Mechanical Harvesting
of
California Oil Olives

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Economically Feasible Mechanical Harvesting

Harvester

- Pruning
- Training
- Final Efficiency
- Effects on Quality

Transport to press

High Quality Olive Oil
Oil Olive Production Systems

Traditional
70-100/acre

High Density – Hedgerow
150 – 300/acre

Super High Density
600 – 900/acre
Traditional Harvest Options:

- hand
- harvest aids
- shakers
- picking head harvesters
16 feet
60% of gross return
1:1 ratio $400/ton
Moving platform?
Traditional Training and Pruning
Traditional Pruning
- 11% efficiency
- 73% tree damage
Mature Hedgerow: 2007 - 139 trees/acre
2007 Harvest Season

- **Traditional Pruning**
  - 11% efficiency
  - 73% tree damage

- **Hedgerow Pruning**
  - 81% removal
  - 73% efficiency
  - 1.5 – 2 tons/hour
  - 68 – 93% value
  - 13% tree damage
Mechanically Pruned for Mechanical Harvest
Oil Olive Harvest Systems

Traditional

Harvest Options:
- hand
- shakers
- harvest aids
- picking head harvesters
Oil Olive Harvest Systems

Traditional Harvest Options:
- expensive
- Inefficient
- undeveloped
Oil Olive Harvest Systems

High Density – Hedgerow
- hand harvest
- harvest aids
- shakers
- MaqTec Colossus
Hand held harvesting devices

1:1.2 ratio

$330/ton
Harvesting olives with air powered combs

1:1.8 ratio $222/ton

Harvesting olives with air powered combs
Comb
Rake
Heads
Comb Rake Heads
1:2.6 ratio: $160/ton
1:2.8 ratio: $140/ton
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

<table>
<thead>
<tr>
<th>Tree canopy’s were 11-12 ft. (3.4-3.7 m) high and 7-8 ft (2-2.5 m) in diameter</th>
<th>Hand Pick Buckets</th>
<th>Hand Pick Onto Nets</th>
<th>Pneumatic Combs</th>
<th>Mini Shaker + Poles</th>
<th>Poles Alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. limbs broken/tree</td>
<td>4.16</td>
<td>3.75</td>
<td>18.7</td>
<td>22.3</td>
<td>28.0</td>
</tr>
<tr>
<td>No. fruit damaged/lb.</td>
<td>0.1</td>
<td>4.0</td>
<td>4.2</td>
<td>3.5</td>
<td>5.3</td>
</tr>
<tr>
<td>Minutes/tree/man</td>
<td>20:15</td>
<td>16:30</td>
<td>11:20</td>
<td>7:45</td>
<td>7:10</td>
</tr>
<tr>
<td>Pounds of fruit/man/hr.</td>
<td>39.8</td>
<td>47.8</td>
<td>71.6</td>
<td>103.5</td>
<td>111.4</td>
</tr>
<tr>
<td>Efficiency compared to hand pick into buckets</td>
<td>1.0 a</td>
<td>1.2 a</td>
<td>1.8 b</td>
<td>2.6 c</td>
<td>2.8 c</td>
</tr>
</tbody>
</table>
Trunk shaker and inverted umbrella WRAP AROUND
Spanish Olive Harvester – Wrap Around
California Pistachio Harvester
1:3.2 ratio: $120/ton
### COMPARISON OF HAND HARVEST METHODS IN SIX DIFFERENT ORCHARDS 2003 and 2004

**POUNDS OF FRUIT PER PERSON PER HOUR**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Very large Mission trees 70/acre (light crop)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>62.5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Large Frantoio trees 155/acre (medium crop)</td>
<td>25.0</td>
<td>28.8</td>
<td>-</td>
<td>150.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Medium Tuscan trees 155/acre (heavy crop)</td>
<td>-</td>
<td>28.9</td>
<td>-</td>
<td>326.5</td>
<td>182.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Small-med Tuscan trees 272/acre (medium crop)</td>
<td>22.2</td>
<td>-</td>
<td>-</td>
<td>115.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Italian trial trees  (medium crop)</td>
<td>-</td>
<td>-</td>
<td>68.9</td>
<td>170.2</td>
<td>-</td>
<td>272.0</td>
<td>617.4</td>
</tr>
</tbody>
</table>
MaqTec Colossus
2008 Finca La Bella Table Olive Harvest

- MaqTec Efficiency*
- 99% removal
- 90% efficiency
  - 10% ground
- 24-30 seconds/tree
- Mild tree damage
- 100% fruit damage
  - severe
- * 8.5 tons/ha
Australia Comparison
Colossus vs. Shaker (07)

Colossus
- Work = 24 hrs/day
- Trees/hr = 79
- Ave. kg/tree = 18.0
- Cost/hr = $337.62
- Cost/kg fruit $0.28

Shaker
- Work = 12 hrs/day
- Trees/hr = 74
- Ave. kg/tree = 19.8
- Cost/hr = $200.69
- Cost/kg fruit $0.23

Adolfo Levin
2nd Australia Comparison
Side-by-side shaker – Colossus

- 90-180 trees/hr. (large and small trees)
- 71 to 92% efficiency
- 0.2 to 1.0% canopy damage
- 0.25 to 0.45% trunk damage
- $416/hr
2nd Australia Comparison
Side-by-side shaker - Colossus

- 90-250 trees/hr. (large and small trees)
- 86 to 97% efficiency
- 0.5 to 3.5% canopy damage
- 0.10 to 0.15% trunk damage
- $352.31/hr

Leandro Ravetti
Australian Harvester Comparison
Trees per hour

- **Side-by-side shaker** – 90-180
- **Colossus** – 90-250

Leandro Ravetti
Australian Harvester Comparison
Harvest Efficiency %

- **Side-by-side shaker** – 71-92%
- **Colossus** – 86-97%

Leandro Ravetti
Australian Harvester Comparison
Canopy Damage %

- **Side-by-side shaker** – 0.2-1.0%
- **Colossus** – 0.5-3.5%

Leandro Ravetti
Australian Harvester Comparison Hourly Rate ($AUS)

- **Side-by-side shaker** – $416
- **Colossus** – $352
Oil Olive Harvest Systems

High Density – Hedgerow

- hand harvest: too expensive
- harvest aids: smaller orchards
- shakers: good
- MaqTec Colossus: good
Oil Olive Harvest Systems

Super High Density
- Hand
- Harvest aides
- Shakers
- Over the row harvesters
1:1 ratio $400/ton
1:2.8 ratio: $140/ton
Shaker Harvester

1:3.2 ratio: $120/ton
Beater bars inside the olive harvester
Braud Grape Harvester
Pull Behind
PTO
Straddle
Harvester
10 ft Tall
2nd Australia Comparison

Side-by-side shaker – Braud grape – Gregoire grape – Haslett coffee - Colossus

- 90-180 trees/hr. (large and small trees)
- 71 to 92% efficiency
- 0.2 to 1.0% canopy damage
- 0.25 to 0.45% trunk damage
- $416/hr

Leandro Ravetti
2nd Australia Comparison
Side-by-side shaker – Braud grape – Gregoire grape – Haslett coffee - Colossus

- 400-550 trees/hr. (small trees only)
- 87 to 97% efficiency
- 3.0 to 4.9% canopy damage
- 0.20 to 0.35% trunk damage
- $335/hr

Leandro Ravetti
2nd Australia Comparison

Side-by-side shaker – Braud grape – Gregoire grape – Haslett coffee - Colossus

- 200-350 trees/hr. (small trees only)
- 78 to 94% efficiency
- 3.1 to 6.5% canopy damage
- 0.25 to 0.35% trunk damage
- $444.5/hr

Leandro Ravetti
2nd Australia Comparison

Side-by-side shaker – Braud grape – Gregoire grape – Haslett coffee - Colossus

- 150-280 trees/hr. (small trees only)
- 86 to 94% efficiency
- 3.2 to 5.0% canopy damage
- 0.10 to 0.30% trunk damage
- $272.75/hr

Leandro Ravetti
2nd Australia Comparison
Side-by-side shaker – Braud grape – Gregoire grape – Haslett coffee - Colossus

• 90-250 trees/hr. (large and small trees)
• 86 to 97% efficiency
• 0.5 to 3.5% canopy damage
• 0.10 to 0.15% trunk damage
• $352.31/hr

Leandro Ravetti
Australian Harvester Comparison
Trees per hour

- **Side-by-side shaker** – 90-180
- **Braud grape** – 400-550 (small trees only)
- **Coffee** – 150-280 (small trees only)
- **Gregoire grape** – 200-350 (small trees only)
- **Colossus** – 90-250

Leandro Ravetti
Australian Harvester Comparison
Harvest Efficiency %

- **Side-by-side shaker** – 71-92%
- **Braud grape** – 87-97% *(small trees only)*
- **Coffee** – 86-94% *(small trees only)*
- **Gregoire grape** – 78-94% *(small trees only)*
- **Colossus** – 86-97%

Leandro Ravetti
Australian Harvester Comparison
Canopy Damage %

- **Side-by-side shaker** – 0.2-1.0%
- **Braud grape** – 3.0-4.9% *(small trees only)*
- **Coffee** – 3.2-5.0% *(small trees only)*
- **Gregoire grape** – 3.1-5.5% *(small trees only)*
- **Colossus** – 0.5-3.5%
Australian Harvester Comparison
Hourly Rate ($AUS)

• **Side-by-side shaker** – $416
• **Braud grape** – $335 *(small trees only)*
• **Coffee** – $273 *(small trees only)*
• **Gregoire grape** – $445 *(small trees only)*
• **Colossus** – $352
Harvest Costs - €/kg (Spain)

- **Shaker + umbrella**
  - 0.1 – 0.15 €/kg
  - 1 ha / day

- **Straddle harvester**
  - 0.04 – 0.07 €/kg
  - 3-4 ha / day

Joan Tous 2006
Oil Olive Harvest Systems

Super High Density

- Hand: too expensive
- Harvest aides: too expensive
- Shakers: HD and SHD
- Over the row harvesters: SHD
- MaqTec Colossus: HD and SHD
Economically feasible oil olive harvesting

- Training and pruning
- Continuous
- Integrated pickup and transport
- Monitored and analyzed for cost
- Not harm tree health
Other Considerations

- Abscission Compounds
  - no consistent results
- Postharvest transport and storage
- Postharvest tree treatment
  - Copper applications for olive knot
Questions?

Groups.ucanr.edu/olive_harvest