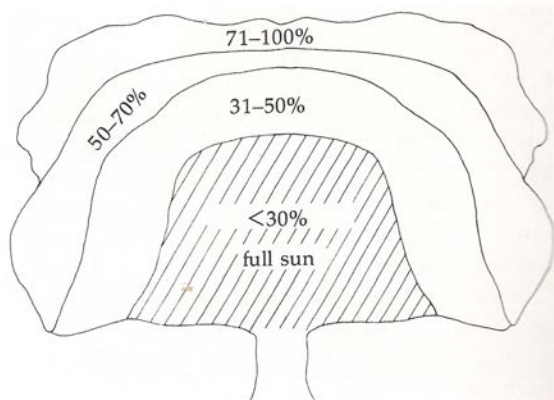


Tall Spindle Orchard Systems in Virginia



Dr. Greg Peck
greg.peck@vt.edu

<http://www.anr.ext.vt.edu/tree-fruit/index.html>



Average light distribution as a percentage of full sunlight.

Character	Development Satisfactory	Development Unsatisfactory
Fruit size	>50%	<50%
Red color	>70%	<40%
Development of spurs	>30%	<25%

Westwood, 1993. Faust, 1989.

The Tall Spindle

Advantages

- ❖ Economically profitable, *if everything goes right*
- ❖ Increased light interception
- ❖ Highly efficient
- ❖ Precocity
- ❖ Better spray coverage
- ❖ Mechanization
- ❖ Pedestrian orchard
 - ❖ 70% of work from the ground

Disadvantages

- ❖ Expensive to install
- ❖ Irrigation is necessary
- ❖ Need lots of labor in early years
- ❖ Nursery trees are in short supply

The Tall Spindle Orchard

❖ Spacing

Row spacing (ft) → Tree spacing (ft) ↓	10	11	12
3	1,452	1,320	1,210
3.5	1,244	1,131	1,037
4	1,089	990	907

❖ Trellising

❖ Irrigation

❖ Dwarfing rootstock

❖ Feathered trees

❖ Single leader

❖ Branch manipulation in years 1 and 2

❖ No permanent branches

- ❖ Bevel (Dutch) cuts
- ❖ Renewal starts in year ~4

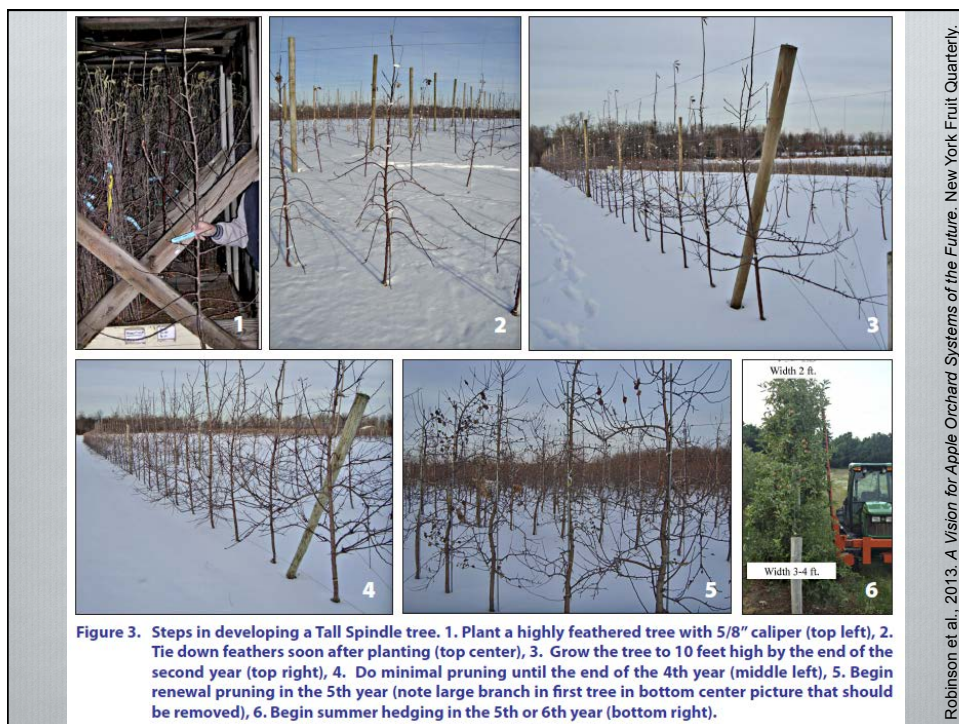
❖ 1:1 tree height to row width ratio

- ❖ Max tree height reached by year 3
- ❖ 10-12 ft tree

❖ Fruit in year 2 or 3

❖ Full production by year 5

- ❖ Yields >1,000 bu/acre



Land Preparation and Planting	Per Acre
Land clearing	\$1,875
Trees (1,000 trees/A @ \$7.00/tree)	\$7,000
Fertilizer	\$123
Lime	\$88
Other planting	\$213
Permanent groundcover	\$37
Sprays (Pesticides, herbicides, PGRs, etc.)	\$466
Trellis hardware	\$4,965
Irrigation	\$867
Labor	\$1,521
Misc. (Tree guards, deer repellent, etc.)	\$893
TOTAL	\$18,048

Assumptions! No equipment purchases, water is already present, existing farm already established, planting >5 acres, mostly H1A visa labor.

Once orchard is in production: **\$3,500-5,000/acre/year** in operating costs.

Economics could be favorable, but...

Table 1. Potential labor savings with a Tall Spindle orchard mechanized with platforms for pruning, hand thinning, tree training and hanging pheromones, and with summer hedging and a harvest assist machine.

Labor Inputs	Traditional Vertical Axis Trees (1000 bu./ac with ladders)	Tall Spindle Trees (1500 bu./ac with platforms)
Dormant Pruning	60 hours/acre	30 hours/acre
Tree Training	20 hours/acre	10 hours/acre
Hand Thinning	80 hours/acre	30 hours/acre
Hanging Pheromones	40 hours/acre	20 hours/acre
Summer Pruning	60 hours/acre	1 hour/acre
Total Pre-harvest Labor	260 hours/acre	91 hours/acre
Harvest	100 hours/acre (4 bins/person/day)	75 hours/acre (8 bins/person/day)
Total Annual Labor	= 360 hours/acre	166 hours/acre

Robinson et al., 2013.

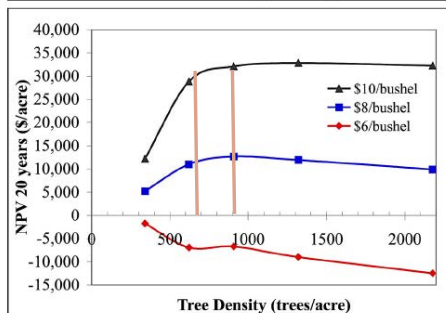
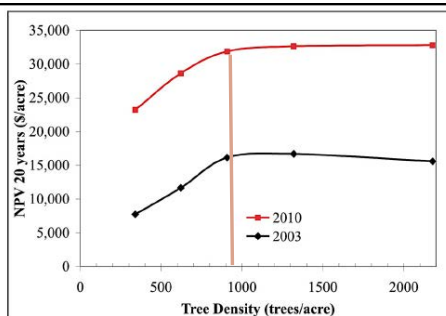


Figure 1. Effect of tree density on 20-year profitability calculated as Net Present Value per acre in 2003 and 2010 (top) and interaction of fruit price and tree planting density on 20-year profitability.

How many trees per acre?

Robinson et al., 2013.

CCTEC CORNELL CENTER FOR TECHNOLOGY
ENTERPRISE AND COMMERCIALIZATION
GENEVA® APPLE ROOTSTOCKS COMPARISON CHART

**Released GENEVA® Apple Rootstocks
Arranged by Tree Size**

Seedling Size

M.7-MM106 Size

M.27 Size

M.9 T337

M.9 PAJ 2

M.26 Size

G.65

G.11

G.41

G.935

G.202

G.16

G.214

G.30

G.890

G.969

G.210

G.222

New Releases

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USDA

Agribusiness Research Service

Contact:
Jessica Lyga,
Plant Varieties &
Geoplasm
Licensing Associate
Office: 607-255-0270
E-mail:
jml73@cornell.edu

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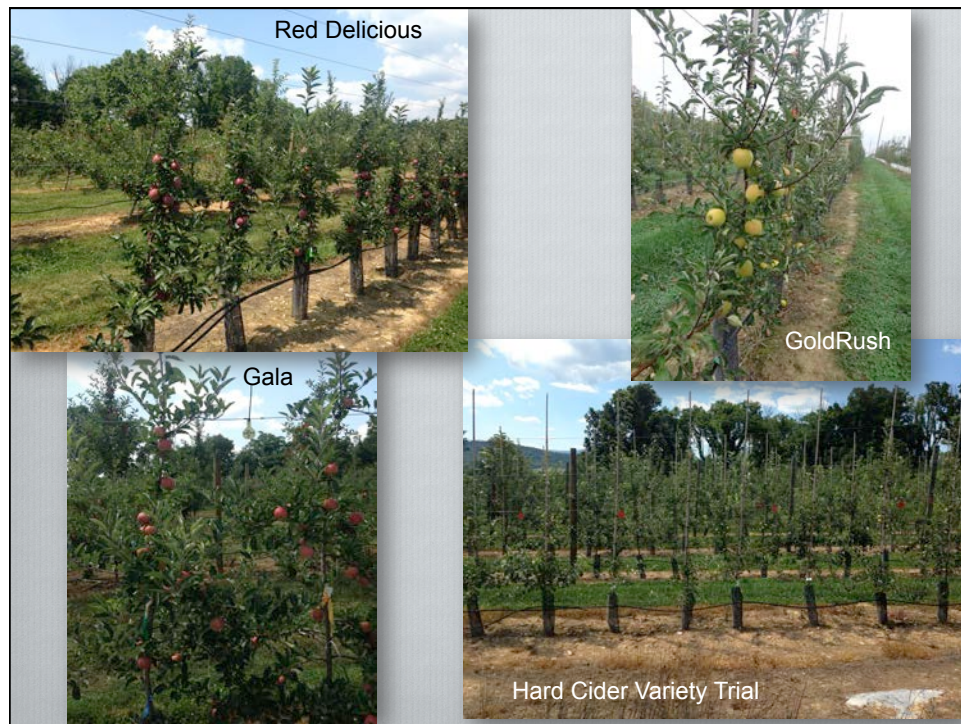
www.cctec.cornell.edu

Trellis Design

Table 3. Cost of Support Systems

	Posts	Wire & Staples	Training Stakes	Installation Labor	Total
3Wire	\$1,123.66	\$205.50	\$0.00	\$367.00	\$1,696.16
5Wire	\$1,123.66	\$340.50	\$0.00	\$387.00	\$1,851.16
3Wire plus Bamboo	\$1,123.66	\$205.50	\$648.00	\$495.00	\$2,472.16
3Wire plus Stabilizer	\$1,123.66	\$205.50	\$211.20	\$495.00	\$2,035.36
1Wire w/Conduit Stake	\$1,123.66	\$68.50	\$2,420.00	\$495.00	\$4,107.16

Finger Lakes Trellis: <http://www.fingerlaketrellissupply.com>.
Hovino, 2012. *Experiences with Support Systems for the Tall Spindle Apple Planting System*. New York Fruit Quarterly.



Additional Resources

- ❖ The Tall Spindle Planting System Fact Sheet (Cornell)
 - ❖ http://www.fruit.cornell.edu/tree_fruit/resources/The%20Tall%20Spindle%20Planting%20System.pdf
- ❖ Training and Pruning the Tall Spindle Apple Orchard System (Ron Perry, Michigan State)
 - ❖ <http://www.hrt.msu.edu/assets/PagePDFs/ronald-perry/HD-and-Tall-Spindle-12.pdf>
- ❖ New York Fruit Quarterly (many in-depth articles by Cornell personnel):
 - ❖ <http://www.nyshs.org/fq.php>
- ❖ Rootstocks
 - ❖ <http://www.extension.org/apples>
 - ❖ <http://www.nc140.org>
- ❖ University of Massachusetts Tall Spindle Resource List (by Jon Clements)
 - ❖ <http://extension.umass.edu/fruitadvisor/resources/tall-spindle-apple>