California Table Olive Orchards of the Future

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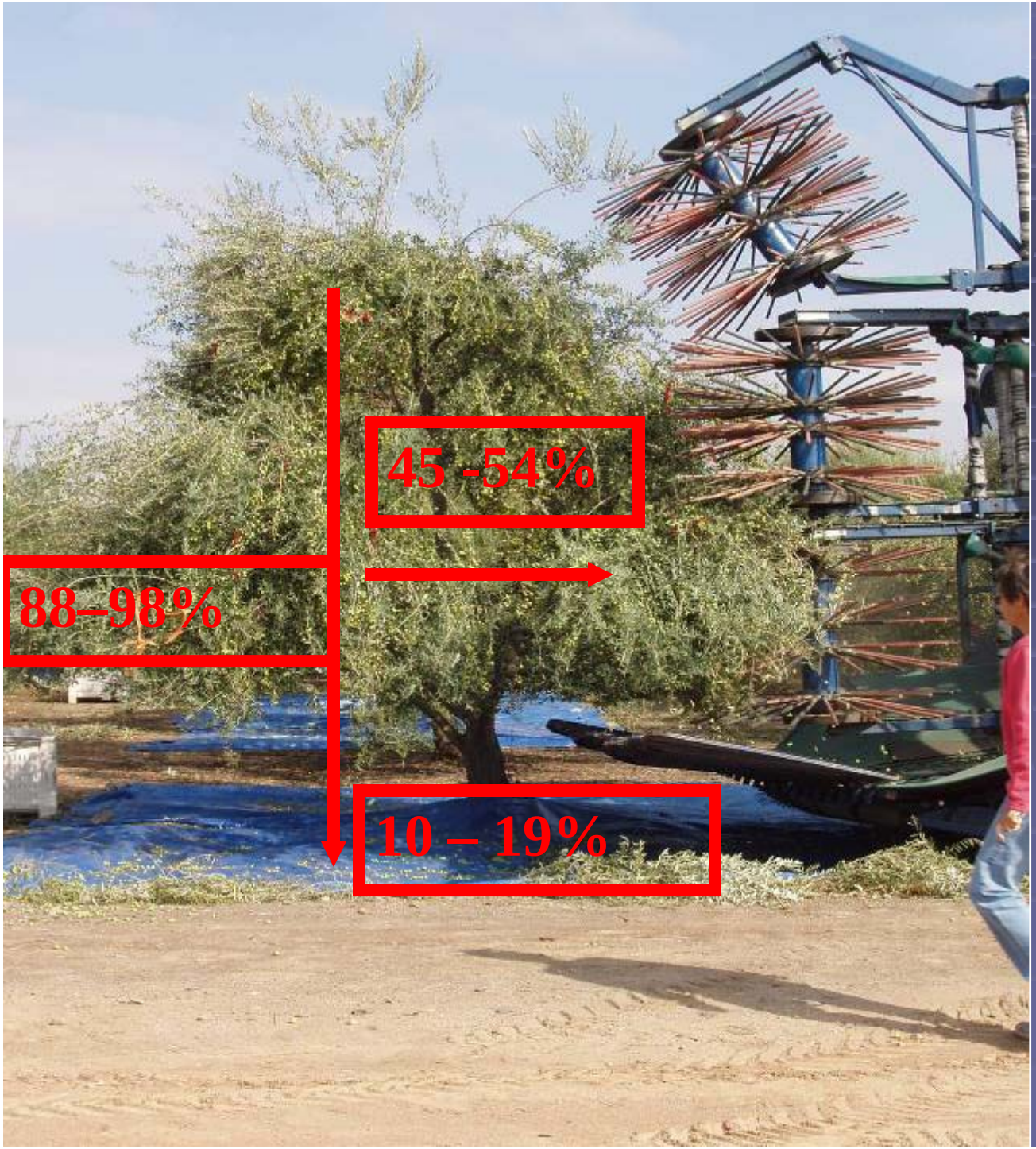
Industry Response to Cost and Availability of Labor

- 1997- 2000 California Olive Committee invested 3 million in the development of a picking head harvester
  - AgRight machine Sturdy machine with a single head
  - Korvan multiple heads
- Research suspended in 2001
- Resumed funding in 2006 and is continuing

Problems

- Machine efficiency
  - Related to tree shape
  - Catch frame competency
- Fruit damage
- Machine cost



2006 Results

- 86% removal
- 67% efficiency
- incompetent catch frame

Super High Density Olive Oil

- 5-6 ft X 13 = 578-670 trees per acre
- Yield in 3rd year
- Mechanical harvest - $300/acre
- Use about 50% as much water
- 2001-2009 - 20,000 acres


DANGER
GOODYEAR

Narrow Canopy Hedgerow

- No leading edge
- No trailing edge
- No inside fruit
- Could be a cheaper lighter machine
- Require less removal force

Nickels Hedgerow

- Planted in spring of 2001 at the Nickels Estate in Arbuckle
- Manzanillo table olives
- 12x 18 feet, North South hedgerow planting
- Six Sevillano pollinators strategically placed
- Center row grafted to Sevillano summer of 2003
- Artificially pollinated with Sevillano pollen, 2004,2005

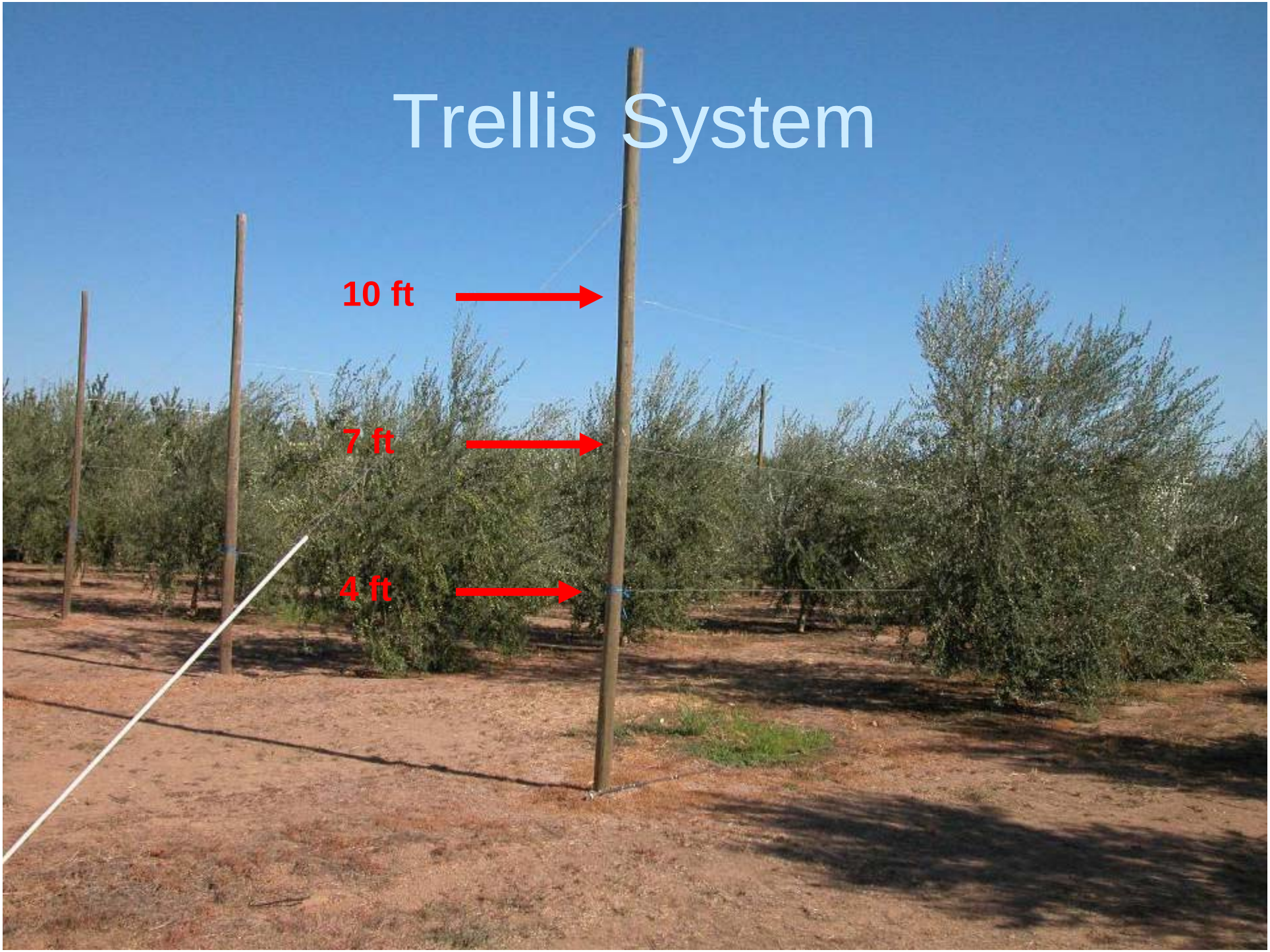
Objectives:

- Develop a narrow canopy hedgerow to facilitate mechanical harvest
- Evaluate and demonstrate feasibility of a high density hedgerow developed specifically for mechanical harvest
- Compare different strategies for developing a narrow canopy hedgerow

Nickels Hedgerow

Treatments

- Conventional – open center, 3-5 primary scaffolds
- Narrow canopy
  - free standing through pruning
  - woven on trellis
  - potential permanent limbs tied to trellis wires


Trellis System
10 ft
7 ft
4 ft

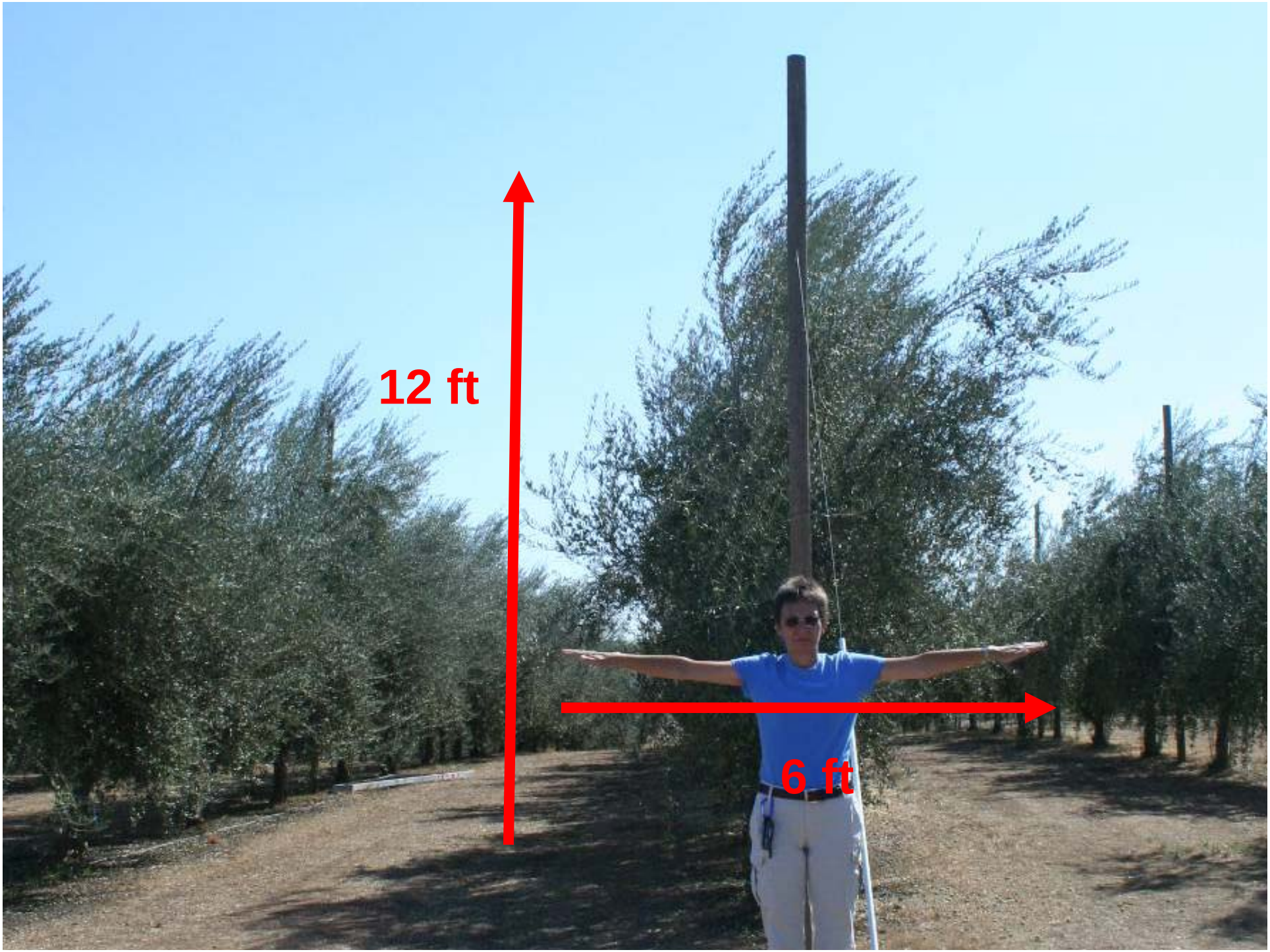
Conventional pruning, 2007

Tied Treatment at bloom, unpruned in 2007

Narrow Canopy Hedgerow at pruning time

Free Standing Narrow Canopy Hedgerow at pruning 2007

Narrow Canopy
Hedgerow at harvest


12 ft
6 ft

Nickel's Hedgerow Olive Harvest, 2004-08

Treatment	2004	2005	2006	2007	2008			Cum. Yield
Year	4th	5th	6th	7th	8th			
	Tons/A	Tons/A	Tons/A	Tons/A	Tons/A	$/Ton	$/A	Tons/A
Conventional	4.09	1.75	2.81	6.39	5.96	$1,060	$6,137	21.00
Free Standing	3.66	1.51	2.26	6.40	5.04	$948	$4,594	18.85
Trellised, Woven	4.21	1.68	2.28	6.07	5.88	$1,004	$5,875	20.12
Trellised, Tied	3.58	3.45	1.76	7.51	4.52	$1,104	$4,983	20.82
Average	3.89	2.10	2.28	6.59	5.35	$1,029	$5,397	20.20

No Significant Differences

Conclusions

- Manzanillo Olives can be grown successfully in a narrow canopy hedgerow
- No yield differences between training systems
  - May be due to variable yields
- Appear to be well adapted to canopy shakers and trunk shakers

California Prune/Pistachio Harvester

Future Plans

- Continue to collect yield data on different training systems
- 2009 -Test various types of mechanical harvesters
  - **Coe canopy shaker**
  - **AgRight over the row harvester**
  - **Trunk Shaker – Nielsen**

Light Studies

- Because the tree canopy is narrow, do you need taller trees or narrower row spacing to maximize yield?
- 100% light interception = maximum yield
- What is the optimum tree height and row spacing for narrow canopy hedgerows?
- Light interception studies started in collaboration with Dr. Bruce Lampinen to measure light interception of the different training treatments

New Plantings

120 acres – 12 X 18 north south hedgerow
Trellised
Double line drip

Estimated that 600 to 1000 acres will be planted by 2010

- Train straight trunk
- Sucker frequently to 36 inches to develop smooth straight trunk

- Will be adaptable canopy or trunk shaking or other types of harvesters

What if none of these harvesting strategies work?

End result

High density hedgerow orchard that is easy to manage and relatively easy to harvest by hand