Mechanical Harvesting of California Oil Olives

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Economically Feasible Mechanical Harvesting

Harvester

- Training
- Pruning
- Final % Efficiency
- Fruit Maturity
- Tree Health
- FDF/fruit weight

High Quality Olive Oil

s. Sergio Castro and Uriel Rosa

Oil Olive Production Systems

Traditional

70 - 100/acre

High Density Hedgerow

150 – 300/acre

Super High Density Hedgerow

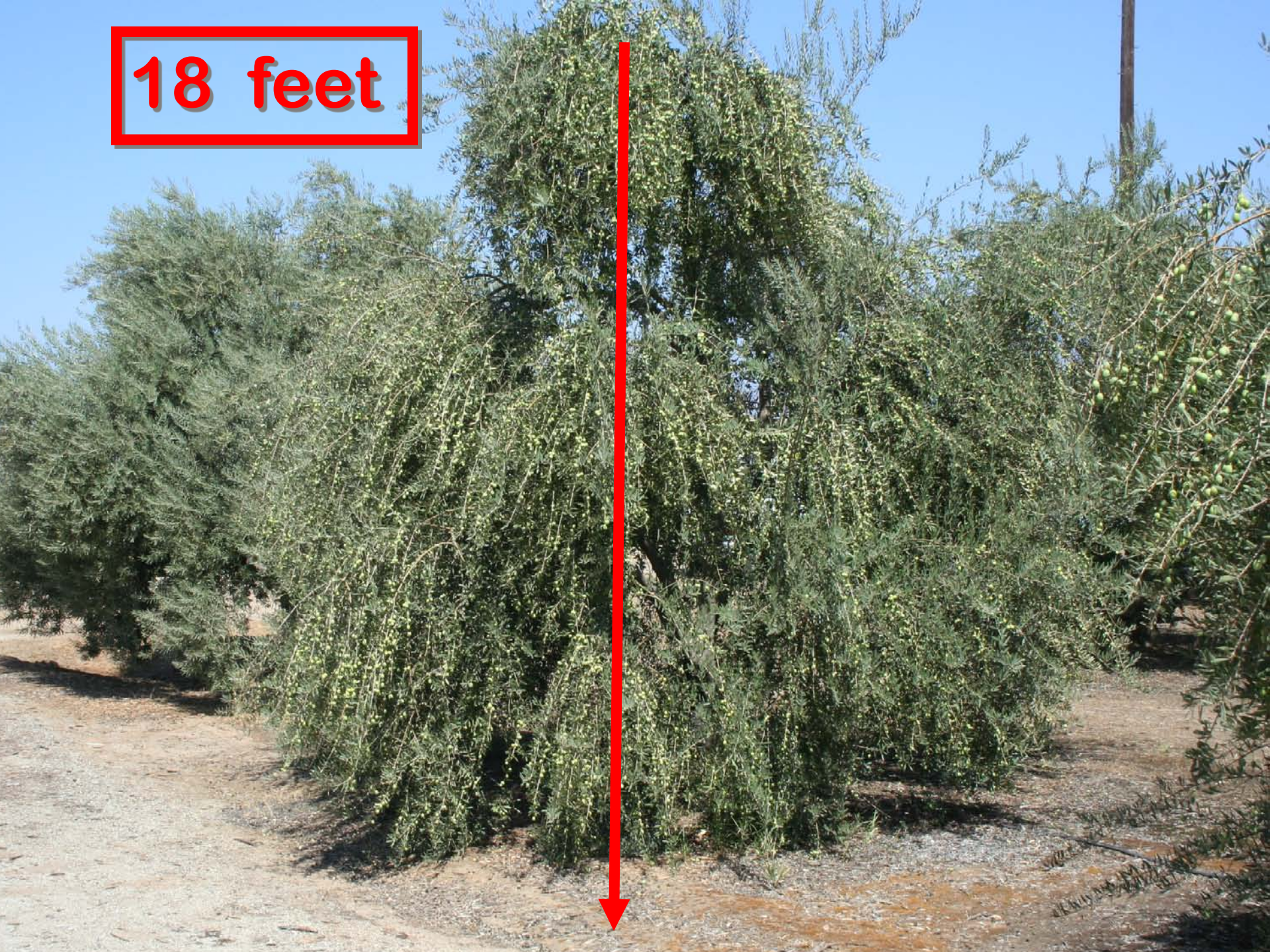
600 – 900/acre

Oil Olive Harvest Systems

Traditional Orchards

Harvest Options:

- Hand
- Picker aides
- Trunk shakers
- Brush head harvesters


18 feet

Oil Olive Harvest Systems

Traditional Orchards

Harvest Options:

- Hand


400/ton: 50% of gross return

Oil Olive Harvest Systems

Traditional Orchards

Harvest Options:

- Hand
- Picker aides

Comb Rake Heads

Oil Olive Harvest Systems

Traditional Orchards

Harvest Options:

- Hand
- Picker aides
- Trunk shakers

Wrap Around Trunk Shaker: 60%

Oil Olive Harvest Systems

Traditional Orchards

Harvest Options:

- Hand
- Picker aides
- Trunk shakers
- Brush head harvesters

DSE 006, 007, 008

Oil Olive Harvest Systems

Traditional Orchards

Harvest Options:

hand, aids, trunk shakers, brush heads

- Inefficient
- Damage unprepared tree

Traditional Orchards are not suitable for mechanical harvesting because the trees are not trained for mechanical harvesting!


Olive orchards
should be developed
with harvesting in
mind!

Goal :
Maximum net return per square meter of orchard floor!

Training and Pruning for Mechanical Harvesting

Light = Photosynthesis

Photosynthesis = Carbohydrates

Carbohydrates = Bloom

Bloom = Olives = Oil


50%
2%

Key components of H-SHD Harvest

- Harvesters :
  - Operating parameters
  - Efficiency
  - Cost
  - Very little is UC data based
    - Why
    - How

Oil Olive Harvest Systems

High Density – Super High Density

- hand harvest
- harvest aids
- bow rod
- trunk shakers
- brush heads

Beater bars inside a moving catch frame

Bow Rod Harvesters

Bow Rod Harvesters

Adapted from Grape Harvesters:

- floatation tires
- double floatation tires
- tread tracks
- self propelled or pull behind

Bow Rod Harvesters

Adapted from Grapes

- 8 - 10 feet internal height
- 4 - 12 feet internal width
- 2.5 – 3 bottom trunk clearance

Bow Rod Harvesters

Efficiencies and speed:

- over 90% efficient
- 1.0 – 1.5 mph = 15 acres/day
  - Slower for heavier crops

Bow Rod Harvesters

Costs: Contract Harvesting

- $325.00 to 350.00 per acre
- $250.00 pre acre for young trees
  - < 5 tons/acre

Bow Rod Harvesters

Acre threshold for ownership:

- $150,000 – $350,000 per machine
- 350 – 400 acres

Bow Rod Harvesters

Problems:

- Rod life of 350 – 400 hours
- Branch damage -> olive knot
- Poor skirting decreases trunk closure

Bow Rod Harvesters

Manufacturers:

- AGH Olivetum: track option
- Korvan
- Gregoire
- Vinestar: pull behind
- Braud New/Holland
- Pellenc


DIESEL
AGH
OLIVETUM
AGH
FRESNO, CA


OLIVETUM
DIESEL
BLUELINE


Gregoire Grape Harvester

Vinestar
Pull Behind
PTO
Straddle
Harvester
10 ft Tall


VINEST


PELLENC
4680

Trunk Shaking Harvesters

Manufacturers:

- ENE Inc
- Coe
- OMC

Trunk Shaking Harvesters

Operating Parameters and costs:

- 4 trees/minute
- catch frame bed 6 – 12 feet
- $200 – $210.00 per acre

Trunk Shaking Harvesters

Problems

- Barking:
  - Clamp @ 800 PSI
  - Longer pads for better trunk contact
  - Modified padding material
- Harvests better closer to origin of shake

Trunk Shaking Harvesters

Manufacturers:

- ENE Inc
- Coe
- OMC

ENE Inc. California Prune Harvester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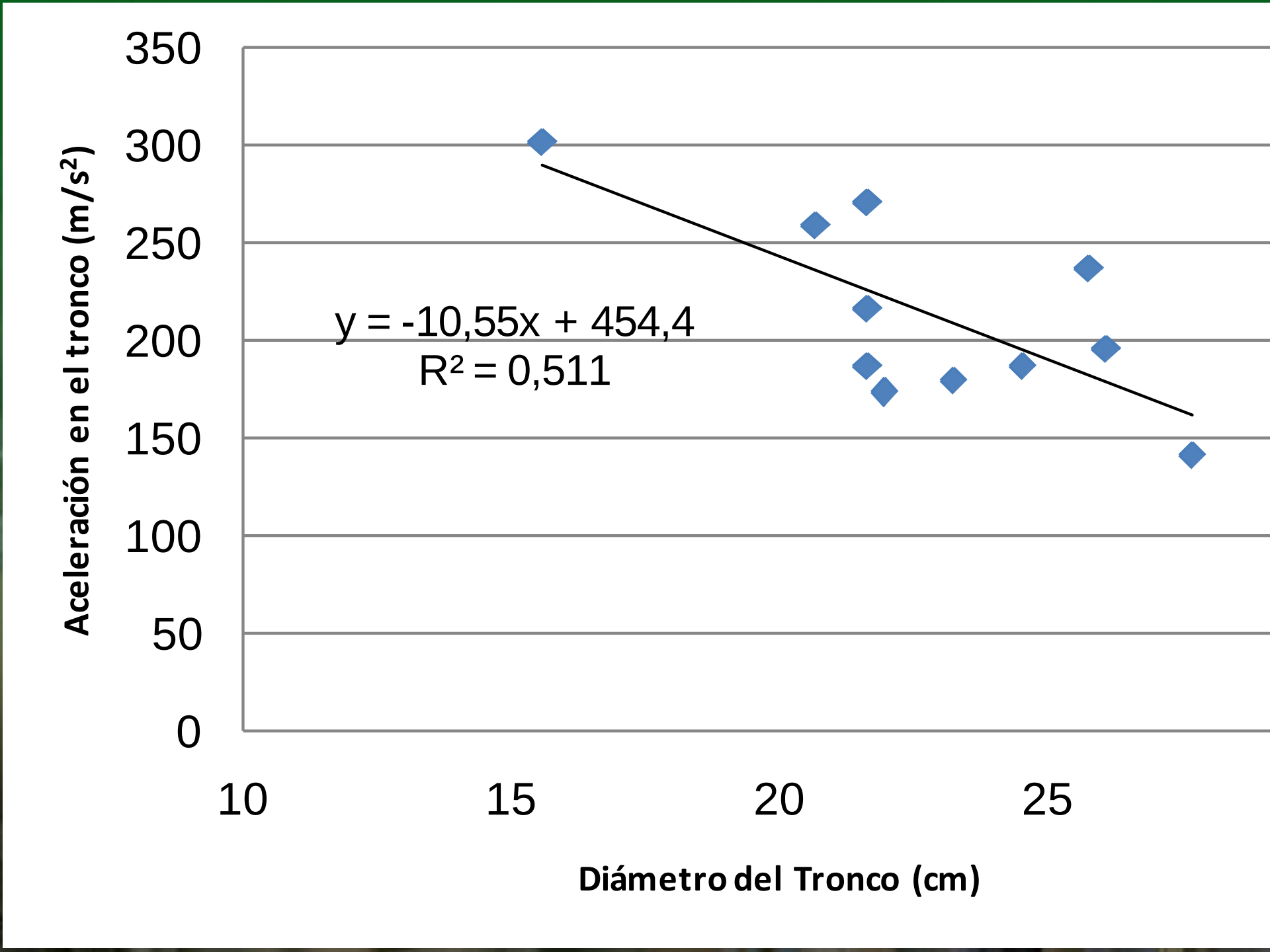
350
300
250
200
150
100
50
0
Aceleración en el tronco (m/s²)
y = -10,55x + 454,4
R² = 0,511
10
15
20
25
Diámetro del Tronco (cm)


Coe Pistachio harvester


TUFF SHED


OMC
ORCHARD MACHINERY CORPORATION
CHICO 530-892-2822
YUBA CITY 530-673-2822
MODESTO 209-669-2522
TULARE 559-688-2081
www.shakermaker.com


SHOCKWAVE
C/A VI
WARNING
ONTORO OLIVES


AFTERSHOCK
SHOCKWAVE
C/A VI
MONTORO OLIVES
SHOCKWAVE
C/A VI

Brush Head Harvesters

Brush Head Harvesters

Operating Parameters:

- MacTeq Colossus: Manzanillos in Argentina
  - 10-15 sec/tree
  - 97% removal
- Agright Olivia
  - 69% poorly prepared table olives

Brush Head Harvesters

Manufacturers:

- Agright Olivia
- Oxbo Citrus Harvester
- Coe Pomegranate Harvester
- MacTeq Colossus
- Haslett Coffee Harvester

Agright Olivia

Coe Pomegranate Harvester

OXBO Citrus Brush Head Harveste

MacTeq Colossus


Colossus Florida


Colossus
1


Haslett Coffee Harvester

DSE 006, 007, 008

Australia Comparison Colossus vs. Shaker (07)

Colossus

- Trees/hr = 79
- Cost/kg fruit $0.28

Shaker

- Trees/hr = 74
- Cost/kg fruit $0.23

Adolfo Levin

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

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 dam
- $335/hr

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

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

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 damag
- $352.31/hr

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

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%

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

Oil Olive Harvest Systems

High Density and Super High Density

- Hand: expensive, slow
- Harvest aides: expensive, slow
- Shakers: HD and SHD
- Over the row harvesters: SHD
- Brush Heads: HD and SHD

Conclusions

Economically feasible oil olive harvesting

- ✓ Spacing
- ✓ Training and pruning
- ✓ Continuous harvesting
- ✓ Integrated pickup and transport
- ✓ Monitored and analyzed for cost
- ✓ Not harm olive oil quality
- ✓ Not harm tree health

Other Considerations

- Abscission Compounds
  - no consistent results
- Postharvest transport and storage
  - 5 – 10 mm/CO2/Kg/H @ 41*F (5*C)
- Postharvest tree treatment
  - Immediate/as needed copper for olive knot

Questions?