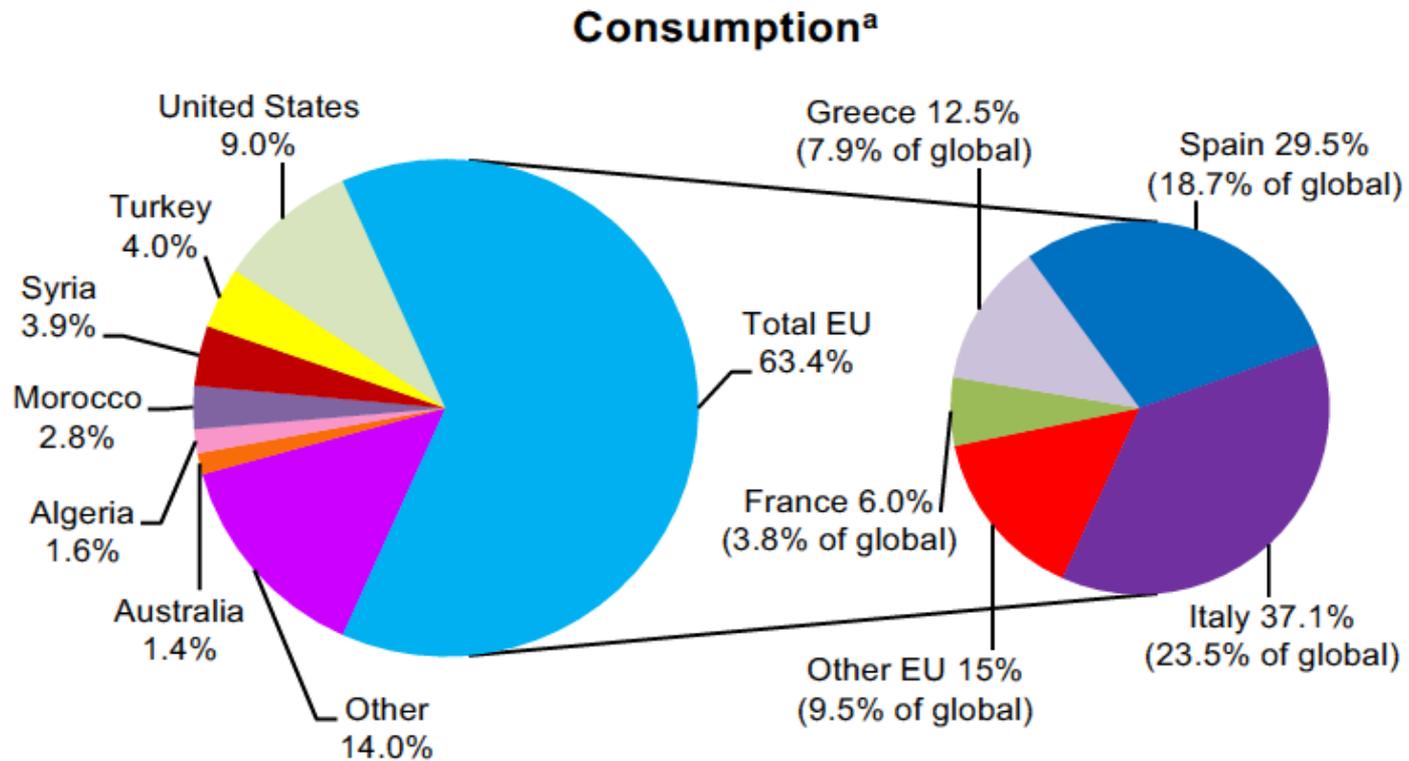
Most Olive Oil is exported from Spain



Source: GTIS, Global Trade Atlas database (accessed June 10, 2013).

Note: Trade amounts are shown in thousands of metric tons.

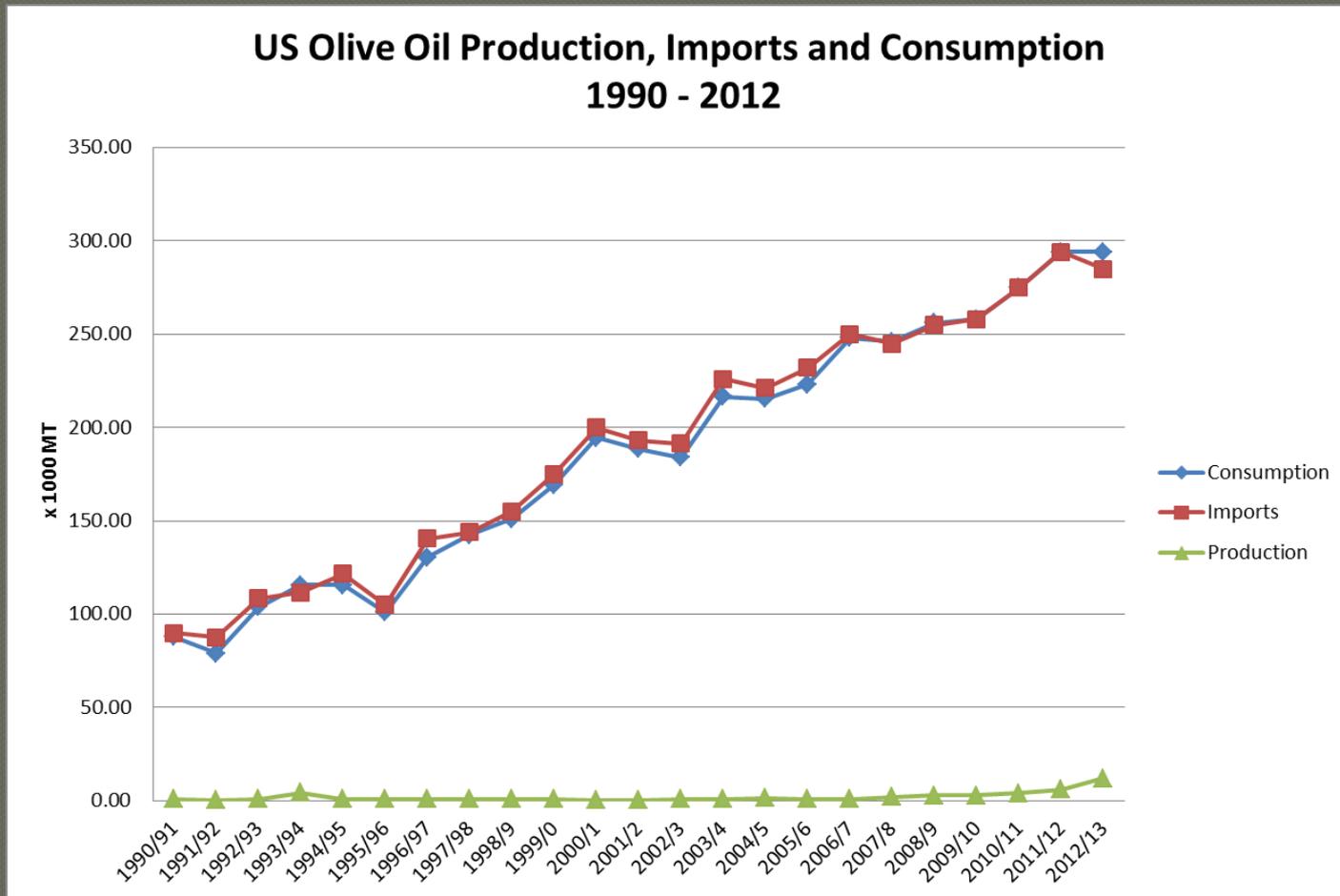
The US consumes much more olive oil than it produces



Total: 3.0 million metric tons

Source: IOC, "Table 4: [World] and [EU] Consumption," November 2012.

The US imports a lot of olive oil



The US is the largest importer of olive oil outside of the Mediterranean Basin

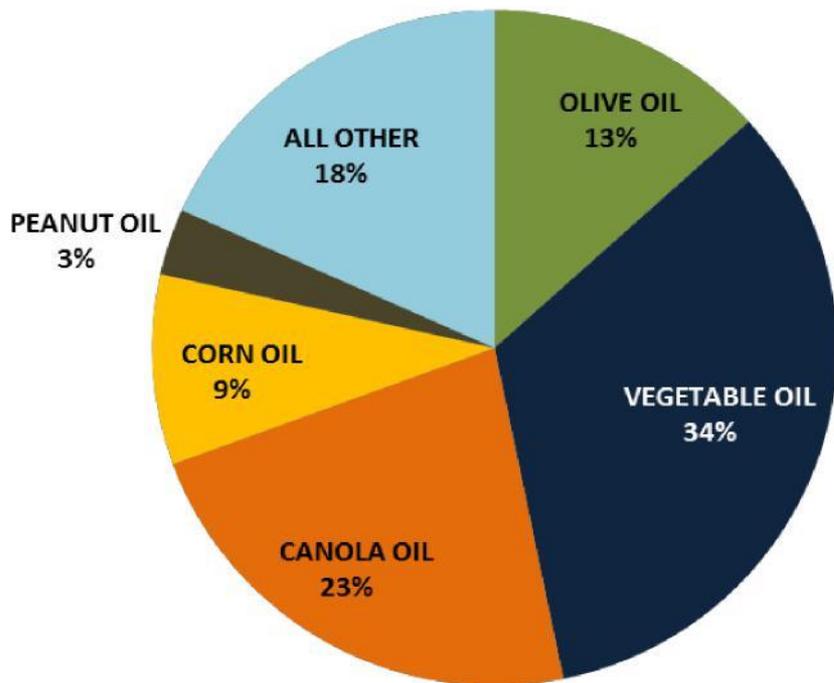


Source: GTIS Global Trade Atlas database (accessed June 10, 2013).

Note: Trade amounts are shown in thousands of metric tons. Intra-EU trade flows are not included.

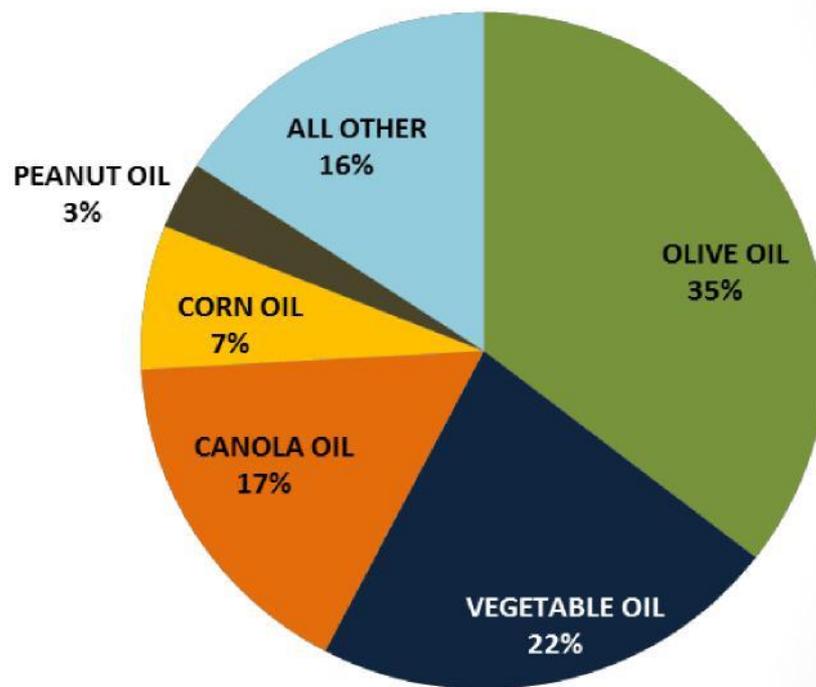


U.S. Pourable Oil Volume



Total Volume Sales: 247.2 Million Gallons
Percent Change vs. Year Ago: +0.5%

U.S. Pourable Oil Value



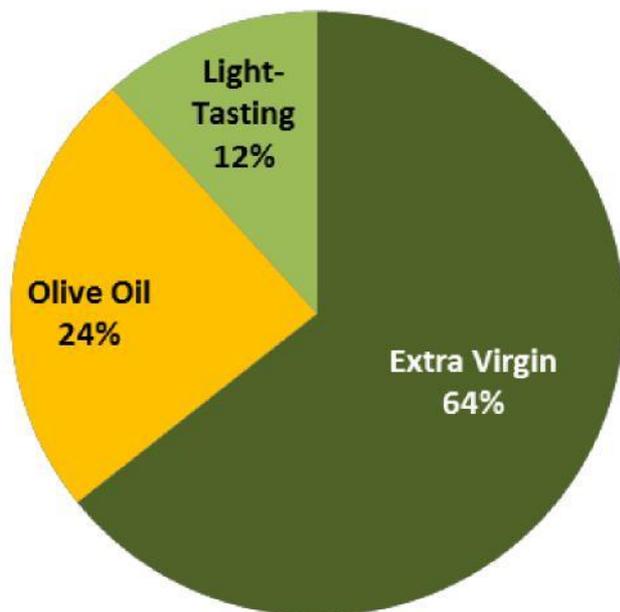
Total Dollar Sales: \$3.03 Billion
Percent Change vs. Year Ago: +1.7%



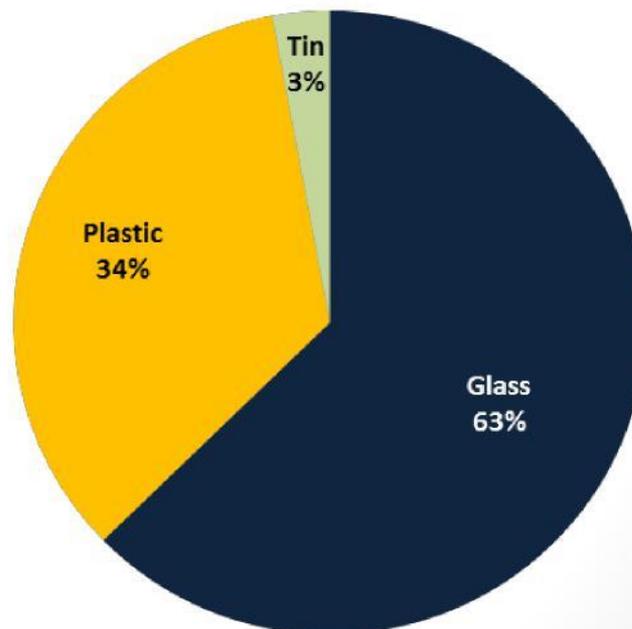
Total US Olive Oil Retail Market

Current 52 Weeks through May 10, 2014				
TOTAL US - XAOC	Liters	Liter % Chg.. Year Ago	Dollars	Dollar % Chg. Year Ago
Olive Oil	123,579,380	-1.9%	\$ 1,070,121,261	6.2%

Liter Share by Type



Unit Share by Package Type

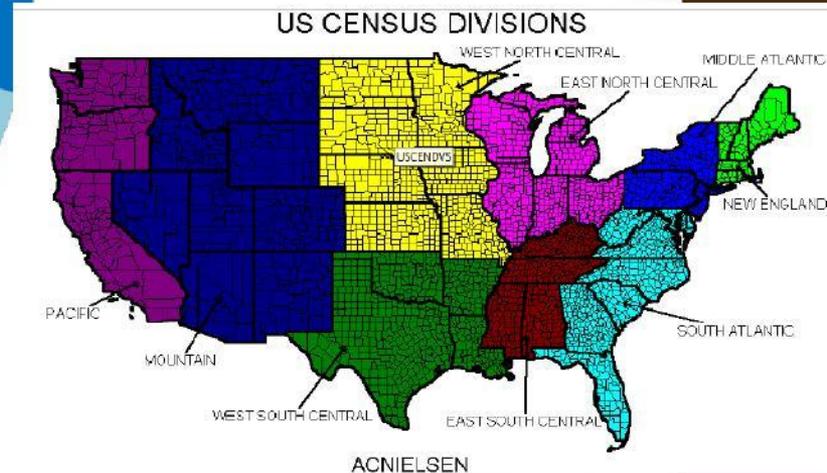
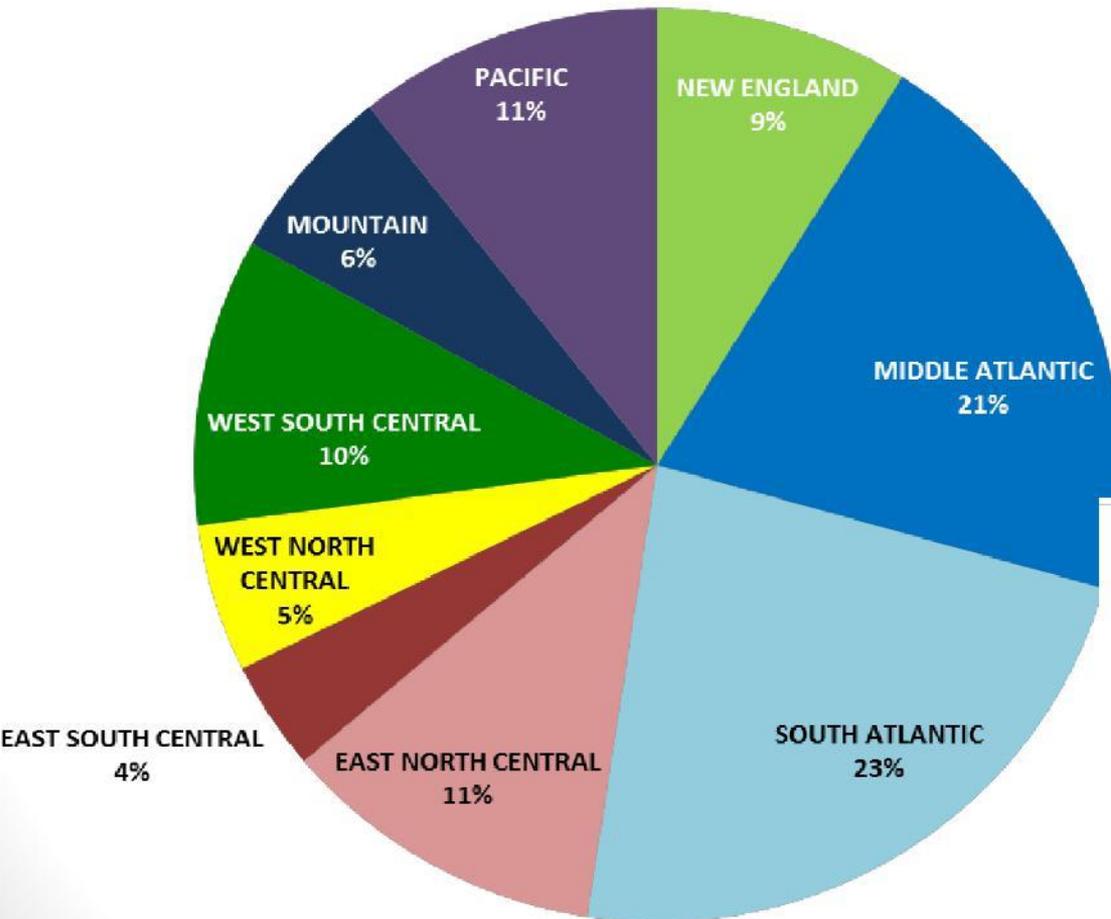


Source: Nielsen 52 Weeks Ending May 10, 2014 (includes Walmart & Club Stores)



Olive Oil Volume by Region

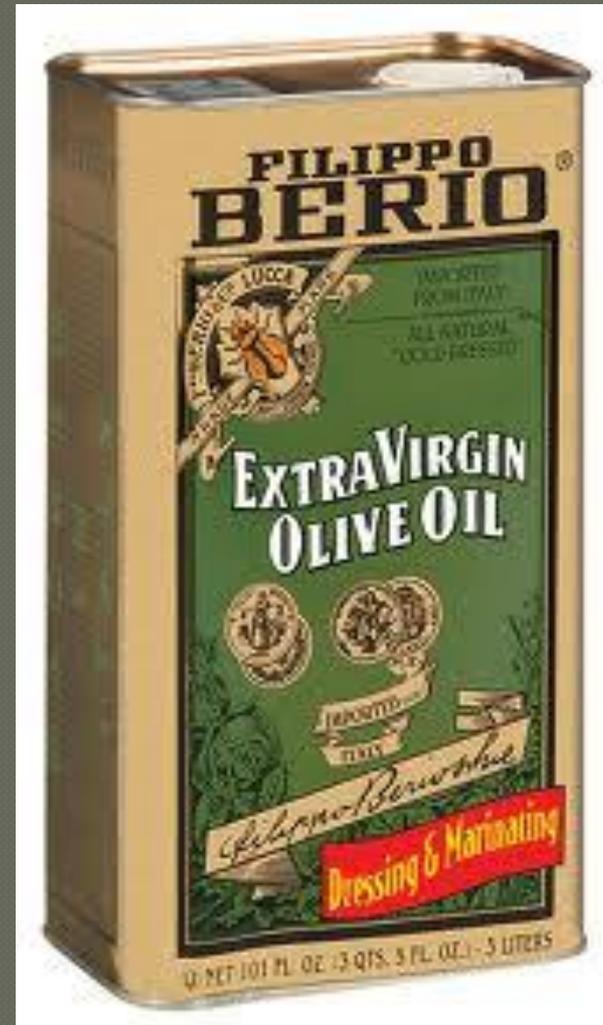
Olive Oil Liters by Region



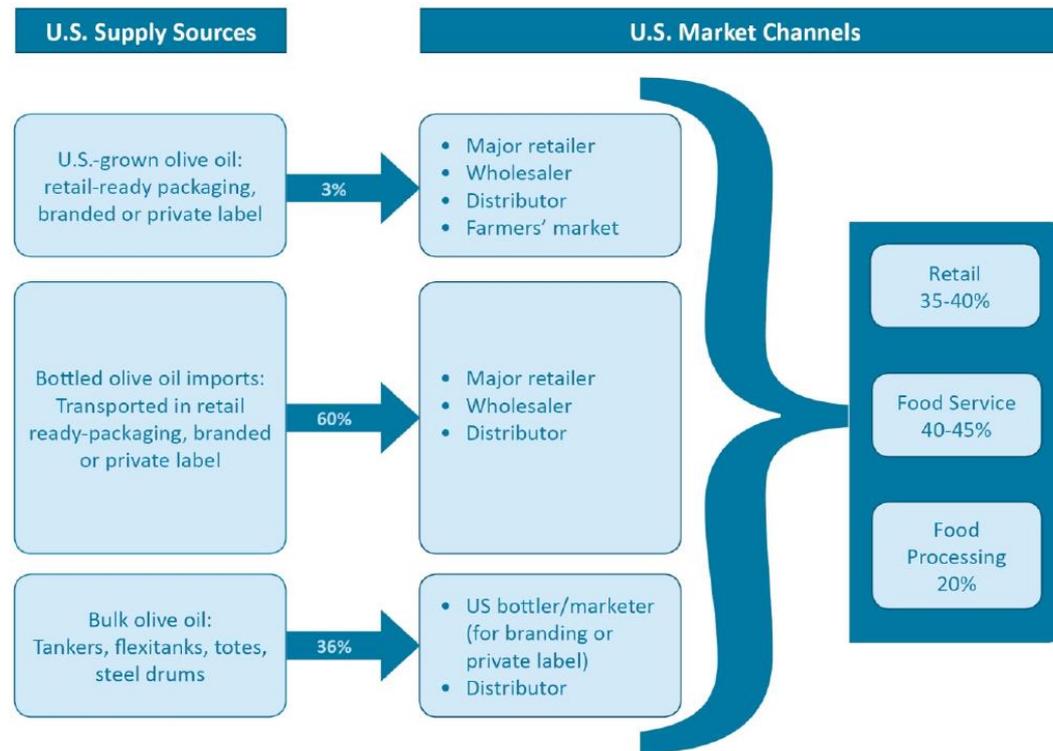
Source: Nielsen 52 Weeks Ending May 10, 2014 (includes Walmart & Club Stores)

Imported Olive Oil

- EU olive oil is subsidized (€217 /ha or \$116/ac)
- “Italian” olive oil is not necessarily from Italy, it could be from Spain or North Africa.
- To supply the US demand, we would need 462,000 acres of olives.
- We have about 40,000 acres.
- About 1100 acres in Imperial and Yuma Counties



The US Olive Oil Market has 3 main components



Source: GTIS, Global Trade Access database (accessed June 19, 2013); Datamonitor, "Study on the promotion of olive oil," January 20, 2010; USITC estimates.

Price of EVOO varies greatly

TABLE 4.2 Average extra virgin olive oil price per ounce by brand, February 2010–February 2013

Brand by type	Average price (\$ per ounce)
Domestic	
California Olive Ranch	0.47
Lodi Olive Oil Company	0.99
Large blenders/bottlers	
Capatriti	^a 0.17
Felipo Berio	0.26
Bertolli	0.26
Star	0.35
Pompeian	0.37
Single source	
Colavita	0.60
Lucini	0.96

Source: Nielsen, U.S. Retail Market Data, 2013.

Marketing Challenges

- It is difficult for domestic oils to compete against imported olive oil considering the subsidies, even in the face of the poor quality of imported oils.
- Most Americans don't know or don't care that their olive oil might not be of the best quality.
- In some trials, Americans actually prefer rancid oil.
- Oil becomes rancid when exposed to light.
- Domestic oil must be marketed as a premium product, superior to the imports.





Many Olive Oil Myths Persist

- The color of olive oil is related to its quality **False** ✓
 - Only 6% know this is false
- Light-tasting olive oil has fewer calories than other olive oils **False** ✓
 - Only 16% of users know this is false
- Like wine, olive oil gets better with age **False** ✓
 - Only 24% know this is false
- Extra virgin olive oil is for cold or raw use only **False** ✓
 - Only 30% know this is false



Domestic Olive Oil



Most oil sold in totes



Desert Olive Farms/Imperial Olive



Queen Creek Olive Mill



Temecula Olive Oil Company



Thank you!

