

# The Tall-Spindle critical steps to success

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# First

- Terence Robinson,  
Cornell University
- “The tall spindle system  
is the path to becoming  
fabulously wealthy”



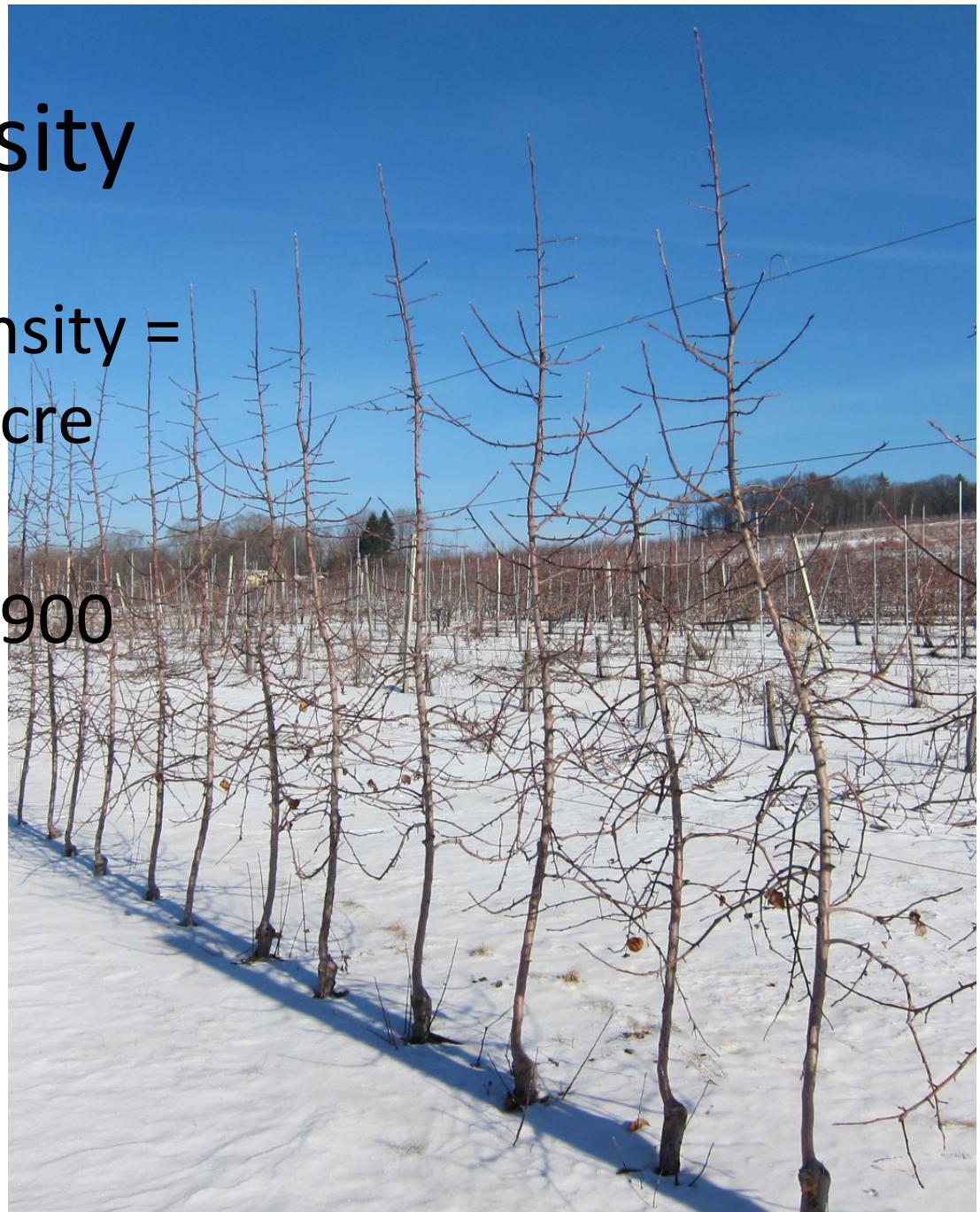
# The basics

- High tree density
- Fully dwarfing rootstocks
- High quality, feathered trees at planting
- High planting depth
- Minimal pruning
- Branch bending in 1<sup>st</sup> leaf
- Superior support system
- Trickle irrigation/fertigation



# High tree density

- High planting density = 1,200 trees per acre (3 ft X 12 ft)
- Can go as low as 900 trees per acre





# Fully dwarfing rootstocks

- Bud 9, M.9 clones, Geneva 11, 16, 41
- Ottawa 3, Vineland 3



# High quality trees

- Preferably 5-10 (or more) feathers
- ½" minimum caliper  
5/8" better
- Branches not too low
- High graft union
- Order early, do your best...



# High planting depth

- Graft union needs to be 4 to 6 inches above ground
- Caution: burr knots attract borers
- Mouse-guards?





# Minimal pruning at planting

- Trees are not headed
- Remove low branches (less than knee height)
- And those breaking the 50% rule (diameter-based pruning) are removed
- Leave as many feathers as possible w/o compromising growth of leader
- Results in 2<sup>nd</sup> leaf crop

# Branch bending

- Remaining branches bent below horizontal at planting
- 1<sup>st</sup> leaf only
- Use wire or string
- Very important to get 2<sup>nd</sup> leaf yield



# Superior support system

- Based on Pressure Treated (or alternative) end and line posts with hi-tensile wire
- 5-6 inch for end posts, 4-5 inch for line posts
- 'Driven' 3 feet in ground
- Line posts every 40 to 45 feet (no farther!)
- 12.5 gauge hi-tensile wire
- U-Hooks



# I repeat: superior support system

## support

- 4-5 in. by 12 ft. PT end and in-line posts
- 12.5 gauge hi-tensile wire
- 1st wire in ASAP
- U-hooks



# U-Hooks

- Large size (3 inch)
- [oescoinc.com](http://oescoinc.com)
- [peachridge.com](http://peachridge.com)

\*Tree stabilizer wires?  
[fingerlakestrellissupply.com](http://fingerlakestrellissupply.com)





# Trickle irrigation

- Netafim  
'RAM' tubing
- 24-inch emitter spacing, 0.4 gallons per hour
- Add fertigation if possible (it's really not that hard)





# How much per acre?

**TABLE 1**

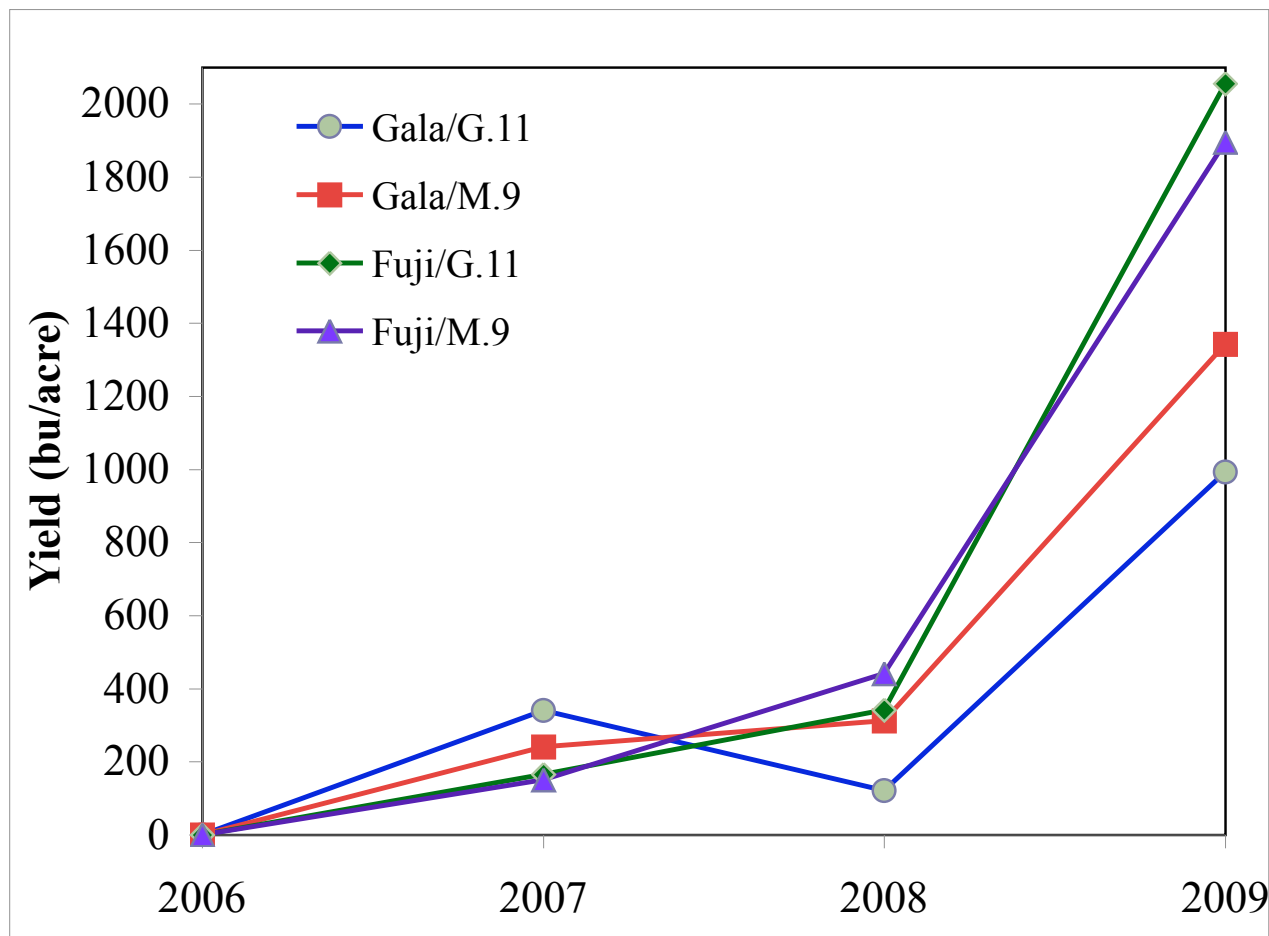
**Establishment Costs for 3' X 11' Tall Spindle Orchard System (10 rows X 400' long)**

<b>Item</b>	<b>Number/acre</b>	<b>Material Costs (\$/acre)</b>	<b>Labor Costs (\$/acre)</b>	<b>Total Cost (\$/acre)</b>
Trees	1320	\$8,580	\$100	\$8,680
Anchor poles (6 ft)	20	\$120	\$100	\$220
Inline poles (12 ft)	110	\$1,100	\$550	\$1650
Wire	12,000 ft	\$280	\$100	\$380
Staples, tightners and crimps		\$50	\$100	\$150
<b>Total</b>		<b>\$10,130</b>	<b>\$950</b>	<b>\$11,080</b>

# What does this get you?

- High early yields!
- Target yields per acre
  - 2<sup>nd</sup> leaf = 200 bushels
  - 3<sup>rd</sup> leaf = 500 bushels
  - 4<sup>th</sup> leaf = 1,000 bushels
  - 5<sup>th</sup> leaf = 1,400 bushels
- 3,100 bushels total
- You do the math:  $3,100 \times \$40 \text{ retail} = \$124,000$

# “Fabulous yields in early years”



Terence Robinson, New York Data



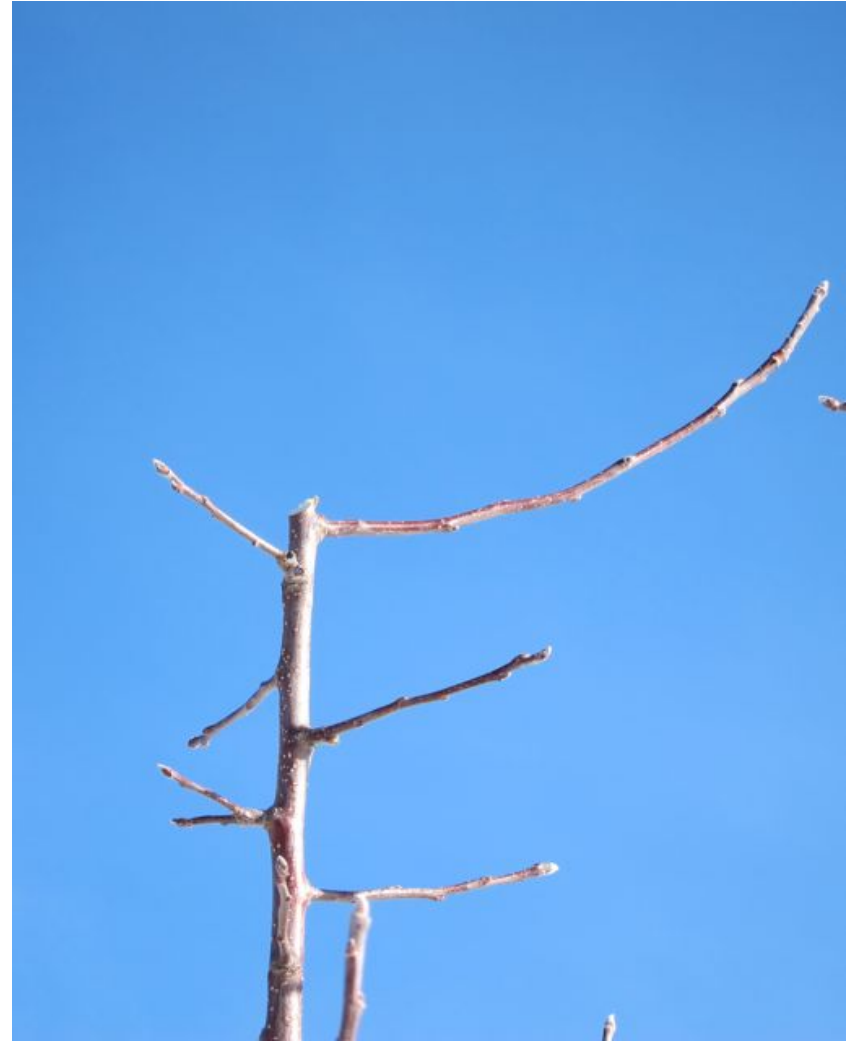
# 4 rules of mature tree pruning

1. Limit tree height to no more than row width
2. Remove 2 to 3 of largest branches
3. Simplify remaining branches
4. Cut back pendant wood

# Rule 1 - mature tree pruning

- Limit tree height to no more than row spacing
  - Preferably a little shorter
  - Don't cut leader until tree reaches optimum height
  - Cut leader to fruitful side branch

# 1. Limit tree height



# Rule 2 - mature tree pruning

- Remove 2-3 largest branches per year
  - These are typically greater than  $\frac{3}{4}$  inch diameter (quarter-size) or longer than 3 feet
  - Prune lower branches first, then upper; but don't leave large branches in top of tree!
  - Resist the urge to over-prune...

“Large branches create large trees.” Terence Robinson



## 2. 2-3 cut rule



# Bevel (renewal) cut



# Rule 3 - mature tree pruning

- Simplify remaining branches
  - No forks (“forks belong on the dinner table”)
  - Single axis, typically somewhat pendant



# 3 – simplify complex branches



# Rule 4 (optional) – mature tree pruning

- Optional: cut back pendant, weak wood  
– Gala, Fuji
- Or, remove entirely
- Pencil size (diameter) is ideal
- Prevents over-cropping and small fruit



# 4 – cut back pendant, weak wood





# Summary of tall-spindle

- Optimum economic tree density

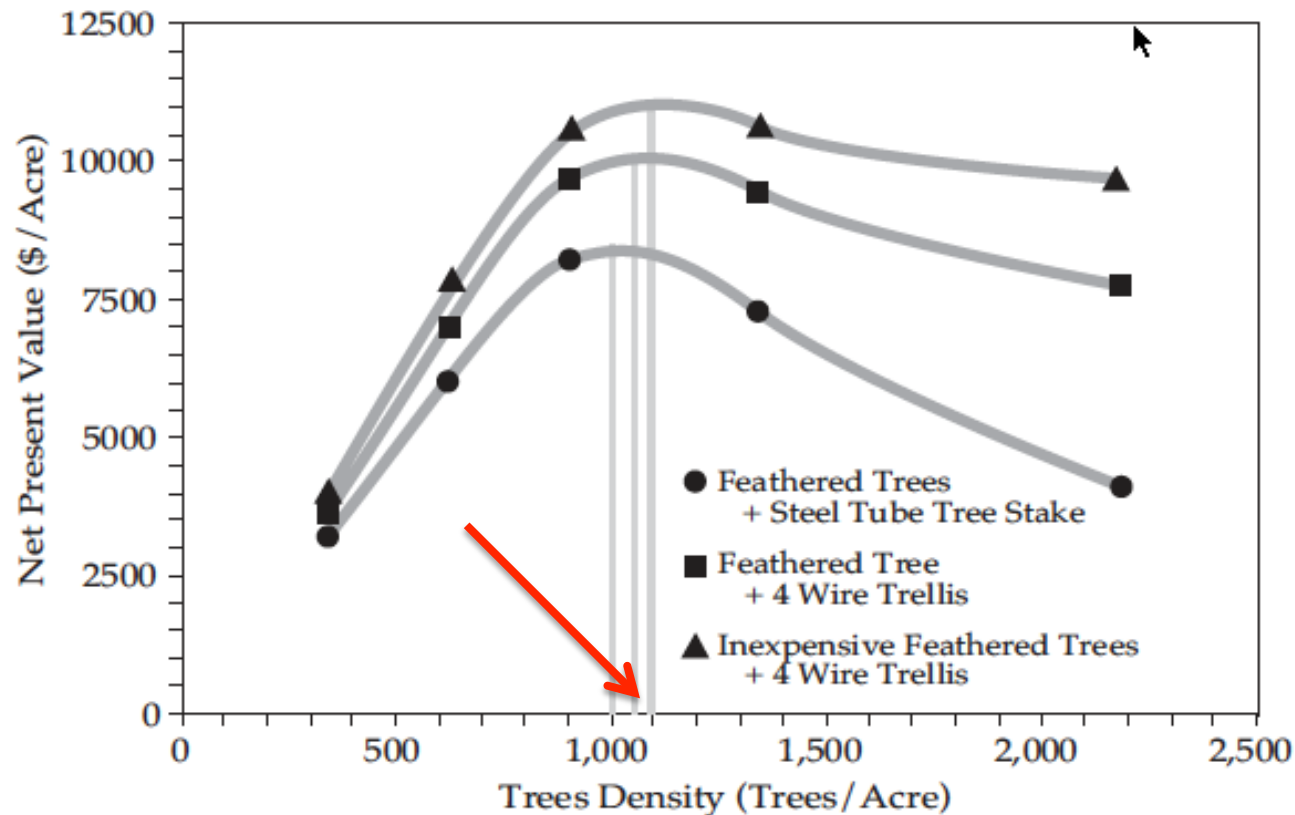


Figure 8. Effect of tree density on orchard profitability after 20 years (Net Present Value/acre).

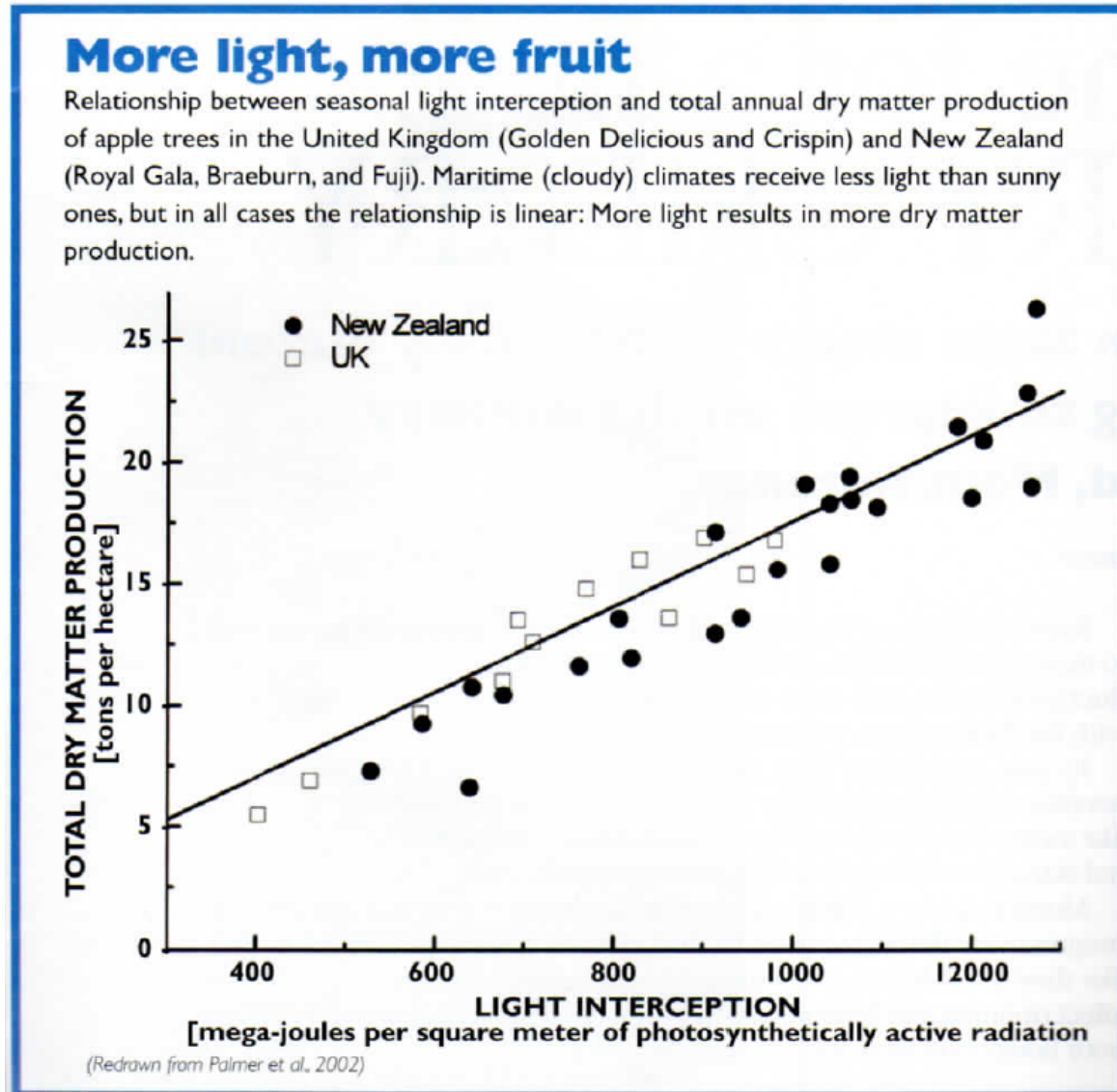
# Summary of tall-spindle

- High early production (assuming feathered trees)



# Summary of tall-spindle

- High light interception (70-75%)
- Tree height = 0.9 X row width





# Summary of tall-spindle

- Good light distribution

- Thin, conical canopy

- No permanent branches

- Columnar/  
simple fruiting  
branches

- High fruit quality





# Summary of tall-spindle

- Improved labor efficiency
  - Simplified pruning
  - Partial mechanization of pruning and harvest



photo Terence Robinson

# MOPUP – Massachusetts Orchard Production Upgrade Program

- 10 orchards
- One acre, 1,000 trees per orchard
- All planted 3 ft. X 12 ft.
- Mac, Cortland, Macoun, Honeycrisp, Gala, Fuji, Golden Delicious





# 2009 planting





# Decent nursery trees





# 2008 planting, 2009 flowers





# 2<sup>nd</sup> leaf Honeycrisp





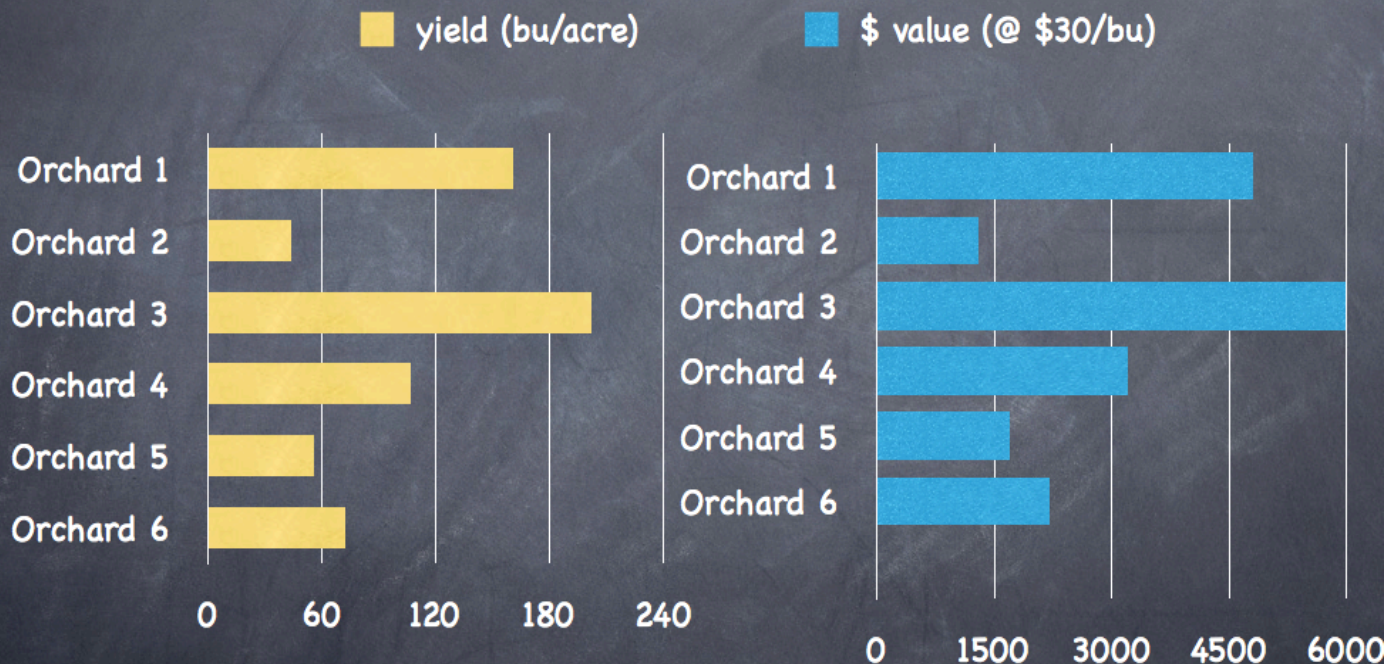
## 2<sup>nd</sup> leaf Gala





# MA MOPUP orchards

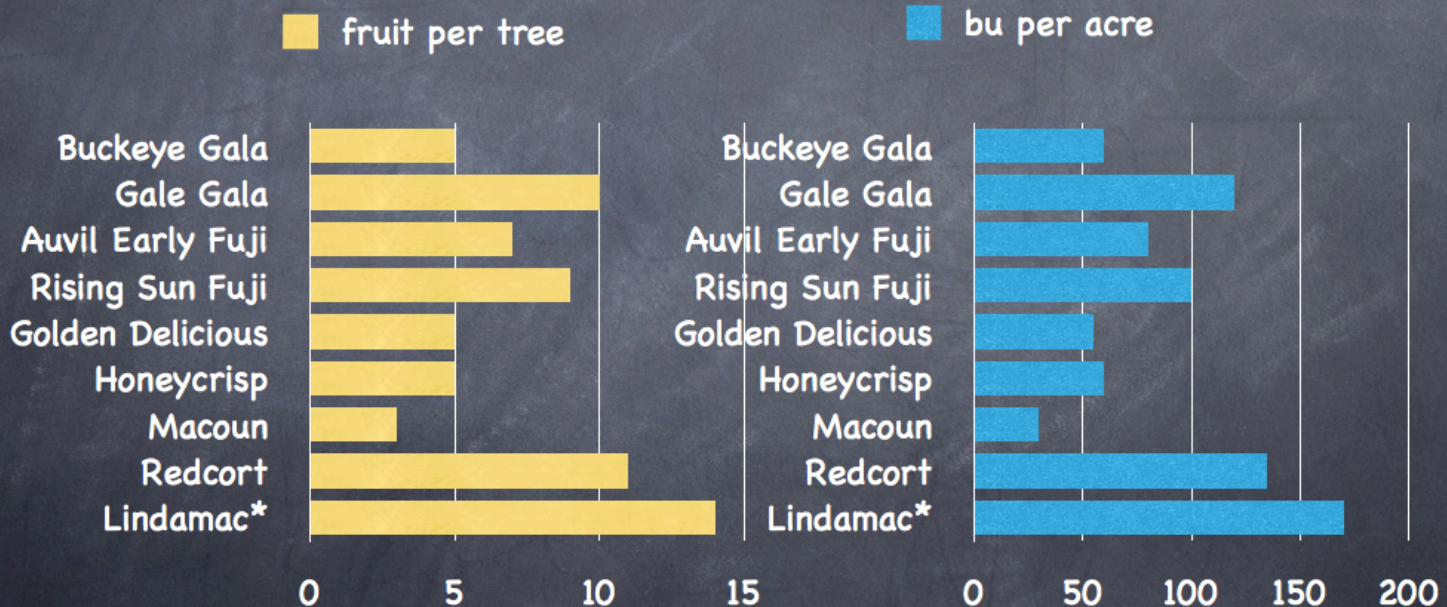
## estimated 2nd leaf yields





# MA MOPUP Orchards

by variety (one orchard)  
2<sup>nd</sup> leaf fruit yield





# Tall-spindle = happy grower



# What's next?

- Plant ½ to one acre (600 – 1,200 trees)
- Order trees ahead of time
- Prepare site
- Plant early
- Build superior support structure
- Irrigate/fertilize
- Pick fruit in following year
- Make money \$\$\$\$\$






# [tallspindleapple.com](http://tallspindleapple.com)

Tall Spindle Apple

1P + <http://www.umass.edu/fruitadvisor/clements/tallspindleapple/> Google

Horicultural News Gmail Pogue's Posts post to del.icio.us YouTube my del.icio.us NJWxNet Cornell Guid...s TreeFruits Yahoo! >>

Tall Spindle Apple




## Tall Spindle Apple

### All about the tall-spindle apple

Links to resources for growing a tall-spindle apple orchard -- "the way to fabulous riches"\*

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[jmcextman@gmail.com](mailto:jmcextman@gmail.com)



\*[Terence Robinson](#), Cornell University

### Publications

[The Tall Spindle Apple Production System](#) - T. Robinson, New York Fruit Quarterly (PDF)

[The Tall Spindle Planting System for Apples in the Northeast](#) - T. Robinson, New England Vegetable & Fruit Conference Proceedings (PDF)

[Managing High-Density Apple Trees for High Yield and Fruit Quality](#) - T. Robinson, New England Vegetable & Fruit Conference Proceedings (PDF)

[Tall spindle system sends NY apple yields skyward](#) - americanagriculturist.com (PDF)

[The Tall Spindle: Apple Orchard System Design for the Future](#) - fruitgrowersnews.com

[Different Approaches to Tall Spindle Establishment in Apple](#) - R. Perry, cherries.msu.edu

[The Tall Spindle Planting System](#) - T. Robinson, fruit.cornell.edu