Growing A 2 Billion Pound Crop…
It’s a Game Changer
Continuing Education Units are available for most sessions.

Please check in at the CEU desk in the Doubletree Hotel lobby for details and instructions.
Be sure to visit the Almond Board booth #237 in the Exhibit tent to pick up your copy of the Research Update (formerly known as the Proceedings)
Growing A Two Billion Pound Crop…
It’s a Game Changer

Moderator: Bob Curtis, ABC

Presenters:
John Edstrom, UC Emeritus Farm Advisor
Mario Viveros, UC Emeritus Farm Advisor
Walt Bentley, UC IPM Entomologist
Growing a 2 Billion Pound Crop

Bob Curtis, Moderator
Milestones

Production Efficiency

Substantial Yield Increases average yield has doubled over the last 20 years

“Good” yield has increased from 2,000 in the 1980’s to current 3000+ kernel pounds per acre

• Newer variety groupings with tighter bloom overlap, single row plantings
• Advances in micro-irrigation and fertigation, irrigation scheduling, nutrition, tree spacing, minimal pruning

Average Yield/Acre (Lbs.)

* Objective Estimate
Leadership in IPM and Environmental Stewardship

Navel orangeworm (NOW) damage reduced 8.8% in 1978 to ≤ 1%

- Current crop year rejects are at an all time low of 0.68%
- Reduction in associated aflatoxin risk

Recognized 4 times for environmental stewardship by CA DPR and US EPA

1. IPM program for navel orangeworm
2. Steadfast commitment to reducing the impact of agricultural pesticides
3. Leadership role in developing and facilitating sustainable agricultural techniques and practices
4. Seasonal Guide to Environmentally Responsible Pest Management

CA Almond Sustainability Program now underway

% REJECTS

* Receipts to date
Fundamental Changes in Production

John P. Edstrom, UCCE Farm Advisor Emeritus
Planting on Marginal Soils
Former Sheep Ground Planted to Almonds
Using Latest Technology?
Advances in Growing Practices

- Micro-irrigation Systems & Precise Water Application
- High-density Plantings
- Soil Modification & Amendments
- Minimum & Machine Pruning
Flood & Sprinkler Pipe Irrigation...
Precise Irrigation Management

Start with Etc as general guideline but also use...

Probes - soil monitoring

Pressure chamber - tree water stress

Dendrometer - limb growth
Adopt of High Density Plantings

Old Standard
30’ x 30’

High Density
15’ x 22’
Fills canopy early
Soil Modification & Amendments?
Standard vs Minimum Pruning
But, if these practices are taken to the extreme or used on prime soil....
Consequences of Dense, High Vigor Orchards

Increased disease problems
✓ *alternaria, rust, scab & hull rot*

Shaker damage
✓ *Ceratocystis cankers*

More shading and stagnant air
✓ *Delays crop maturity & hull drying*
Early Defoliation Debilitates

Alternaria leaf spot

Scab

Leaf Rust
High Water & Nitrogen Favors..

Fruitwood dieback from hull rot

Increased disease = more fungicides & higher costs
And May Also Require Machine Hedging.
Today’s high input production systems produce early, ultra-high yields but, often result in more problems and increased costs, especially on fertile or deep soils.

Be careful where you apply these practices
Past Successes to Future Challenges
Mario Viveros, UC Farm Advisor Emeritus, Kern County
Cooperators

Belridge Farming Company
Tejon Ranch
Kern Farming Company
Visser Farms
Vetsch Farms of California
Paramount Farming Company
Researchers

Beth L. Teviotdale
Bruce Lampinen
Dale E. Kester
David A. Goldhamer
Ken A. Shackel
Norman McGilbert
Tom Gradziel
Warren G. Micke
## Kern Almonds (1979)

<table>
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<tr>
<th>Category</th>
<th>Number</th>
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<td>Bearing</td>
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<td>Yield (lbs/Acre)</td>
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<td>Average</td>
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<td>Good Grower</td>
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Cultural Characteristics

Cost of production $900-1100
Frost minimal risk
Diseases none
Insects NOW
Varieties

Nonpareil-Merced-Mission
Nonpareil-Carmel- Price
Nonpareil-Carmel
Arrangement 2:1
The Dream 1980’s
2,000 Meat lbs/Acre
Research That Change Production Practices

Regional variety plots
Pruning (Training)
Noninfectious bud failure
Post harvest irrigation
Regional Variety Plots

Established

- 1973
- 1986
- 1993

Purpose

- Assessed Variety performance under commercial conditions.
Information Acquired

Nonpareil yield increase in 1:1 arrangement

Bloom overlap

Butte high yield potential

Variety releases
  - Sonora
  - Solano
  - Padre
  - Winters
Tree Training (Pruning)
The Concept

Short Pruned trees

- 1\textsuperscript{st} Dormant, 3 scaffold, 12 inches long
- 2\textsuperscript{nd} Dormant, 2 scaffolds per primary cut, 36 inches long

Long pruned trees

- 1\textsuperscript{st} Dormant, 3 to 4 scaffolds left alone
- 2\textsuperscript{nd} Dormant, eliminate limbs in center and problem limbs
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<tr>
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<tr>
<td>Long Nonpareil</td>
<td>192 lbs/A</td>
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<td>Carmel</td>
<td>422 lbs/A</td>
<td>1,628 lbs/A</td>
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<td>Short Nonpareil</td>
<td>28 lbs/A</td>
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<td>Carmel</td>
<td>45 lbs/A</td>
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Noninfectious Bud Failure
Assessment of Nonpareil and Carmel Clones
Nonpareil clone 2-70 with low BF potential
Single-Tree progeny testing for Carmel
Post Harvest Irrigation
A Difficult Task

Irrigation System
• 80% Flood
• 16% Solid set
• 4% Drip

Varieties
• Nonpareil-Merced-Mission
• Arrangement 2:1
Severe Defoliation

No irrigation during harvest
Bud Drop-Merced and Carmel

No post harvest irrigation
Post Harvest Irrigation Demonstration

Tonny Visser
80 acre orchard
• 40 post harvest irrigation
• 40 no irrigation
Drought 1987-1992
Regulated Deficit Irrigation Experiment
Yield (lbs/Acre) Effect Due to Pre Harvest Irrigation and Post Harvest Irrigation

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<th>Post harvest Irr</th>
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<td>Irrigation Cutoff (days)</td>
<td>Hull rot S.</td>
<td>% Hull split</td>
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Post Harvest Irrigation

Increase yields beyond 2,000
Regulated Deficit Irrigation for hull rot control
A New Challenge:
5,000 lbs/Acre at Low Cost

Possible?
Sustainable?
Low cost?
The Present Efforts
High Density Planting

Advantages
• Early production
• High yields

Disadvantages
• High costs
  . Trees
  . Pruning
  . Sanitation
  . Harvest
  . Disease Control
High Density Plantings May Not Mean 5,000 lbs/acre
Requirements For Top Yields (5,000 ?)

- Tree density should fit the soil
- Soil free of water penetration problems
- Well design irrigation system
- Good irrigation and fertilization practices
- Good horticulturist
Growing a 2 Billion Pound Crop

Walt Bentley, UC IPM Entomologist