

# Canopy Management

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9<sup>th</sup> Advances in  
PISTACHIO PRODUCTION  
November 9<sup>th</sup> 2020

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## Canopy Management

- What
- Why
- When
- How (and who)
  - Hand
  - Mechanical
- Economics
  - Hand
  - Mechanical



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## Canopy Management: What

- What is Canopy Management?
  - **mature tree pruning: 6-8 -> lifespan**
- Decisions to achieve desired canopy configuration:
  - Height
  - Volume
  - Accessible trunk
  - Branch and shoot orientation
  - Light penetration
  - Net Profit

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## Canopy Management: Why

- Why prune a mature tree:
  - Orchard operations
    - Spraying
    - Harvesting
  - Ensuring good annual crops
    - Light Interception
      - 80% of the orchard floor
    - Light penetration into the canopy
    - Branching
      - More bearing points
    - Annual yields
      - Alternate bearing

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## Canopy Management: Why

- Why prune a mature tree?
  - Orchard operations:
    - Spraying
    - Harvesting

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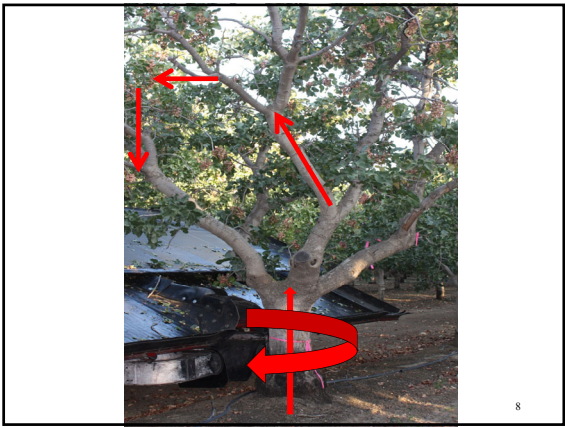
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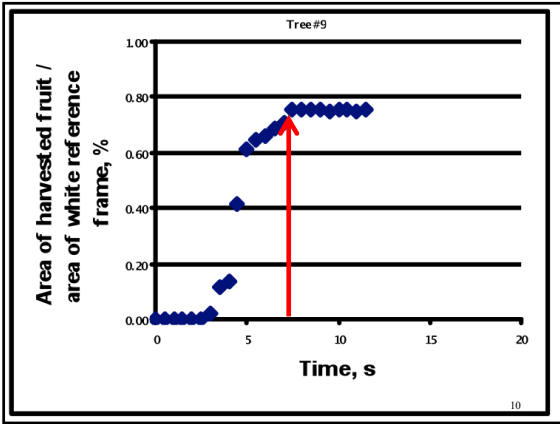
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### Canopy Structure: Harvest

- Compact and upright
- accessible trunk
- Scaffolds:
  - Upright
  - Short
  - Stiff
- Canopy thinned
  - No damping
- Circle ties

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### Canopy Management: Why

- Why prune a mature tree ?
  - Ensuring good annual crops:
    - Light Interception
      - 80% of the orchard floor
    - Light penetration

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**Canopy Management: Why**

- Why prune a mature tree?
- Branching:
  - More leaves
  - More bearing points: buds
    - Components of yield:
      - More buds = clusters
      - More nuts
      - Bigger nuts

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## Canopy Management

- Why prune a mature tree?
- Control Alternate Bearing



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Mechanical topping mitigated alternate bearing:

- Topping was more effective than hedging
- Was most effective prior the low crop year

HORTSCIENCE 30(7): 1369-1372. 1995.

### Mechanical Topping Mitigates Alternate Bearing of 'Kerman' Pistachios (*Pistacia vera* L.)

L. Ferguson<sup>1</sup>, J. Maranto, and R. Beede  
Department of Pomology, University of California, Kearney Agricultural  
Center, 9240 South Riverbend Avenue, Parlier, CA 93648

Additional index words: *Pistacia atlantica*, hedging, pruning, nut quality, blanks, shell  
splitting

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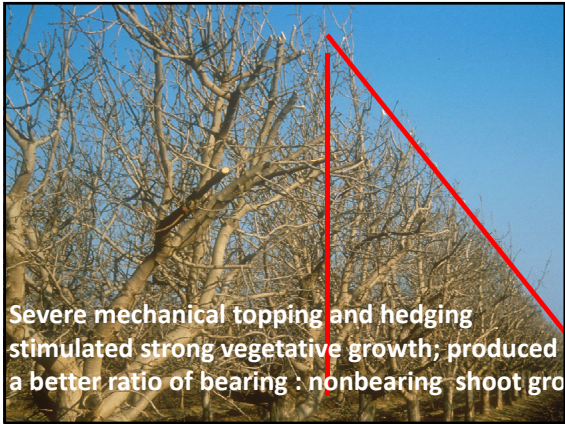
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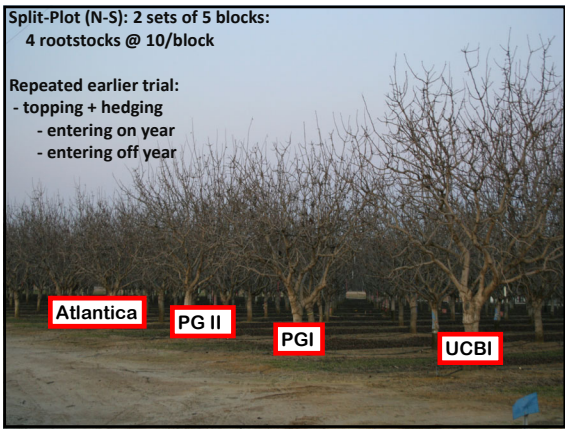
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Rootstock	Topped & Hedged	Alternate Bearing Index	Average Lbs./Acre @ 128 trees/acre on or off year * Average of 6 year total
<i>P. Atlantica</i>	ON	.79	3552
<i>P. Atlantica</i>	OFF	.41	4049 (3800)*
<i>P. Integerrima</i>	ON	.55	4538
<i>P. Integerrima</i>	OFF	.21	4924 (4731)*
<i>P. Integerrima X P. Atlantica</i>	ON	.27	5442
<i>P. Integerrima X P. Atlantica</i>	OFF	.27	5425 (5433)*
<i>P. Atlantica X P. Integerrima</i>	ON	.29	5445
<i>P. Atlantica X P. Integerrima</i>	OFF	.30	5823 (5634)*

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## •Conclusions and Implications:

- 1995/2018 data consistent
  - *P. atlantica* \*
    - 2018 data demonstrated an interaction between rootstock vigor and mechanical pruning that affected alternate bearing
      - *P. integerrima* = PGI \*
      - *P. atlantica* x *P. integerrima* = UCBI \*
      - *P. integerrima* x *P. atlantica* = PGII \*
- \* *Seedling Rootstocks*

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## Canopy Management: When

- Start when:
  - 6-8 years



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## Canopy Management: When

- Ends when:
  - bearing life



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## Canopy Management: When

- When during the season:
- December and January
- Dormant season:
  - Before hormone auxin starts suppressing bud break of lateral buds

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## Canopy Management: When

- Hormone:
- is a chemical produced in one place
- has a target elsewhere in the plant
- is a control chemical:
  - obtaining food and/or nutrients
- Auxins

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## Canopy Management: When

- Auxins:
- Produced in the stem, buds, and root tips
- Maintain apical dominance
- Enforce dormancy of lateral, subterminal, vegetative buds
- Removing apical bud stops auxin distribution that:
  - Inhibits lateral vegetative bud break

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## Canopy Management: When

- Want to prune before:
  - the apical bud breaks dormancy
  - suppresses vegetative bud break



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## Canopy Management: How

- Hand
- Mechanical + hand pruning



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## Two Pruning Methods

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>• Hand</li><li>• <b>Advantages</b><ul style="list-style-type: none"><li>• precise</li></ul></li><li>• <b>Disadvantages</b><ul style="list-style-type: none"><li>• Expensive</li><li>• Time Consuming</li><li>• Difficult to teach</li></ul></li></ul> | <ul style="list-style-type: none"><li>• Mechanical</li><li>• <b>Advantages</b><ul style="list-style-type: none"><li>• Less expensive</li><li>• Decreases Alternate Bearing</li></ul></li><li>• <b>Disadvantages</b><ul style="list-style-type: none"><li>• Indiscriminate</li></ul></li></ul> |
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## Canopy Management: How

- **Function:** expose leave to light
- **Objective:** harvestable tree and yield
- **Assumptions:**
  - **Bigger tree: higher yield**
  - **Hand pruning: better horticulturally**
- **Decision:** sustainability and economics

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## Canopy Management Requirements:

- **Know difference between;**
  - **fruiting bud**
  - **Vegetative bud**
- **Know the bearing habit**
  - **Apically dominant**
- **Know the cut and response**
  - **Heading**
  - **Thinning**
- **Recognize the tree shape you want**

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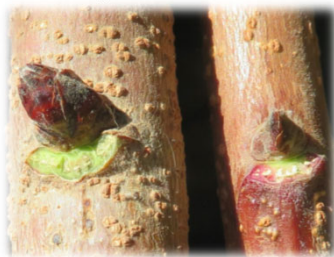
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## Canopy Management Requirements:

- **Know difference between;**
  - **Fruiting bud**
  - **Vegetative bud**



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## Canopy Management Requirements:

- Recognize bud transition on a branch



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## Canopy Management Requirements:

- Understand bearing habit:
- Fruit on:
  - 1 year wood



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## Canopy Management Requirements:

- Understand bearing habit:
  - Apically dominant:



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## Canopy Management Requirements:

- Know the cut and the response:



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## Types of Pruning Cuts

- **Heading cuts:** shoot is cut in half
  - basal portion with less buds remain
  - removes stored carbohydrates
    - subtending and proximal shoot growth
- **Thinning cuts:** entire shoot is cut off at base
  - Destroys apical dominance

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## Heading Cut: Destroys Apical Dominance

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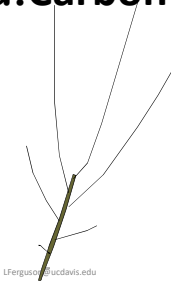
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# Heading Cut: Alters Bud:Carbohydrate Ratio

Encourages shoot  
growth



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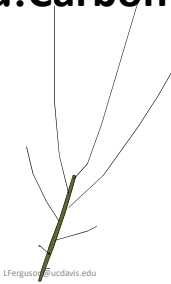
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# Heading Cut: Alters Bud:Carbohydrate Ratio

Encourages shoot  
growth



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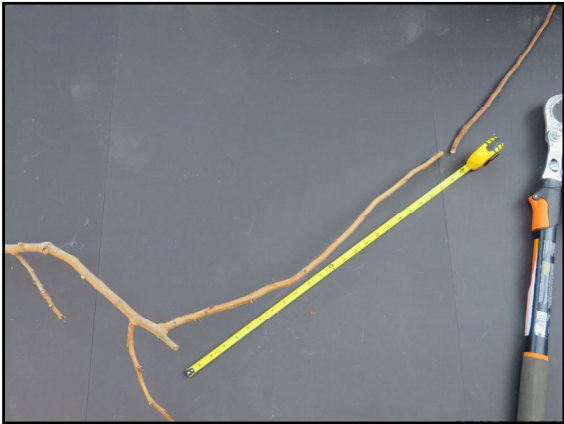
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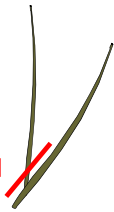
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## Thinning Cut: Removes Entire Shoot

Does not alter  
bud:carbohydrate ratio

- less response
- tree canopy is thinned
- letting light enter



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## Thinning Cut: Removes Entire Shoot

Does not alter  
bud:carbohydrate ratio

- less response
- tree canopy is thinned
- letting light enter



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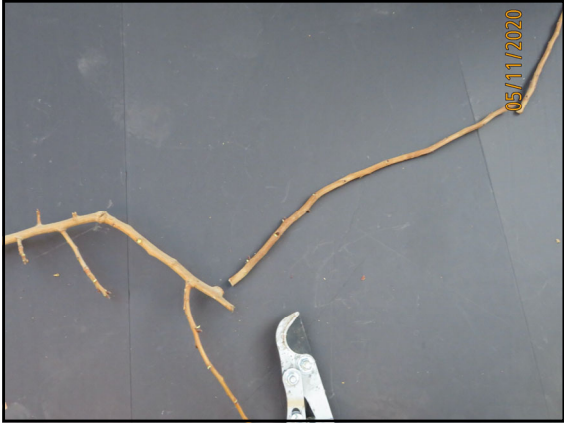
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### Canopy Management Requirements:

- Recognize tree shape you want.



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### Desired Canopy Structure

- Compact and upright
- accessible trunk
- Scaffolds:
  - upright
  - short
  - stiff
- Canopy thinned
  - No damping



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# Canopy Management

- How to hand prune
  - Four steps
    - One: Low, flat, overlapping broken branches
      - won't shake, broken by harvester
      - thinning cut
      - loppers, saw
    - Two: Outside thinning cuts
      - push the canopy up
      - < 45° angle
      - loppers
    - Three: Inside heading cuts
      - snakes
      - loppers
    - Four: Tip the whips
      - tip the top canopy
      - pole pruners

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# Pruning Tools:



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# Canopy Management

- How to hand prune:
  - Four steps
    - One: Low, flat, overlapping broken branches
      - won't shake, broken by harvester
      - thinning cut
      - loppers, saw

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### How to Prune...

- Do not cut branches flush with trunk
- Preserve branch collar = ridge in bark around base of branch
- Branch collar contains cells that make woundwood which grows over a pruning cut
- Branch collar also makes compounds to defend tree against decay
- Do not paint or tar wounds




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### How to Prune...

- Use a three-cut system for branches larger than 2.5 cm
- Prevents bark tearing or damage to remaining branch
- 1<sup>st</sup> cut: 1-2 inches from branch union
- Cut  $\frac{1}{3}$  to  $\frac{1}{2}$  way through the branch from underneath (undercut)
- 2<sup>nd</sup> : A few cm up, cut from above, removing the branch.
- Make the final cut just above branch collar




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## Canopy Management

- How to hand prune
  - Four steps
    - Two: Outside thinning cuts
      - push the canopy up
      - < 45° angle
      - loppers
      - pole pruners

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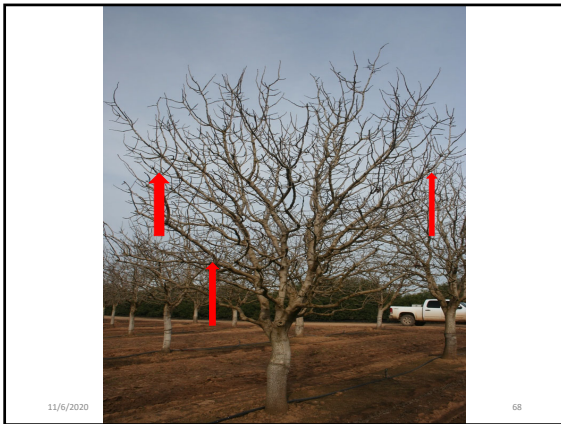
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## Canopy Management

- How to hand prune
  - Four steps:
    - Three: Inside heading cuts
      - snakes
      - loppers or saw

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# Canopy Management

- How to hand prune
  - Four steps:
    - Four: Tip the whips
      - tip the top canopy
      - pole pruners

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# Canopy Management

- Mechanical pruning:
  - Annual Topping
  - Every other year hedge
    - every other row middle
    - cross hedge
  - Orchard Floor Maintenance



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## Canopy Management Costs

### Hand:

- \$300-500/acre
- Includes stacking shredding
- Trained crew

### Mechanical:

- topping, hedging:
  - \$28-35/acre/each
- If 5 mph:
  - good orchard floor
  - 40% less
- With hand cuts:
  - \$150/acre

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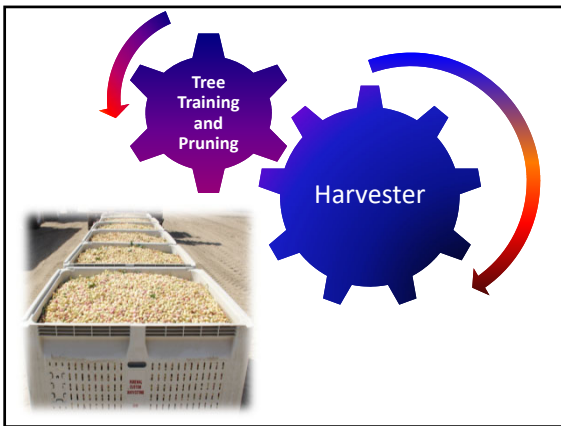
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## Canopy Management

- What
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- When
- How (and who)
  - Hand
  - Mechanical
- Economics
  - Hand
  - Mechanical



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## Pistachio Production Manual

<https://anrcatalog.ucanr.edu/Details.aspx?itemNo=3545>

<https://www.youtube.com/watch?v=ZRKDbcOWoZY>

<https://www.youtube.com/watch?v=k8xAWLEmkrU>

<https://www.youtube.com/watch?v=T3-YMHDI0E>

<https://www.youtube.com/watch?v=fs6wtsoPBbl&t=1s>



**9<sup>th</sup> Advances in PISTACHIO PRODUCTION**  
November 9<sup>th</sup> 2020

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## Questions ?

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**9<sup>th</sup> Advances in PISTACHIO PRODUCTION**  
November 9, 2020

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