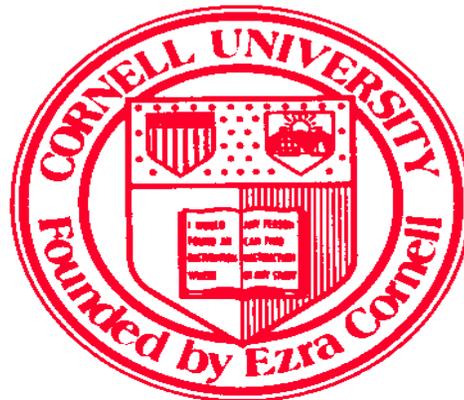


The Next Step in the Tall Spindle: Fruiting Wall using Tall Spindle Trees and Mechanical Pruning

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NY-ARDP



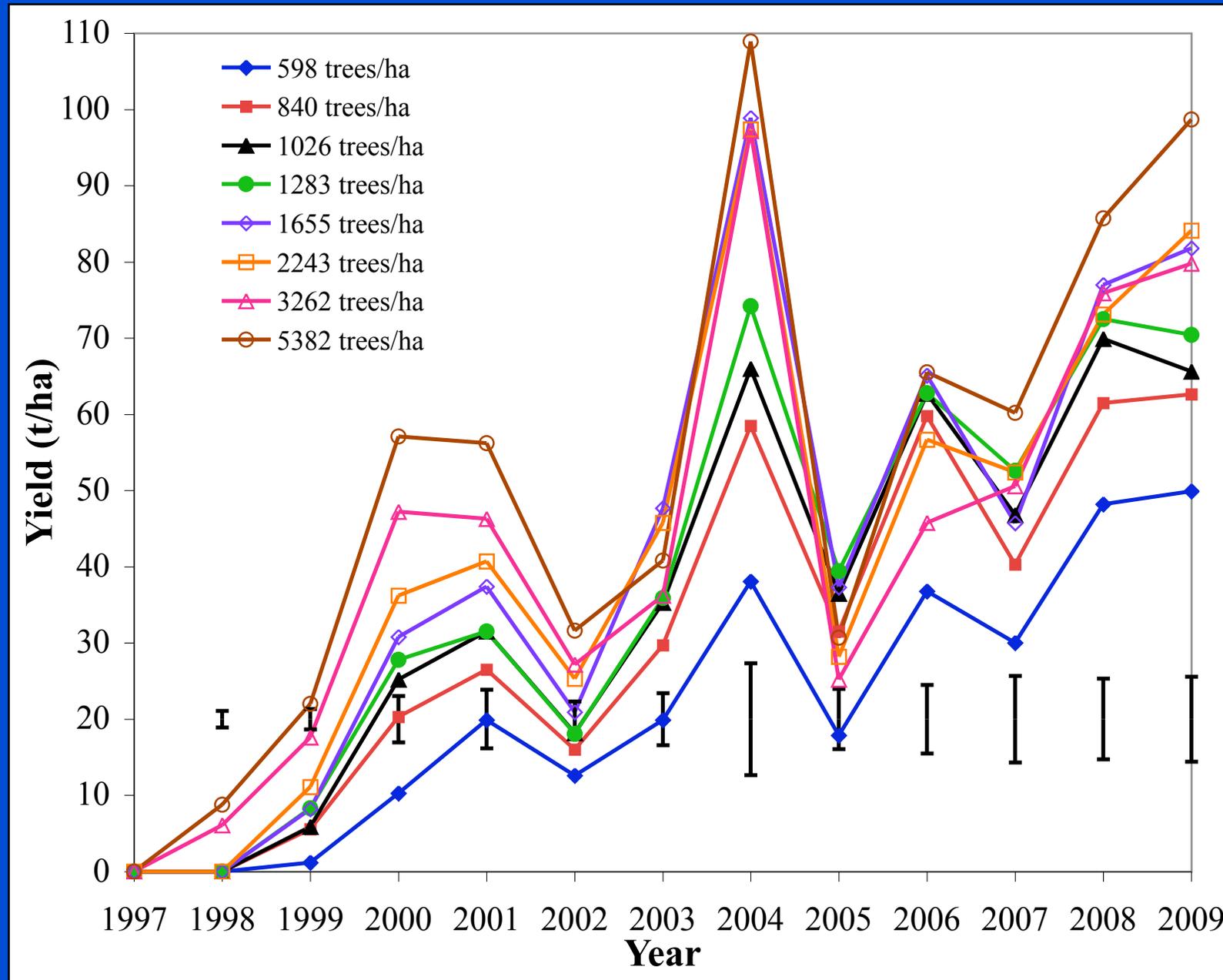
NY farm viability
INSTITUTE

Principles of the Tall Spindle System

- **Optimum Economic Tree Density**
 - 900-1,300 trees/acre
- **High Early Production** (Feathered trees+minimal pruning)
 - 3,300 bu/acre in first 5 years
- **High Mature Yields** (High light interception 70-75%)
 - Tree height=0.9*row width (~ 11ft)
 - 1500 bu/acre with Gala
 - 2000 bu/acre with Fuji
 - 1200 bu/acre with Honeycrisp
- **High Fruit Quality** (Good light distribution in the canopy)
 - thin conical canopy
 - no permanent branches
 - limb renewal pruning of limbs larger than $\frac{3}{4}$ " diameter.
 - columnarized (simplified) fruiting branches
 - balanced vigor and calm trees
- **Improved Labor Efficiency**
 - Simplified pruning recipe
 - Partial mechanization of dormant pruning, hand thinning, tree training and harvest (30-40% reduction in labor costs)

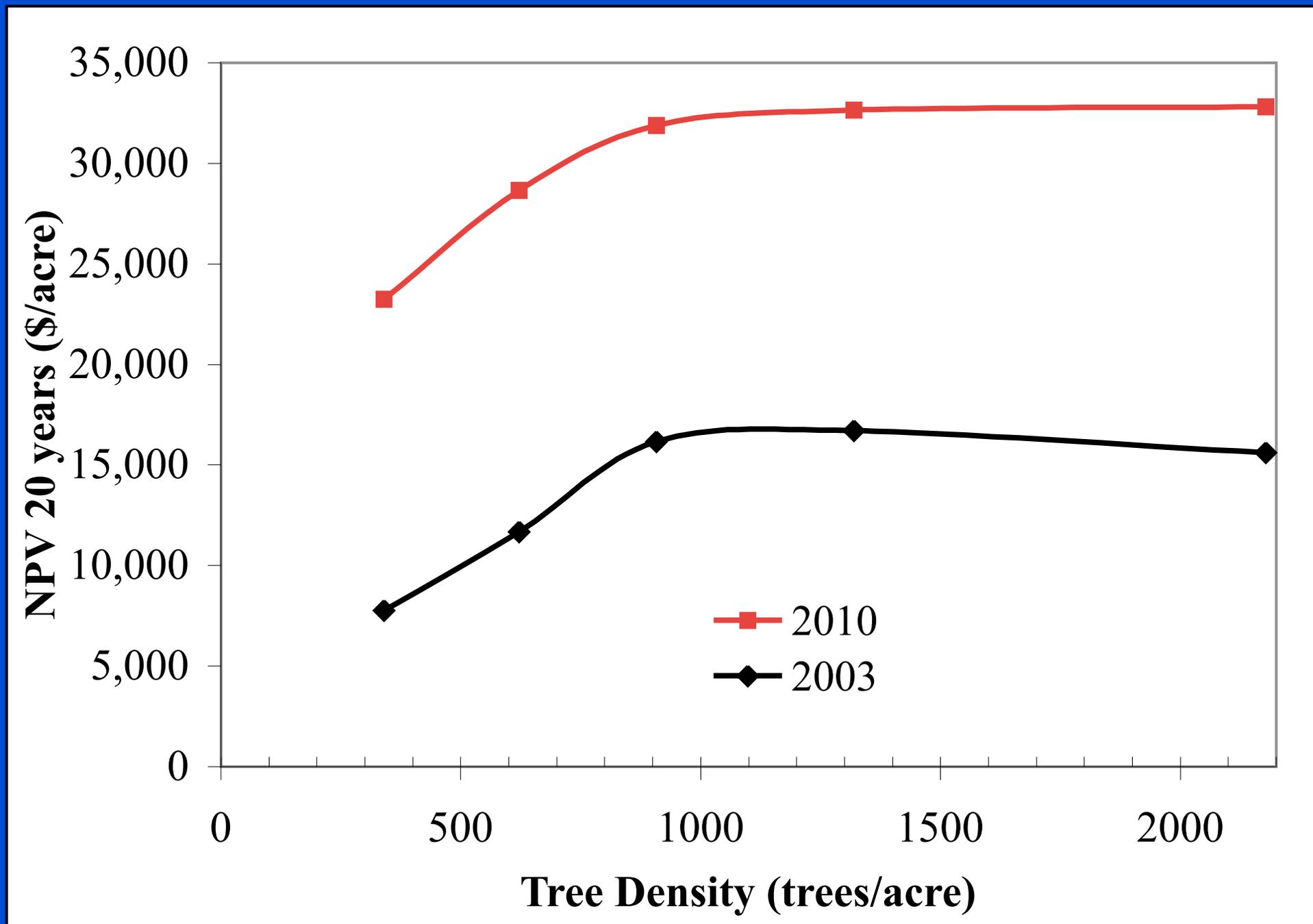


Background: 1997 Geneva Spacing Trial (200-2,200 trees/ac)



Tree density had a highly significant effect on yield per ha. The highest density system achieved 100 t/ha on the 8th year while the lowest density system did not surpass 50 t/ha.

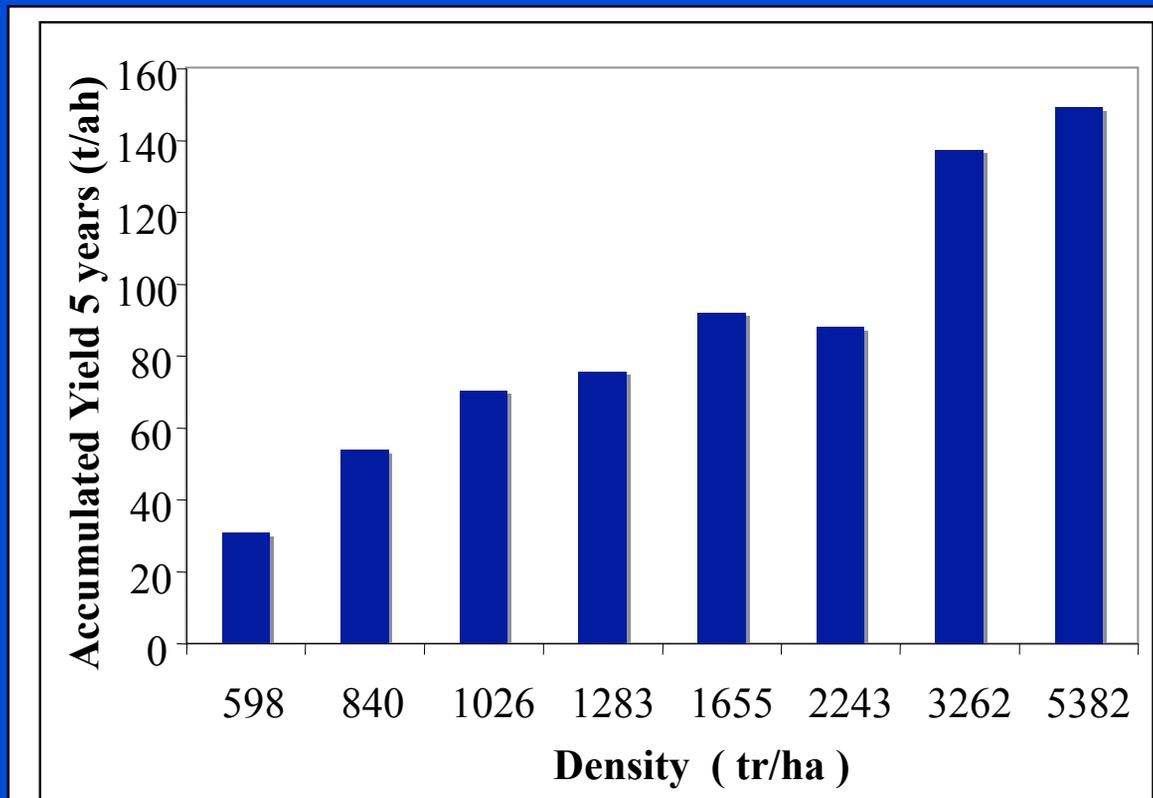
Profitability of Apple Orchards in NY over 20 Years



New York targets for early yield:

- 300 bu/acre in the second leaf
- 600 bu/acre in the third leaf
- 1,000 bu/acre in the fourth leaf
- 1,400 bu/acre in the fifth leaf

A total of 3,300 bu/acre over the first 5 years



Developing the Narrow Conical Tall Spindle Tree



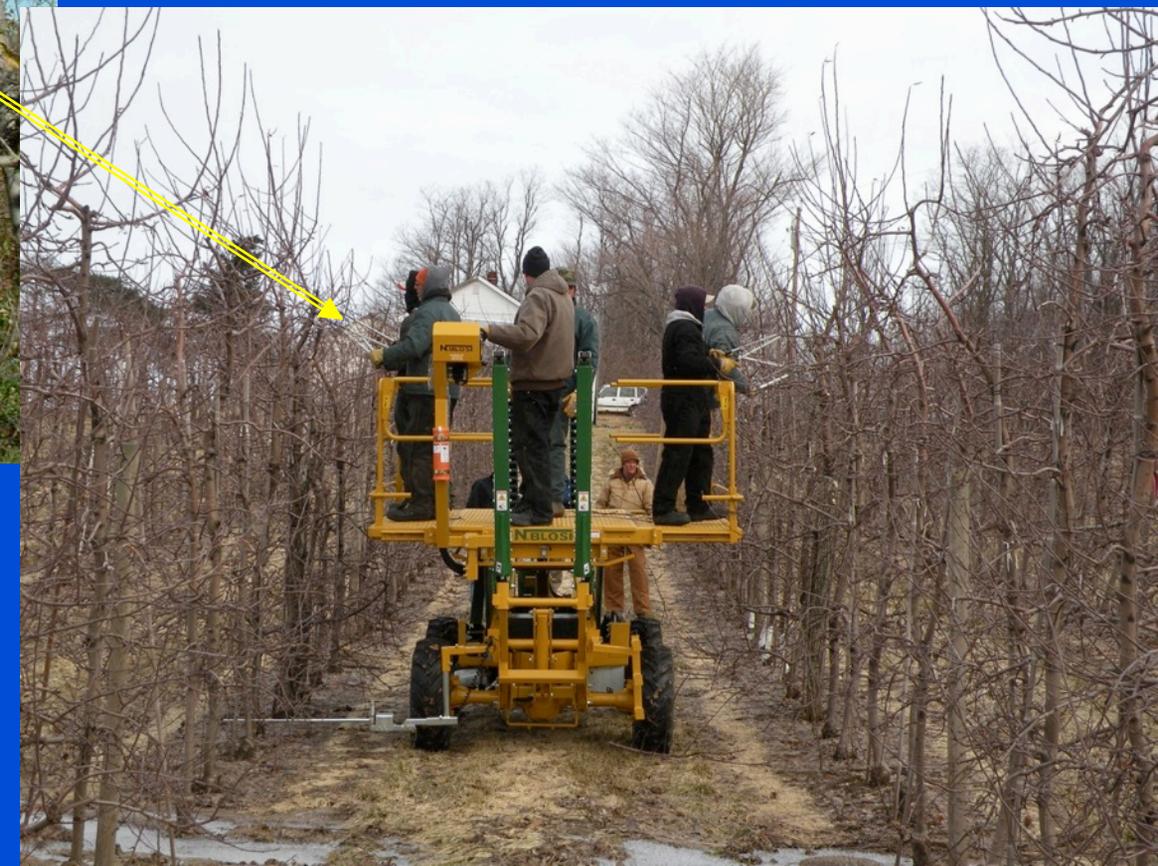
Simple pruning of the Tall Spindle



The Simple and Narrow Canopy of the Tall Spindle is Adaptable to Partial Mechanization of Pruning



From single person machines to multiple person machines that are self steering and move at a constant velocity



Partial Mechanization of Dormant Pruning and Hand Thinning can Reduce Labor Costs by 25-50%



New 2012 Kubota mounted Trimming Platform with self-steering mechanism (designed/built by Dan LaGasse, Lyons, NY)

New Directions for the Tall Spindle: Mechanical Summer Pruning

Benefits include:

- reduction of costs,
- improved fruit quality.
- Timing: June, July, August?



What is different now?

- Orchards are more suitable
 - Dwarfing rootstocks
 - Calm trees
 - Small fruiting branches
- Summer pruning timing
 - Less regrowth
 - Flower buds on end of regrowth
- High labor costs are pushing labor savings approaches
- Good success by CTIFL in France for almost 10 years and some French growers.
- Good results in Trentino Italy, Germany, Belgium and Spain



Mechanization of Summer Pruning

Goal is to have a narrow fruiting wall with good light distribution but not create a vigor response in the tree and reduce pruning costs by 2/3.

With tall spindle, the canopy should be an angled wall 3-4 ft. wide at base and 2 ft. wide at top.

One possible pruning strategy is:

1. Begin in year 5 with a good dormant pruning leaving only small branches.
2. Use mechanized summer hedging for 2 years then
3. A corrective dormant pruning to remove limbs that have become too large and remove small weak wood.



Width 2 ft.

Width 3-4 ft.

In 2011 and 2012 we began several hedging trials in NYS
Geneva, Vandewalle's (WNY), Lamont (WNY), Crist (ENY) and Everett (NNY)



Shoot response to mechanized summer shearing



Geneva Results of Mechanization of Summer Pruning

<u>Variety</u>	<u>% of Shoots Cut</u>		
	<u>June</u>	<u>July</u>	<u>August</u>
Fuji/M.9	33.2	36.7	29.5
Golden/M.9	32.9	35.3	28.5
Jonagold/M.9	25.7	24.4	28.2
Gala/M.9	35.4	38.6	44.6
<u>Average</u>	<u>31.8</u>	<u>33.8</u>	<u>32.7</u>

<u>Variety</u>	<u>No. of Fruits Cut Off</u>		
	<u>June</u>	<u>July</u>	<u>August</u>
Fuji/M.9	8.0	2.0	6.0
Golden/M.9	6.0	1.0	2.0
Jonagold.M.9	7.0	7.0	5.0
Gala/M.9	13.0	13.0	2.0
<u>Average</u>	<u>8.5</u>	<u>5.8</u>	<u>3.8</u>



<u>Variety</u>	<u>Shoot Regrowth (cm)</u>		
	<u>June</u>	<u>July</u>	<u>August</u>
Fuji/M.9	24.1	13.6	0.0
Golden/M.9	14.3	12.4	0.0
Jonagold/M.9	28.2	22.6	0.0
Gala/M.9	20.2	5.7	0.0
<u>Average</u>	<u>21.7</u>	<u>13.6</u>	<u>0.0</u>

Severity of Summer Pruning

- With Tall Spindle trees and row spacings of 12 ft. the hedging is done 2 feet from trunk



- With Super Spindle trees and 10 ft. row spacings the hedging is done 1 ft from trunk. (the wall is very narrow)



Example -Fruiting Wall – France (Pomanjou Company)

- Converted 200 ha to fruiting wall 4 years ago
- Objective was to reduce production cost.
- They had 1 permanent employee for 20 acres
Now they have 1 for 30 acres
- They wanted to improved light distribution in the canopy for better color under hail nets which reduce light.
- Pruning which was of about 50 hrs per acre per year is now reduced to 4 hrs of mechanical pruning per acre per year, and 28 hrs per acre every 3 years of hand pruning
- The trees were hedged to a distance 8-10 inches on each side of the trunk. Granny are pruned wider
- The yield/acre was the same as other growers. However the fruiting wall must not be overloaded which results in smaller fruit size



Fruiting Wall trials around the world

- Spain - Ramon
- Germany - Gerhard Baab
- Italy – Alberto Dorigoni
- Belgium – Koen Karolus



Precision Hand Thinning

- 1m grid system
- 20 fruits between each wire



The possibility of reducing pruning and harvest costs in the hedged Tall Spindle system

	Traditional VA Trees (1000 bu/ac with ladders)	Tall Spindle Trees (1500 bu/ac with platforms)
<u>Labor Inputs</u>		
Dormant Pruning	60 hours/acre	20 hours/acre
Tree Training	20 hours/acre	10 hours/acre
Hand Thinning	80 hours/acre	30 hours/acre
Summer Pruning	40 hours/acre	1 hour/acre
<u>Total Pre-harvest</u>	<u>200 hours/ha</u>	<u>71 hours/acre</u>
Harvest	80 hours/acre	80 hours/acre
	(5 bins/person/day)	(7.5 bins/person/day)
<u>Total annual labor input =</u>	<u>280 hours/acre</u>	<u>151 hours/acre</u>

Conclusions

- The Tall Spindle system is the system we recommend for maximum profitability
 - High early yields
 - High mature yields
 - Excellent fruit quality
 - Simple training and pruning recipe
- Can we reduce costs?
 - Dormant pruning costs of the Tall Spindle can be reduced by 25-50% with platforms
 - Mechanized canopy shearing for 2 years followed by corrective hand pruning in the 3rd year could reduce annual pruning costs by 67%
 - Harvest platforms could reduce harvest labor cost of the Tall Spindle by 25-30%
 - Annual total labor inputs can be reduced by 46% by using the Tall Spindle planting system, pruning/thinning platforms, summer sidewall shearing and a harvest picking platform



Next Step: In-depth School on Precision Orchard Management March 14-15 Geneva, NY

SPEAKERS are Terence Robinson, Alison De Marree, Steve Hoying, Lailiang Cheng, Kerik Cox, Art Agnello, Robert Seem, Jordi Llorens, Rod Farrow, Jim Eve, Deborah Breth, Mike Fargione, and Mario Miranda Sazo.

Registration is \$125/person for NY and out-of-state residents. Registration fee includes proceedings, coffee both days, lunch and dinner on March 14, breakfast on March 15. Advance registration is required; deadline is March 8, 2013.

A block of rooms has been reserved at the Ramada Geneva Lakefront (www.genevaramada.com, 1-800-990-0907 or 315-789-0400) under the name of Cornell In-Depth Fruit School; the rooms will be held until March 1, 2013. The hotel rooms are \$79 per city side room and \$89 per lake side room.

Registration on-line at the Web site: <http://tinyurl.com/beaeu6e>
Or contact Gemma Osborne at 315-787-2248 or email at gro2@cornell.edu



Cornell University
Cooperative Extension

FRIDAY, MARCH 15, 2013 (morning sessions)

Session 7: "Precision Spraying and Using Weather Data"

Session 8: "Precision Harvest Management"

Session 9: "Final Discussion of Where Are the Opportunities and Rankings by Growers, Extension, and Researchers"

PRECISION SESSIONS

THURSDAY, MARCH 14, 2013 (morning sessions)

State of the Art Presentations followed
by Grower Discussions

Session 1: "What is Precision Orchard Management"

**Session 2: "Where are the Economic Opportunities of More
Precise Orchard Management"**

Session 3: "Precision Thinning and Crop Load Management"

THURSDAY, MARCH 14, 2013

(lunch included and afternoon sessions)

**Session 4: "Precision Nutrient, Water, and
Weed Management"**

**Session 5: "Efficient Planting Systems for Pruning, Thinning,
and Harvest"**

**Session 6 (dinner included): "The Orchard of the Future!
Using All Available Tools to Reduce Risk and
Improve Efficiency"**



**"2013 Eastern
Apple Precision
Orchard
Management
SUMMIT"**

March 14-15, 2013

**Ramada Geneva Lakefront,
41 Lakefront Dr, Rt 5 and 20
Geneva, NY 14456**

March 15, SUMMIT starts 8:30am and ends 1 pm!

March 14, SUMMIT starts 8:30am and ends 8:30pm!