Growing A 2 Billion Pound Crop… It’s a Game Changer

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CEU Credits

Continuing Education Units are available for most sessions.

Please check in at the CEU desk in the **Doubletree Hotel lobby** for details and instructions.

Research Update

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

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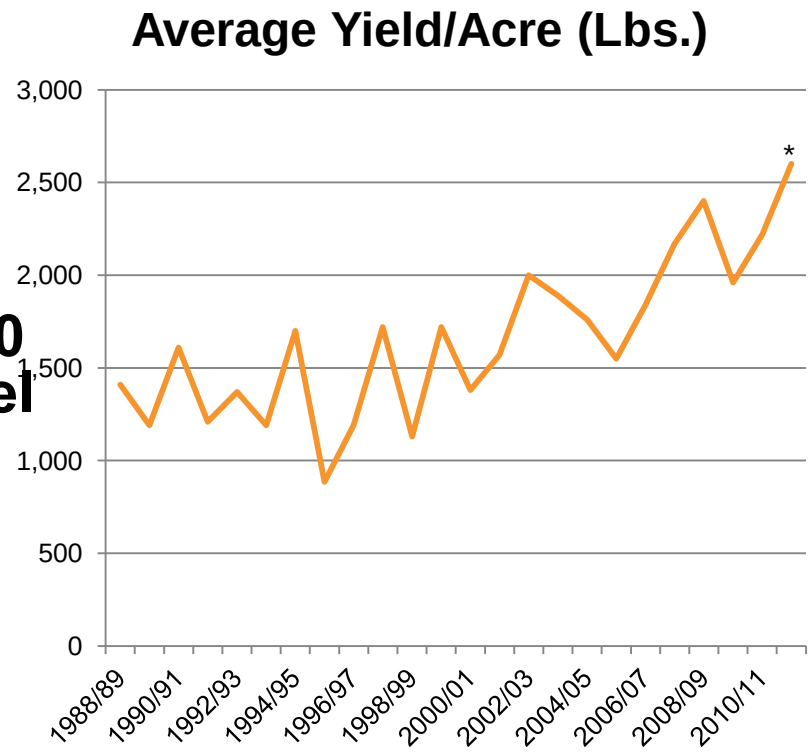
Milestones

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**



* Objective Estimate

Milestones

Leadership in IPM and Environmental Stewardship

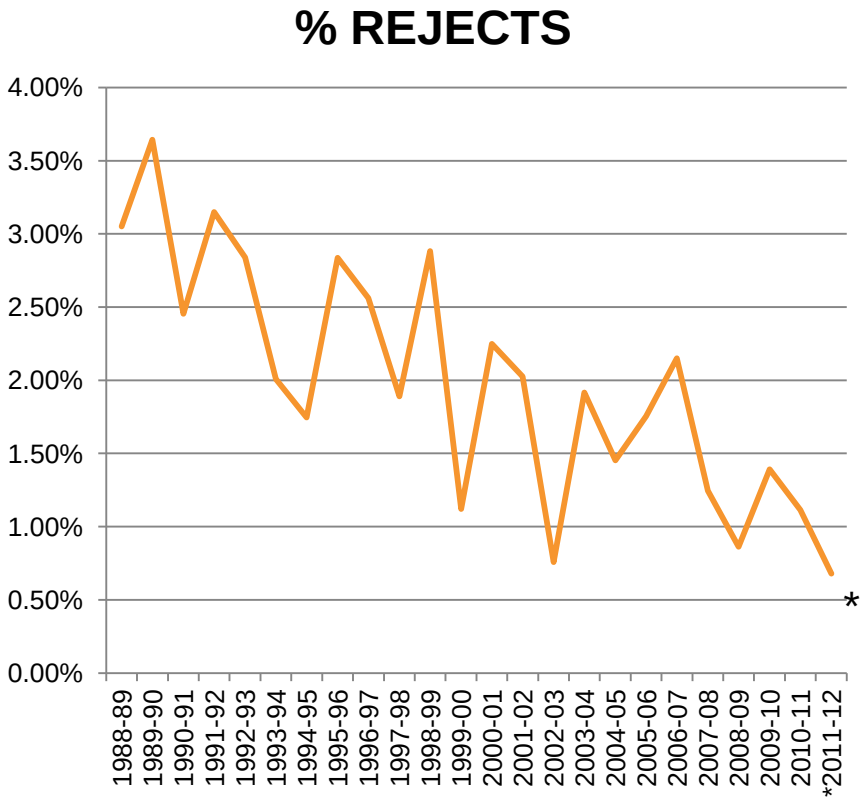
Navel orangeworm (NOW) damage reduced 8.8% in 1978 to ≤ 1%

- 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



* Receipts to date

Fundamental Changes in Production

John P. Edstrom, UCCE Farm Advisor Emeritus

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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….

Micro-irrigation

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Single hose drip

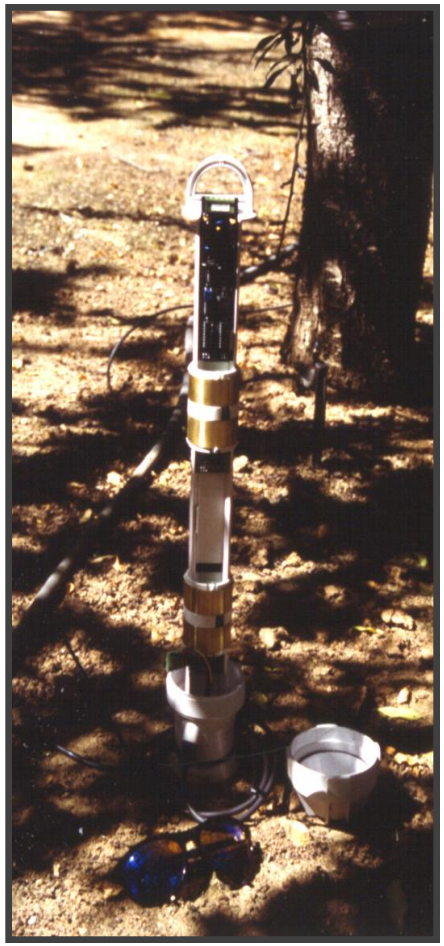
Subsurface drip

Micro-jet + drip

Double hose drip

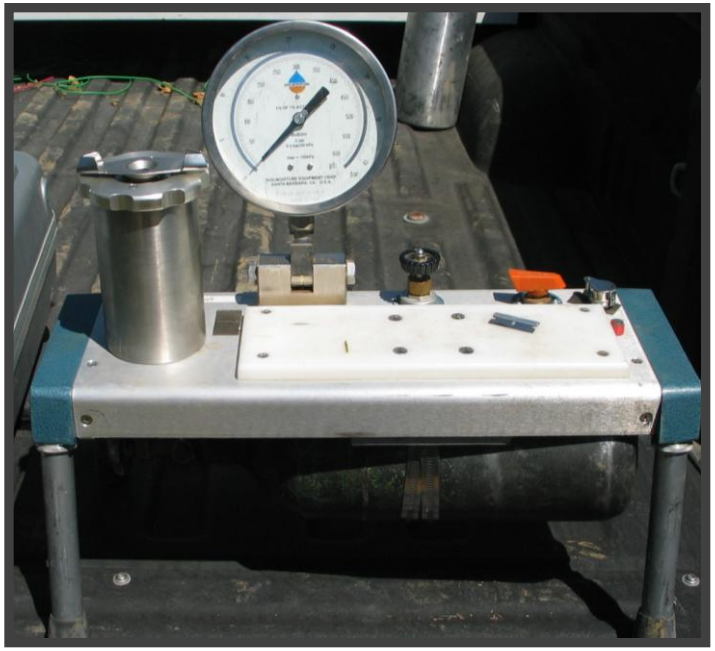
Precise Irrigation Management

Start with Etc as general guideline but also use…



Probes - soil monitoring

Dendrometer - limb growth



Pressure chamber- tree water stress

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

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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

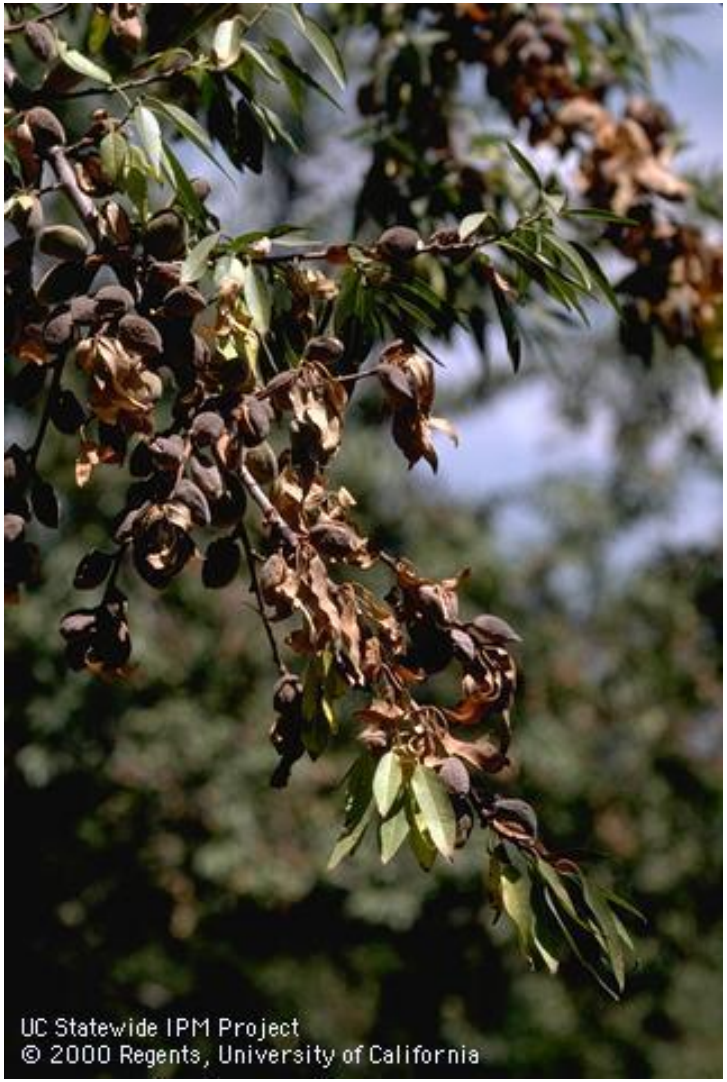
Scab

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.

<u>Be careful where you apply these practices</u>

Past Successes to Future Challenges

Mario Viveros, UC Farm Advisor Emeritus, Kern County

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Cooperators

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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)

Total	63,096
Bearing	60,541
Non-bearing	2,555

Yield lbs/Acre

Average	**1,418**
Good Grower	**1,600**

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

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Regional variety plots

Pruning (Training)

Noninfectious bud failure

Post harvest irrigation

Regional Variety Plots

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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

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

Long pruned trees

- 1st Dormant, 3 to 4 scaffolds left alone
- 2nd Dormant, eliminate limbs in center and problem limbs

Short vs. Long Pruning

	3rd leaf	4th leaf
Long Nonpareil	192 lbs/A	1,222 lbs/A
Carmel	422 lbs/A	1,628 lbs/A
Short Nonpareil	28 lbs/A	706 lbs/A
Carmel	45 lbs/A	961 lbs/A

Noninfectious Bud Failure

Assessment of Nonpareil and Carmel Clones

Information Acquire

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Nonpareil clone 2-70 with low BF potential

Single-Tree progeny testing for Carmel

Post Harvest Irrigation

A Difficult Task

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Irrigation System

- 80% Flood
- 16% Solid set
- 4% Drip

Varieties

- Nonpareil-Merced-Mission
- Arrangement 2:1

Severe Defoliation

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No irrigation during harvest

Bud Drop-Merced and Carmel

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No post harvest irrigation

Post Harvest Irrigation Demonstration

Tonny Visser

80 acre orchard

- **40 post harvest irrigation**
- **40 no irrigation**

Dave Goldhamer 1989

Drought 1987-1992

Regulated Deficit Irrigation Experiment

Yield (lbs/Acre) Effect Due to Pre Harvest Irrigation and Post Harvest Irrigation

	Pre harvest Cutoff (days)							
Post harvest Irr	53	46	39	32	25	18	11	4
Yes	2646	2530	2530	2116	2537	2148	1886	2140
No	292	731	568	1049	1152	1041	1316	1453

Average Hull Rot strikes/tree Due to Pre Harvest Irrigation Cutoff

	Irrigation Cutoff (days)							
	53	46	39	32	25	18	11	4
Hull rot S.	0.0	0.2	0.3	0.7	1.2	3.7	4.4	5.0
% Hull split	28	46	35	68	90	96	98	97

Post Harvest Irrigation

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Increase yields beyond 2,000

Regulated Deficit Irrigation for hull rot control

A New Challenge:
5,000 lbs/Acre at Low Cost

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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 ?)

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Tree density should fit the soil

Soil free of water penetration problems

Well design irrigation system

Good irrigation and fertilization practices

Good horticulturist

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Walt Bentley, UC IPM Entomologist

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