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 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 2\textsuperscript{nd} 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?
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>
<thead>
<tr>
<th>Item</th>
<th>Number/acre</th>
<th>Material Costs ($/acre)</th>
<th>Labor Costs ($/acre)</th>
<th>Total Cost ($/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees</td>
<td>1320</td>
<td>$8,580</td>
<td>$100</td>
<td>$8,680</td>
</tr>
<tr>
<td>Anchor poles (6 ft)</td>
<td>20</td>
<td>$120</td>
<td>$100</td>
<td>$220</td>
</tr>
<tr>
<td>InLine poles (12 ft)</td>
<td>110</td>
<td>$1,100</td>
<td>$550</td>
<td>$1650</td>
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<tr>
<td>Wire</td>
<td>12,000 ft</td>
<td>$280</td>
<td>$100</td>
<td>$380</td>
</tr>
<tr>
<td>Staples, tighteners and crimps</td>
<td></td>
<td>$50</td>
<td>$100</td>
<td>$150</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$10,130</td>
<td>$950</td>
<td>$11,080</td>
</tr>
</tbody>
</table>
What does this get you?

• High early yields!
• Target yields per acre
  – 2\textsuperscript{nd} leaf = 200 bushels
  – 3\textsuperscript{rd} leaf = 500 bushels
  – 4\textsuperscript{th} leaf = 1,000 bushels
  – 5\textsuperscript{th} leaf = 1,400 bushels
• 3,100 bushels total
• You do the math: 3,100 X $40 retail = $124,000
“Fabulous yields in early years”

Yield (bu/acre)

Gala/G.11
Gala/M.9
Fuji/G.11
Fuji/M.9

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, Honeyscrisp, Gala, Fuji, Golden Delicious
2009 planting
Decent nursery trees
2008 planting, 2009 flowers
2\textsuperscript{nd} leaf Honeycrisp
2\textsuperscript{nd} leaf Gala
MA MOPUP orchards

estimated 2nd leaf yields

- Yield (bu/acre)
- $ Value (@ $30/bu)

Orchard 1
Orchard 2
Orchard 3
Orchard 4
Orchard 5
Orchard 6

Yield:
- Orchard 1: 120
- Orchard 2: 60
- Orchard 3: 180
- Orchard 4: 120
- Orchard 5: 60
- Orchard 6: 120

Value:
- Orchard 1: 4500
- Orchard 2: 3000
- Orchard 3: 4500
- Orchard 4: 3000
- Orchard 5: 4500
- Orchard 6: 3000
MA MOPUP Orchards

by variety (one orchard)

2nd leaf fruit yield

- Buckeye Gala
- Gale Gala
- Auvil Early Fuji
- Rising Sun Fuji
- Golden Delicious
- Honeycrisp
- Macoun
- Redcord
- Lindamac*

fruit per tree

bu per acre
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 $$$$$$
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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*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)


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