

The Tall-Spindle critical steps to success

Jon Clements

Extension Educator

**Center
for Agriculture**

University of Massachusetts Amherst



First

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

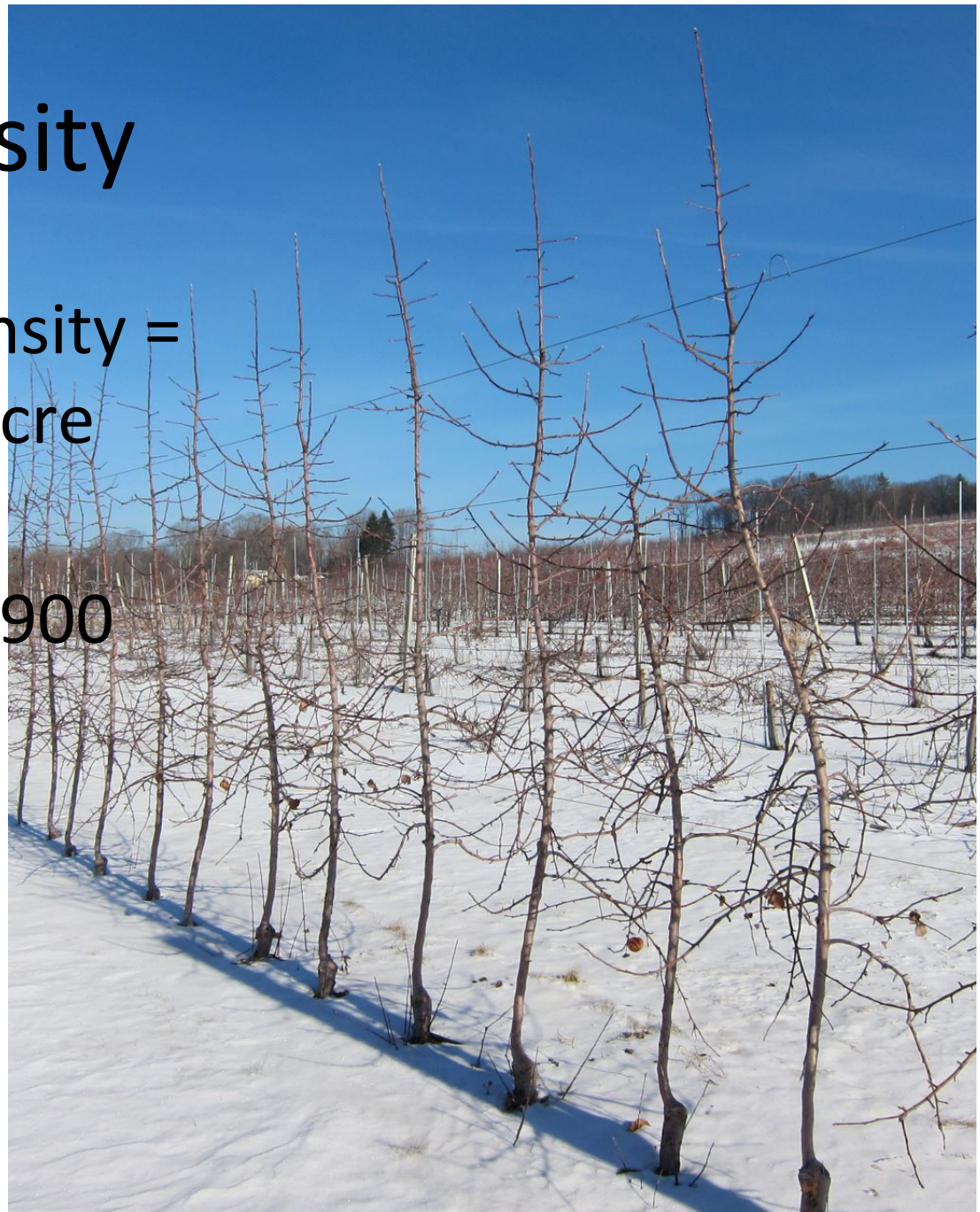


The basics

- High tree density
- Fully dwarfing rootstocks
- High quality, feathered trees at planting
- High planting depth
- Minimal pruning
- Branch bending in 1st 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 2nd leaf crop

Branch bending

- Remaining branches bent below horizontal at planting
- 1st leaf only
- Use wire or string
- Very important to get 2nd 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
- peachridge.com

*Tree stabilizer wires?
fingerlakestellissupply.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

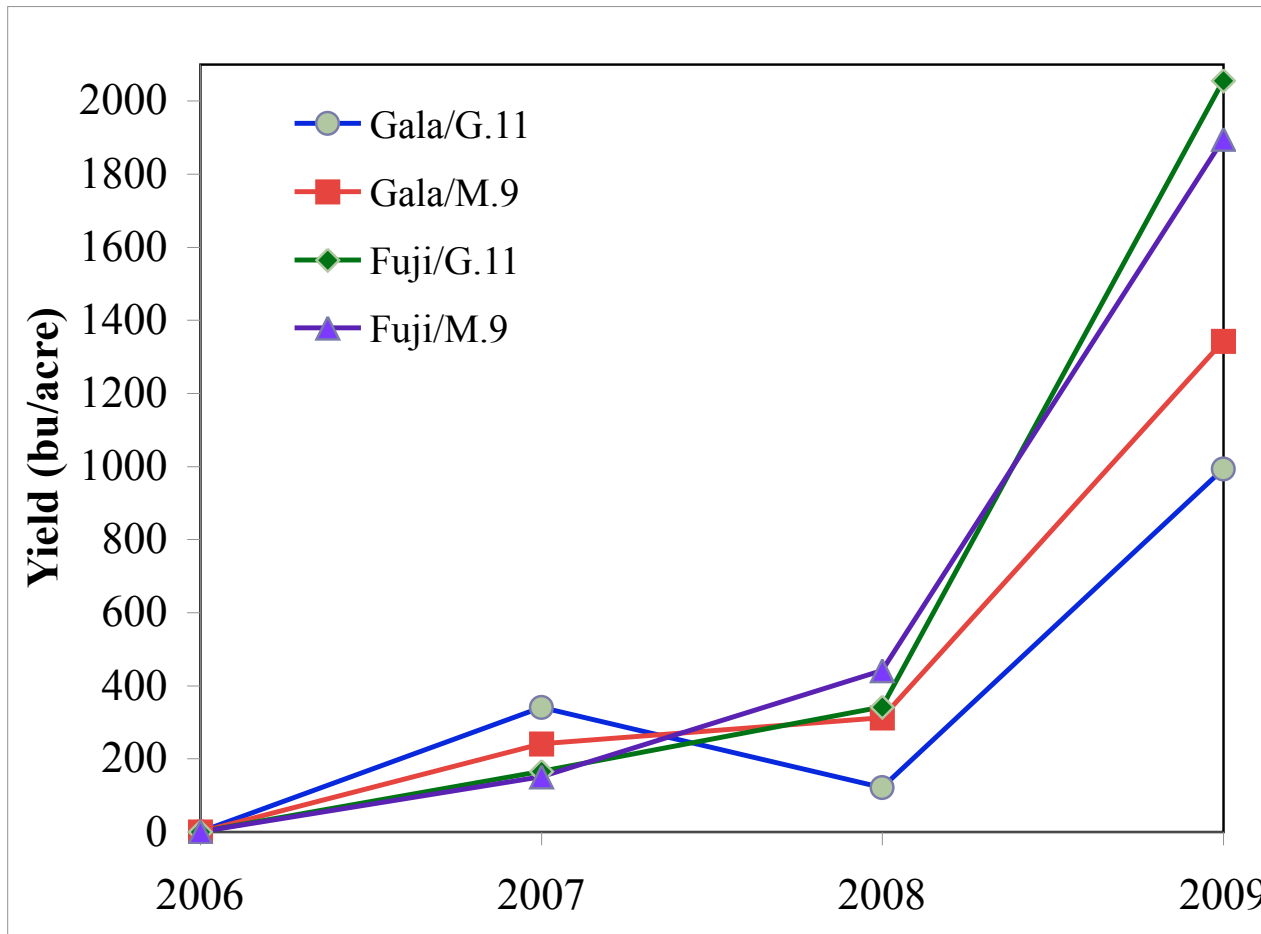
Establishment Costs for 3' X 11' Tall Spindle Orchard System (10 rows X 400' long)

Item	Number/acre	Material Costs (\$/acre)	Labor Costs (\$/acre)	Total Cost (\$/acre)
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
Total		\$10,130	\$950	\$11,080

What does this get you?

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

“Fabulous yields in early years”



Terence Robinson, New York Data

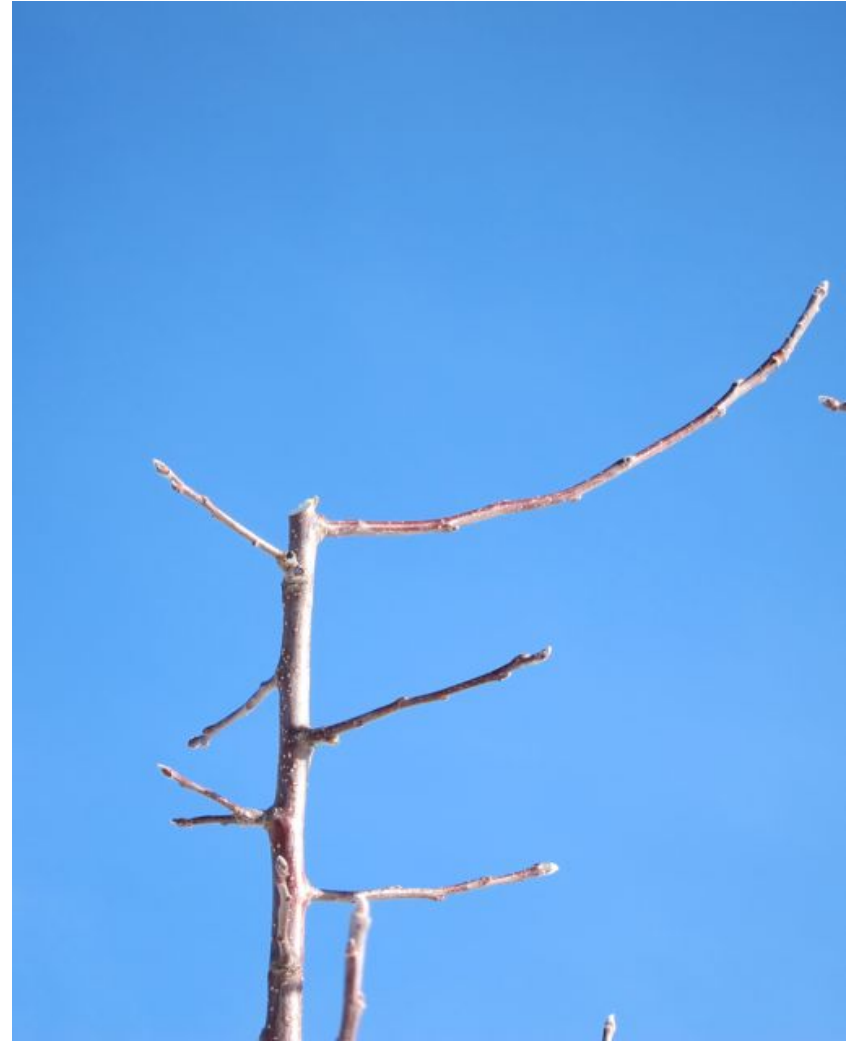
4 rules of mature tree pruning

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

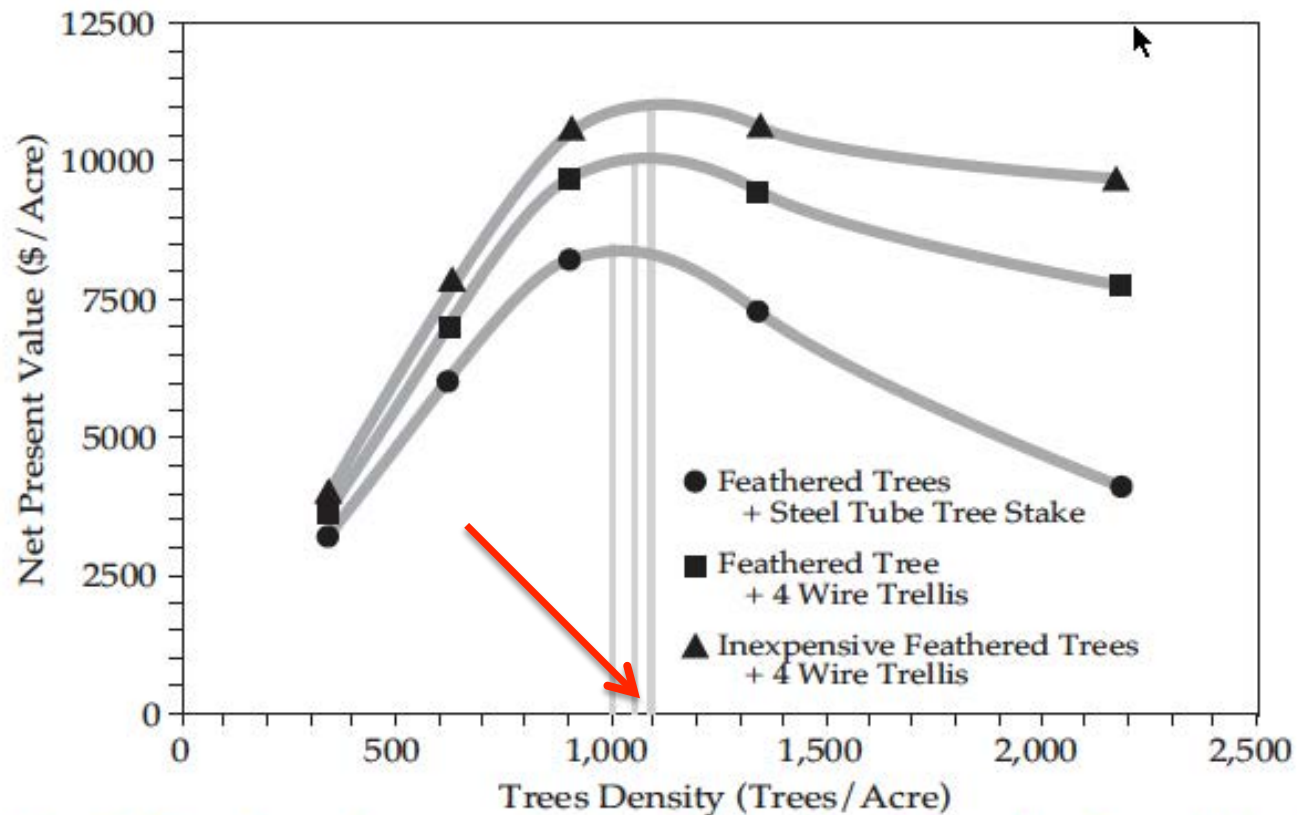


Figure 8. Effect of tree density on orchard profitability after 20 years (Net Present Value/acre).

Summary of tall-spindle

- High early production (assuming feathered trees)

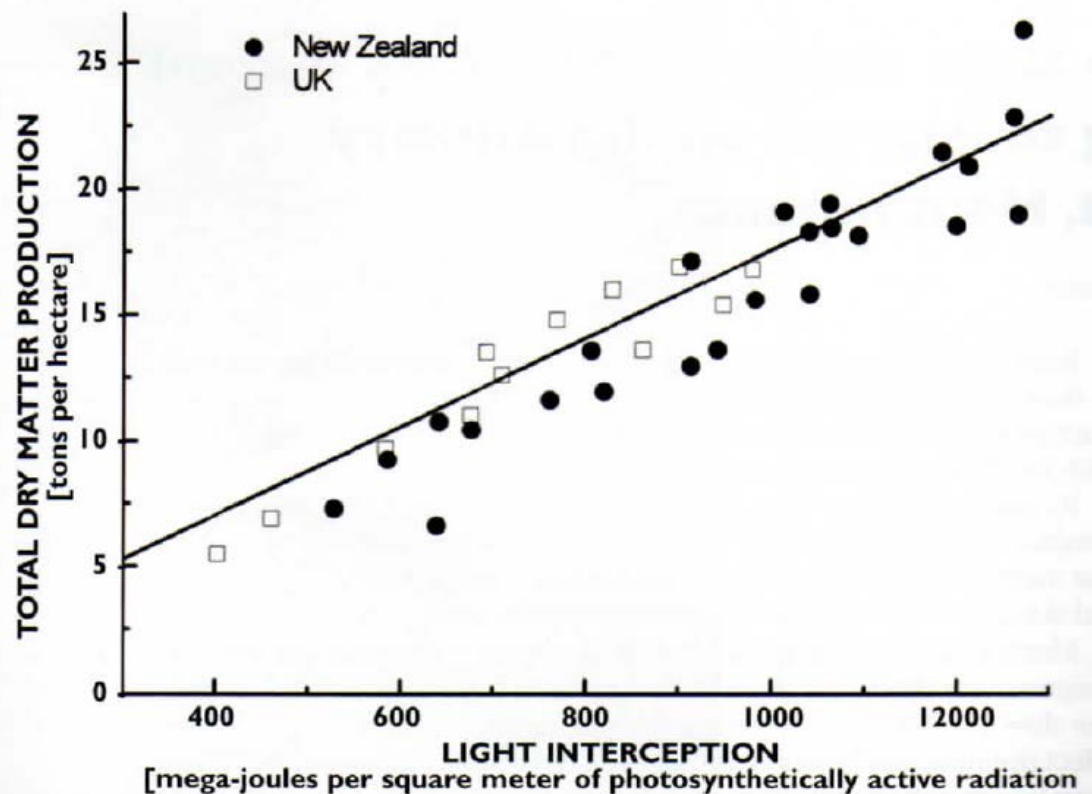


Summary of tall-spindle

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

More light, more fruit

Relationship between seasonal light interception and total annual dry matter production of apple trees in the United Kingdom (Golden Delicious and Crispin) and New Zealand (Royal Gala, Braeburn, and Fuji). Maritime (cloudy) climates receive less light than sunny ones, but in all cases the relationship is linear: More light results in more dry matter production.



(Redrawn from Palmer et al., 2002)

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



2nd leaf Honeycrisp

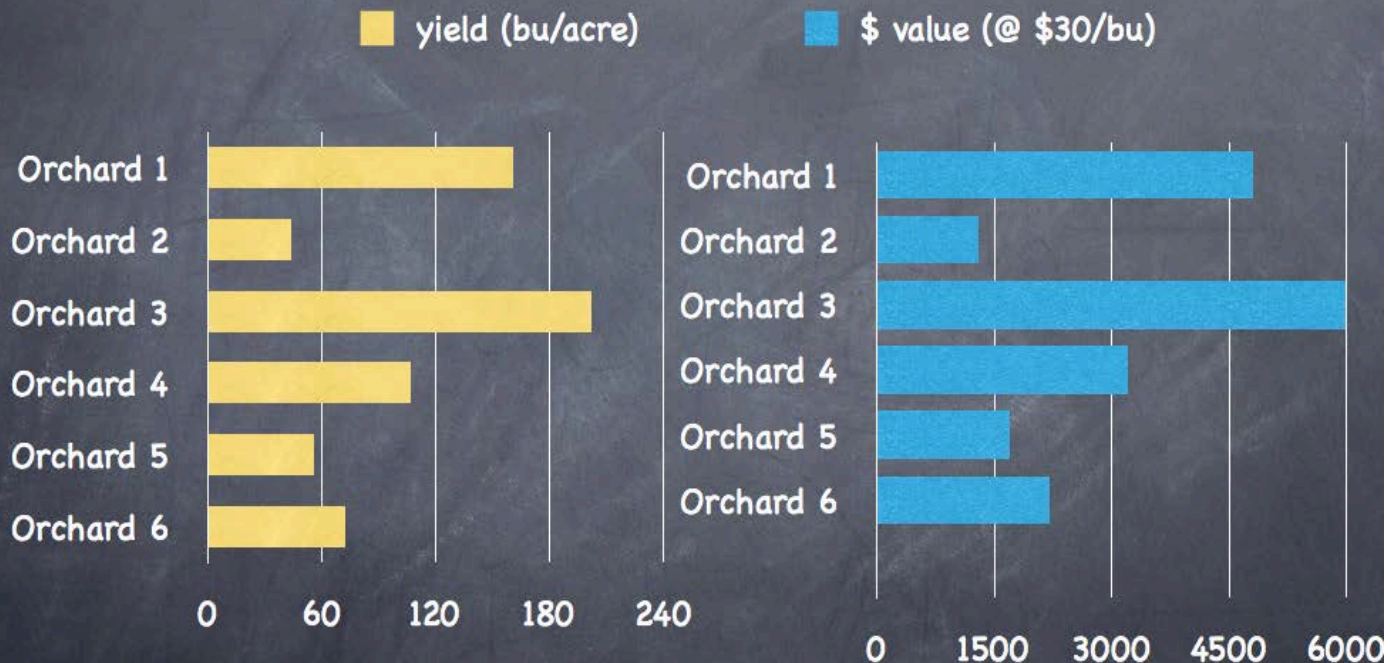


2nd leaf Gala



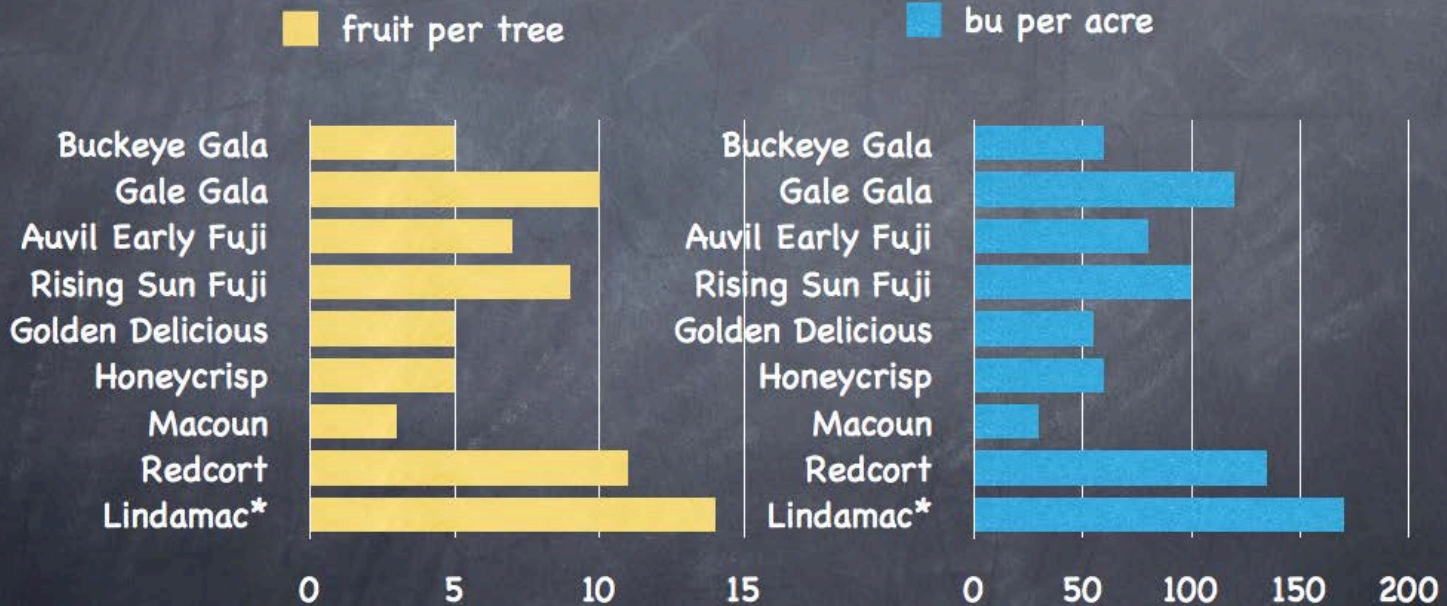
MA MOPUP orchards

estimated 2nd leaf yields



MA MOPUP Orchards

by variety (one orchard)
2nd leaf fruit yield



Tall-spindle = happy grower

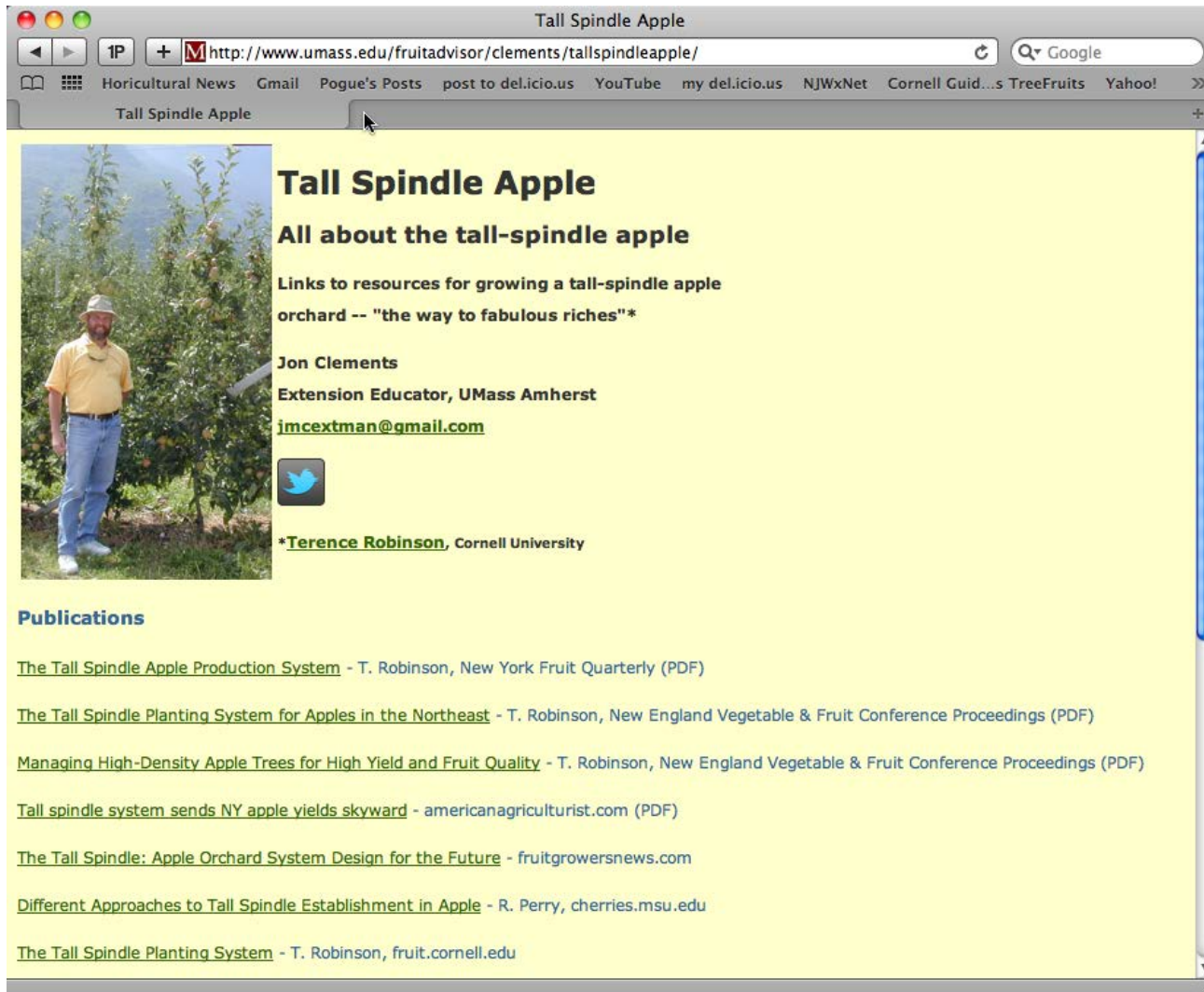


What's next?

- 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




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"*

Jon Clements
Extension Educator, UMass Amherst
jmcentman@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