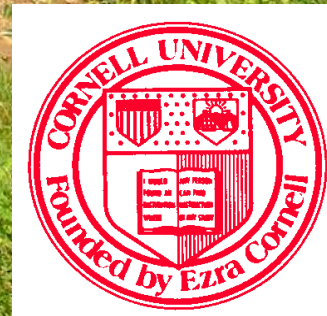


Pears Are Like Apples: So Why Aren't We Growing Them in High Density

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The Challenges with Pears

- Slow to begin production (Plant pears for your heirs)
- Low Mature Yields - Apples have higher yields thus most growers choose to plant apples.
- Poor fruit set
- Fire blight
- Pear Psylla
- Modest or Low Prices



Solutions for the Production Problems of Pears

- Higher tree densities
- Better rootstocks
- New varieties with fire blight resistance or new varieties for high priced market niches
- Adoption of apple tree management
- Improvement of fruit set and thinning



Most High Density Pear Orchards use Quince Rootstocks



The Challenges with Quince Rootstocks in NY

- Quince is susceptible to cold damage in some years in New York State.
- Quince is susceptible to pear decline and fire blight
- Most pear orchards are not irrigated



What is the optimum planting density?



200 trees/acre



4000 trees/acre

The Variety Dilemma: Traditional Varieties or New Fire blight Resistant Varieties

- Traditional Varieties:
Bartlett, Bosc, Anjou, Comice, Seckel
- Fire Blight resistant varieties:
Harrow Varieties - Harrow Crisp, Harrow Sweet, Sundown
- USDA varieties – Magness, Potomac, Blakes Pride, Sunrise, Shennandoah, Gem



NY Pear Systems Trial

- A 4 acre field trial was planted at Geneva, NY in 2003.
- 4 Varieties (Bartlett, Bosc, Taylors Gold Comice, Concorde).
- 5 Rootstocks (seedling, OHF97, OHF87, Pyrodwarf, Pyro 2-33, Quince A)
- 4 training systems were used ranging in density from 242-2,178 trees/acre.

System	Tree Den. (trees/acre)	Spacing (ft)	Initial Heading Height (inches)
Central Leader	242	10 x 18	32
Vertical Axis	519	6 x 14	48
Tall Spindle	908	4 X 12	60
Super Spindle	2178	2 x 10	60

Traditional Central Leader

- Spacing 10X18'
- Conduit support pole but no trellis
- Leader headed each year
- Branches tied down to 45° in third year.



Vertical Axis

- Spacing 6 X 14'
- Conduit support pole and single wire trellis.
- Leader headed at planting.
- Branches tied down to 90° at end of second year.
- Large branches removed with a bevel cut.



Tall Spindle

- Spacing 4 X 12'
- Conduit support pole and single wire trellis
- Leader not headed at planting.
- Branches tied down below horizontal (135°) at the end of the second year.

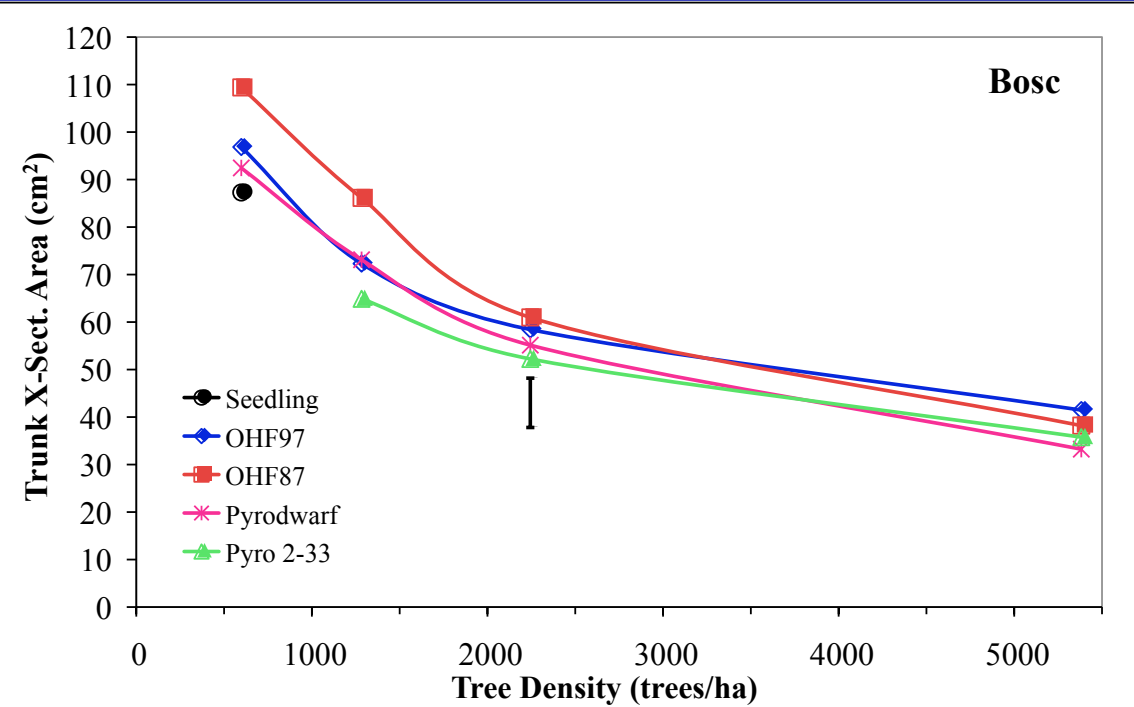
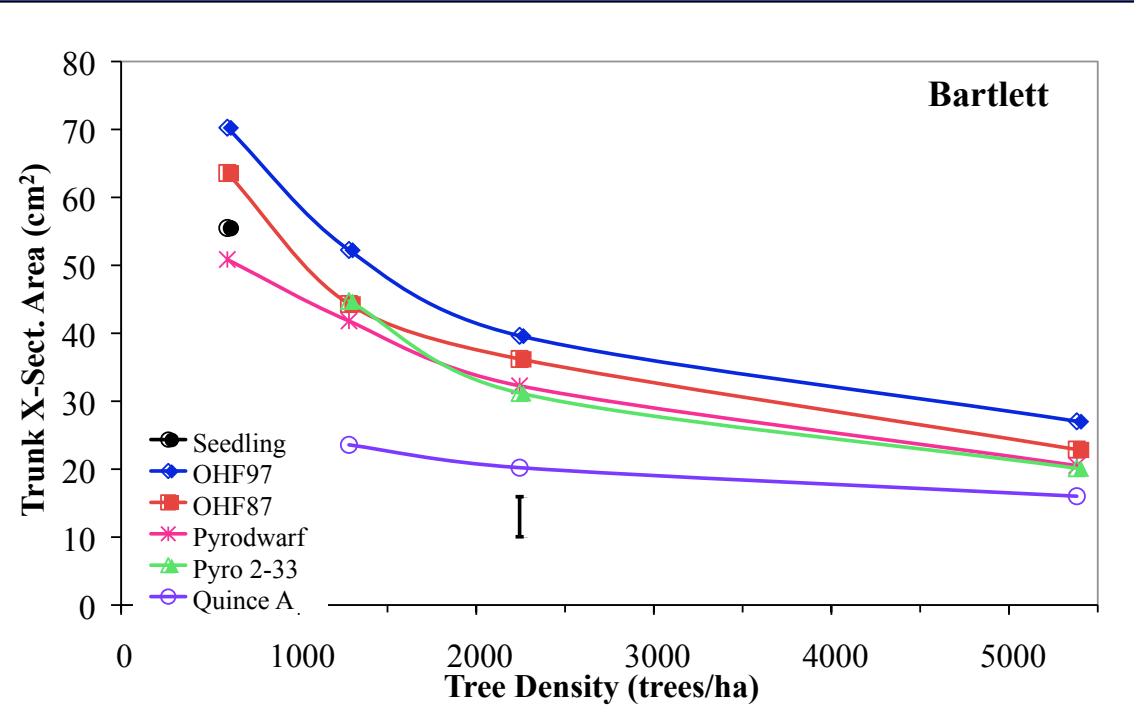


Super Spindle

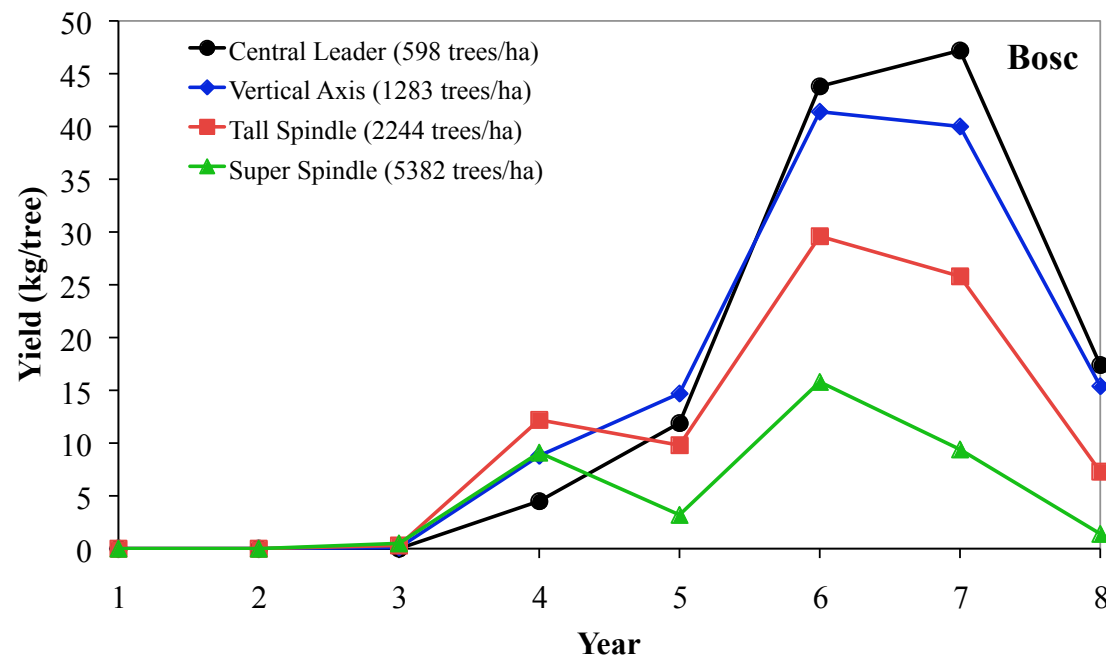
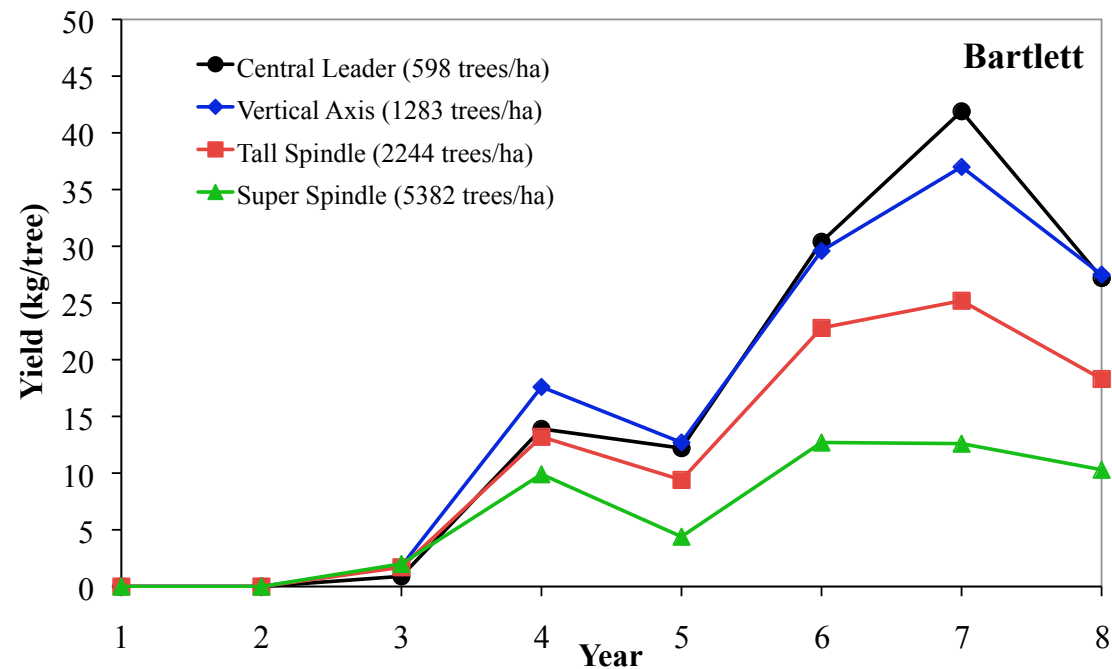
- Spacing 2 X 10'
- Leader not headed at planting.
- Branches tied to trellis wire in first and second year.
- Large branches removed with a bevel cut.
- Fruitful branches shortened to fit into space.



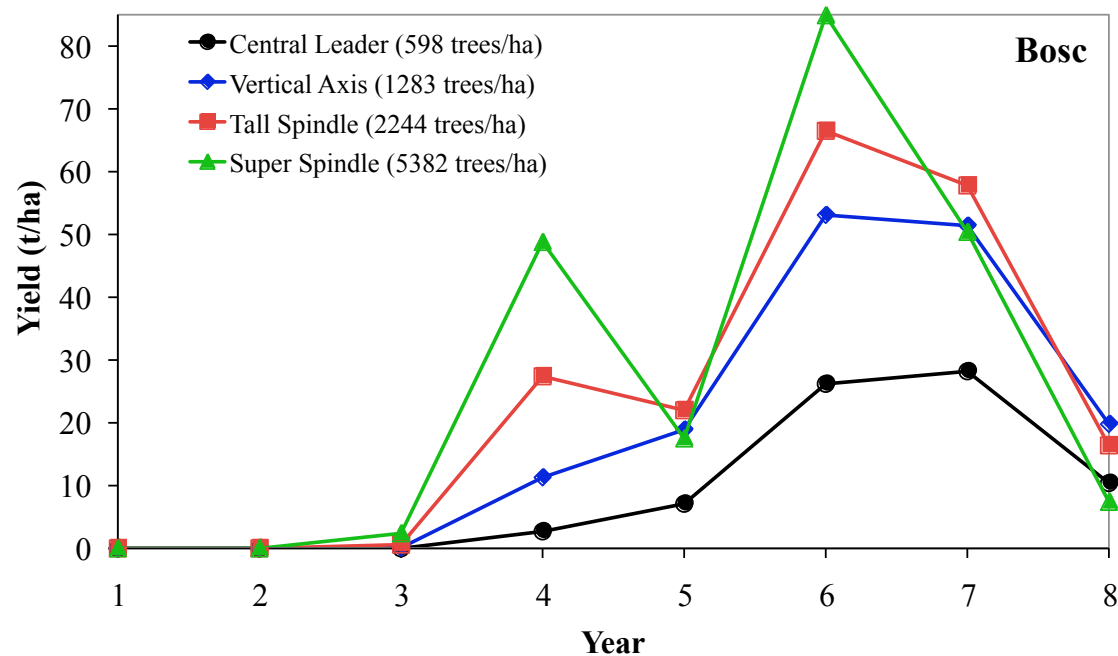
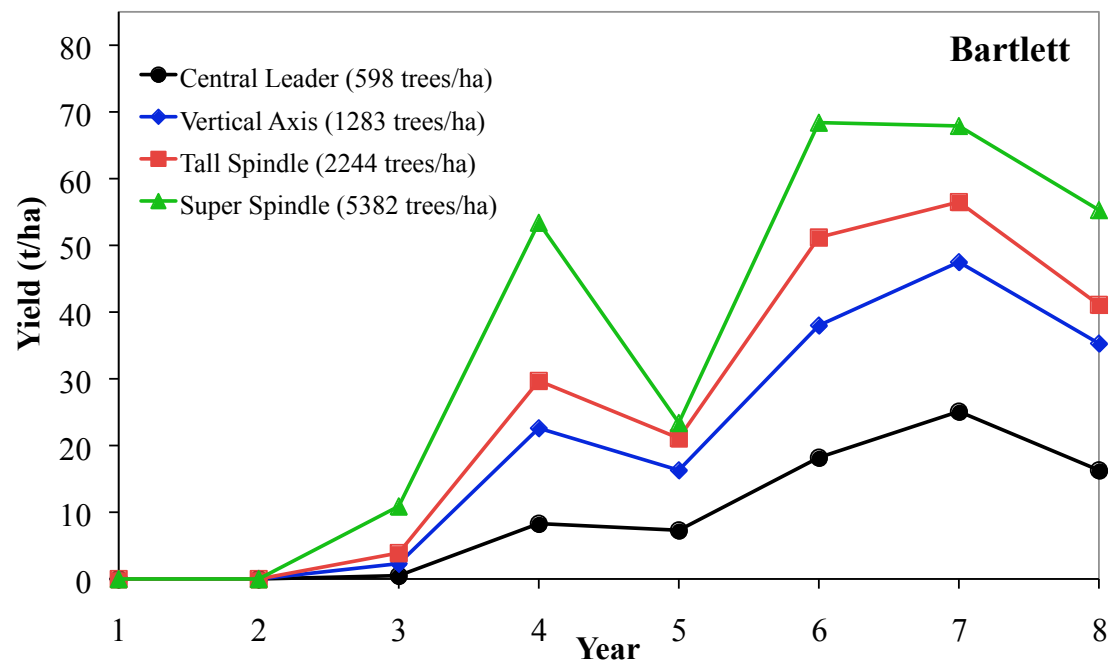
Effect of Planting Density and Rootstock on Tree Size



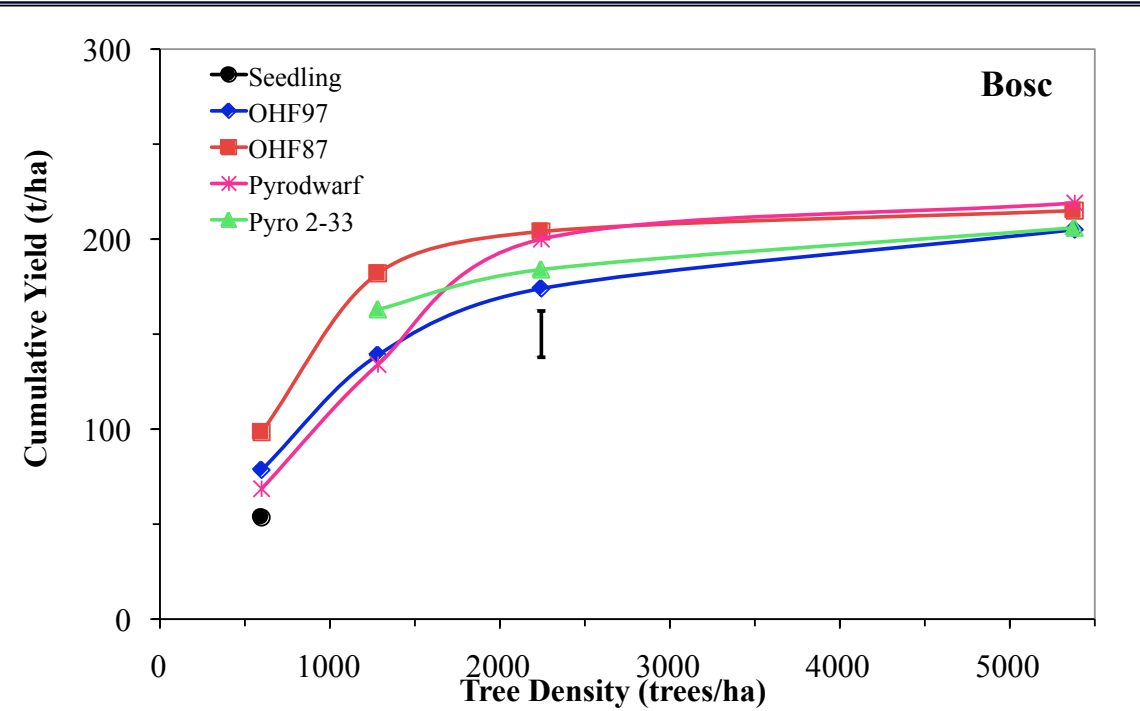
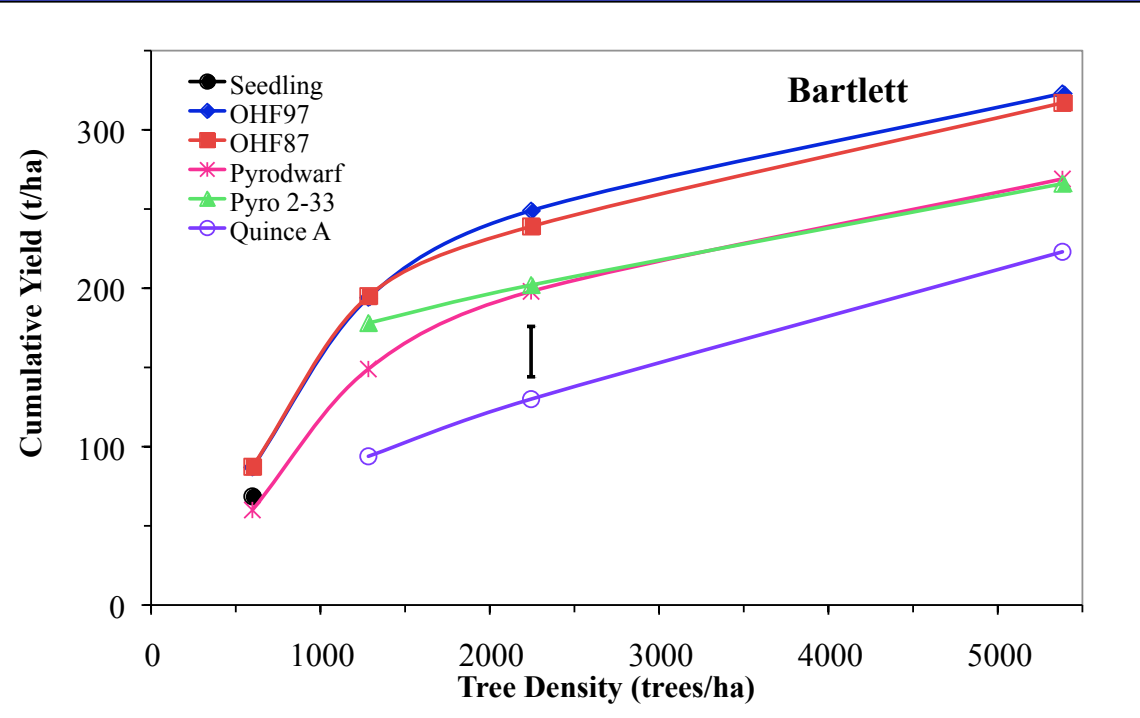
Effect of Training System on Yield /Tree



Effect of Training System on Yield / Ha

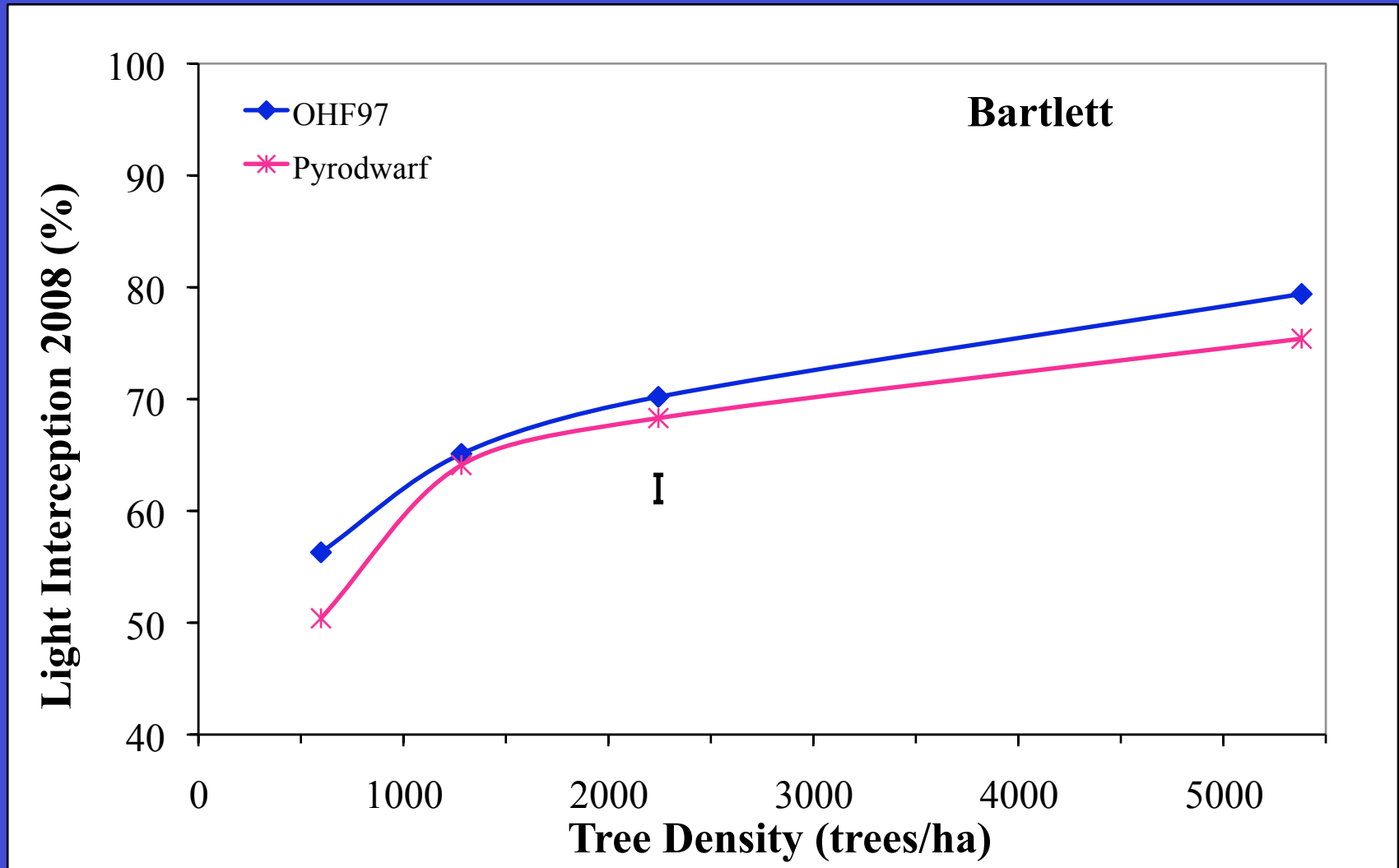


Effect of Training System and Rootstock on Cumulative Yield / Ha

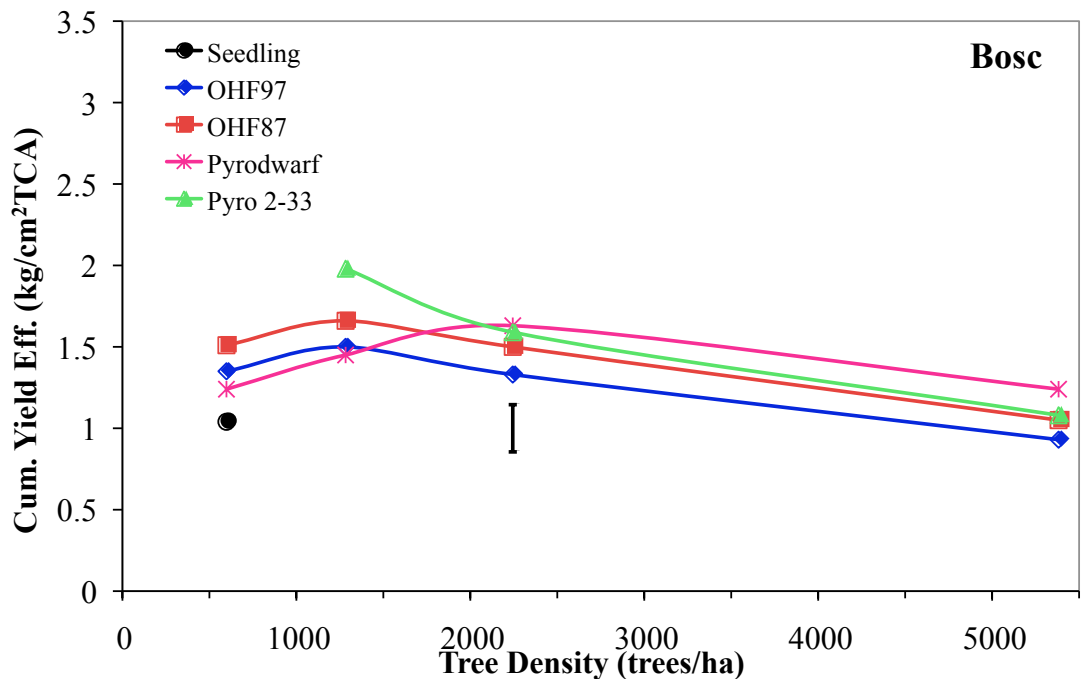
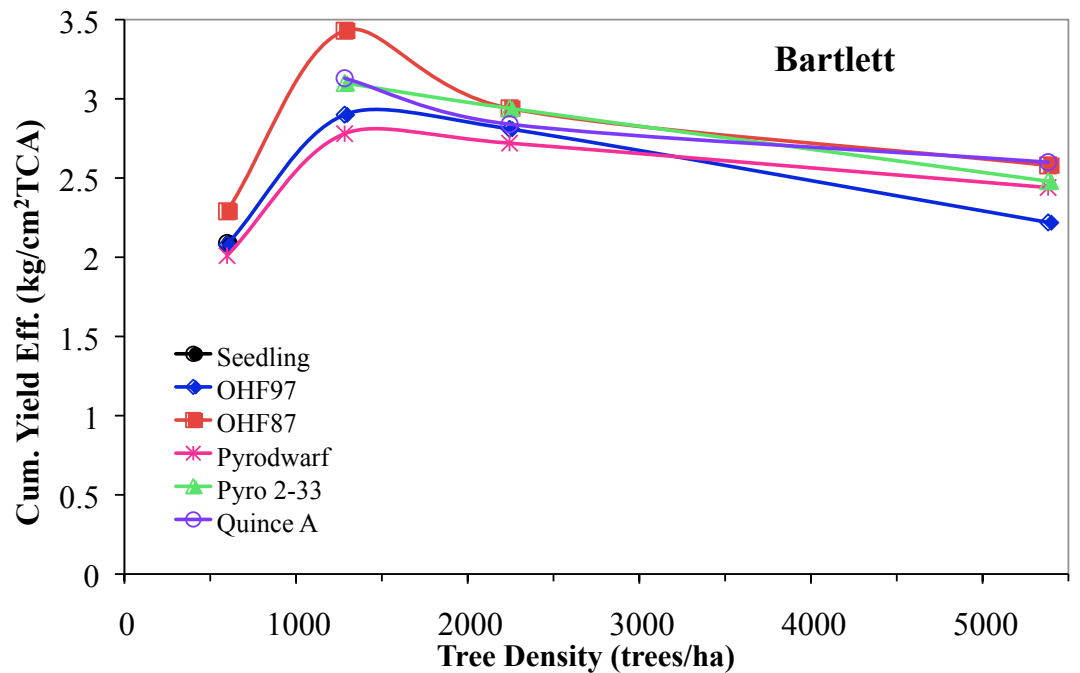


Effect of Planting Density and Rootstock on Light Interception

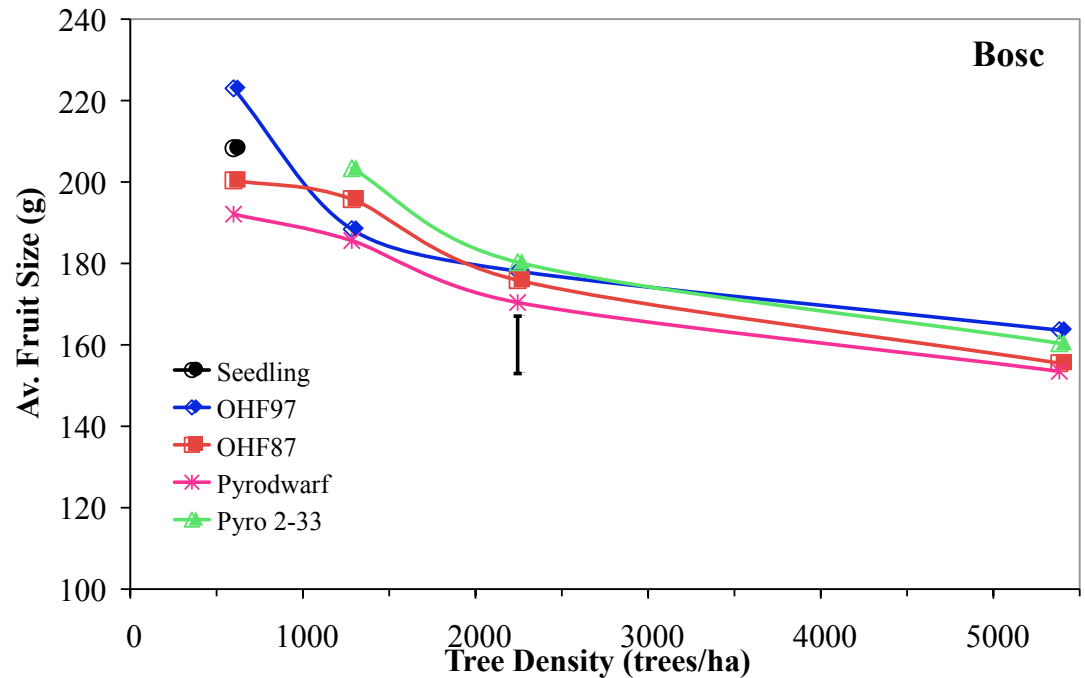
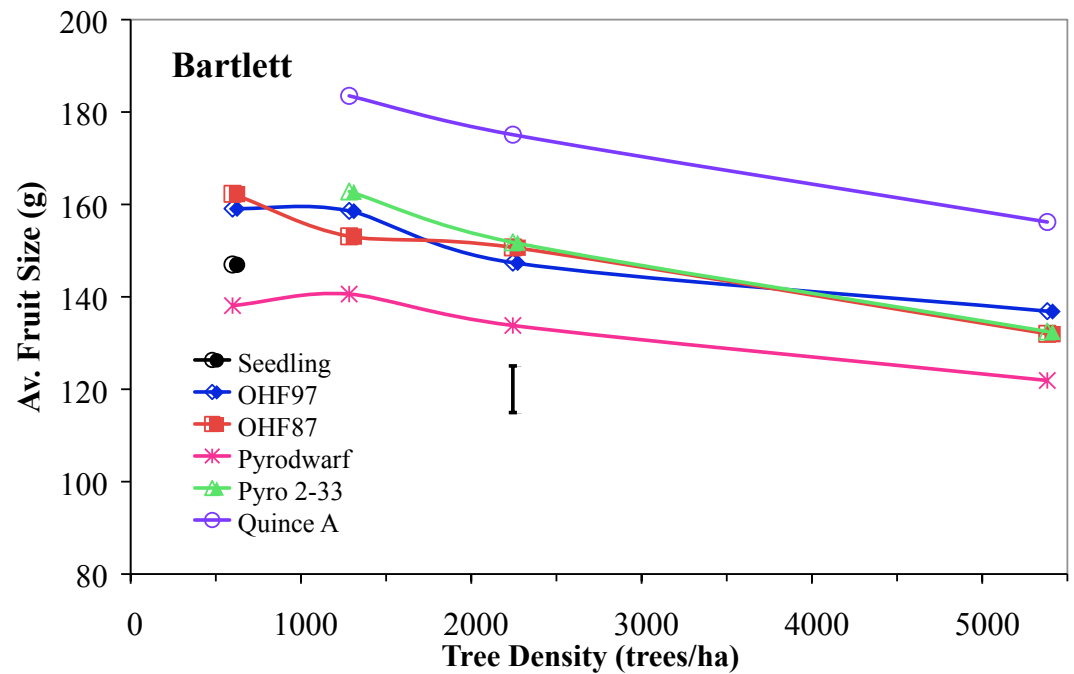
(1:1 ratio of tree height to between row width)



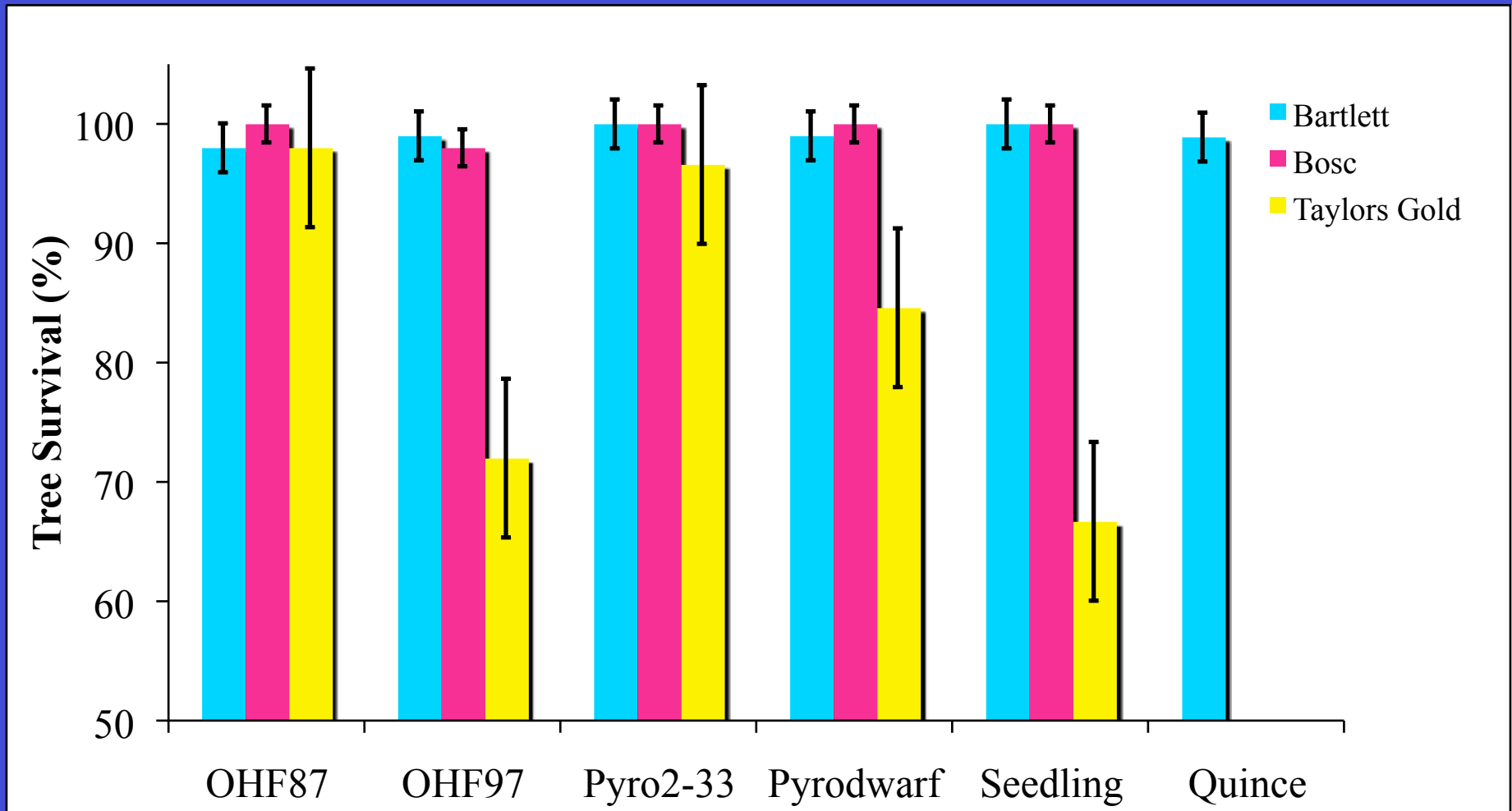
Effect of Planting Density and Rootstock on Cumulative Yield Efficiency



Effect of Planting Density and Rootstock on Average Fruit Size



Effect of Rootstock and Cultivar on Tree Survival



Rootstock Options

- *Pyrus communis*
 - OHF 97, 87, 69, 40, 217, 513
 - BP1, 3
 - Pryodwarf, Pyro 2-33
 - Horner
- *Pyrus calleryana*
- *Pyrus betulafolia*
- *Cydonia oblonga* (Quinces)
 - Quince A
 - Quince C
 - Quince BA29
 - Quince Sydo
 - Quince Eline

Option 1: Tall Spindle

- Tree Density ~1200 trees/acre
- Spacing: 3 ft. X 12 ft.
- Rootstock: OHF 87, Pyro 2-33
- Trellis: Three or four wire trellis with 12' posts
- Pruning: Leader not headed at planting, then branch renewal (remove branches larger than $\frac{3}{4}$ inch diameter).
- Feathered tree
- Branches tied down below horizontal (135°) early in the second year.
- Plant Growth Regulators and/or trunk ringing to induce cropping in the second and third years.





Option 2: Bi-Axis, Tri-axis

- Planting Density: 908 trees/acre
- Spacing: 4 ft. X 12 ft.
- Rootstocks: OHF 87, Pyro 2-33,
- Trellis: 4 wires with 12 ft posts
- 2 stem tree from nursery
- Short fruiting branches without limb bending.
- Renewal pruning to eliminate larger branches ($>3/4$ inch)
- Short pruning (cutting back fruiting branches to a spur)

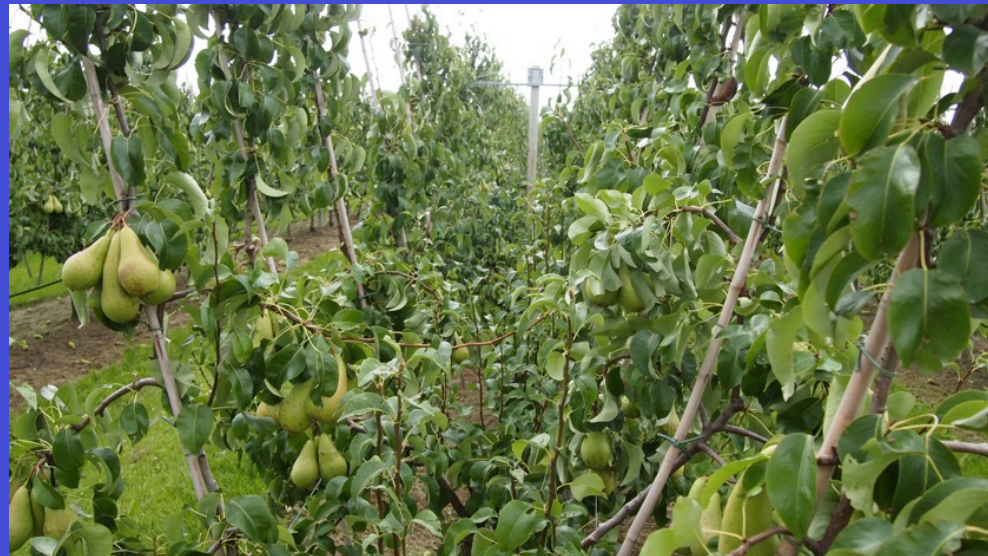






Option 3: Quad Axis in a V

- Tree density: 1850 trees/acre
- Spacing: 2 ft. X 12 ft.
- Rootstocks: OHF 87, Pyro 2-33,
- Trellis: A low V-trellis with 3 wires per side
- 4 stem trees from the nursery
- 2 stems on each side of the V-trellis with bamboo training sticks
- Short fruiting branches and spurs.
- Eliminate branches
- Short pruning (cutting back fruiting branches to a spur)







Option 4: Super Spindle

- Tree density: 2000-4000 trees/acre
- Spacing: 18 inches X 10 ft.
- Rootstocks: OHF 87, Pyro 2-33, Quince C, Quince A
- Trellis: 4 wire
- Eliminate branches
- Short pruning (cutting back fruiting branches to a spur)







Key New Management Strategies for Pear

- No heading of the leader at planting
- Tying down branches in year 1 or 2
- Renewal pruning (no permanent branch structure)
- Root pruning
- Trunk Ringing
- Growth Regulators



Pruning or branch bending with Pear

- Traditional pear experts use pruning to manage pear branches when planted on Quince rootstocks
- With *Pyrus* rootstocks limb bending is useful to induce cropping and manage branch vigor



In apple it is common to tie down branches



With Pear it is common to stub back branches

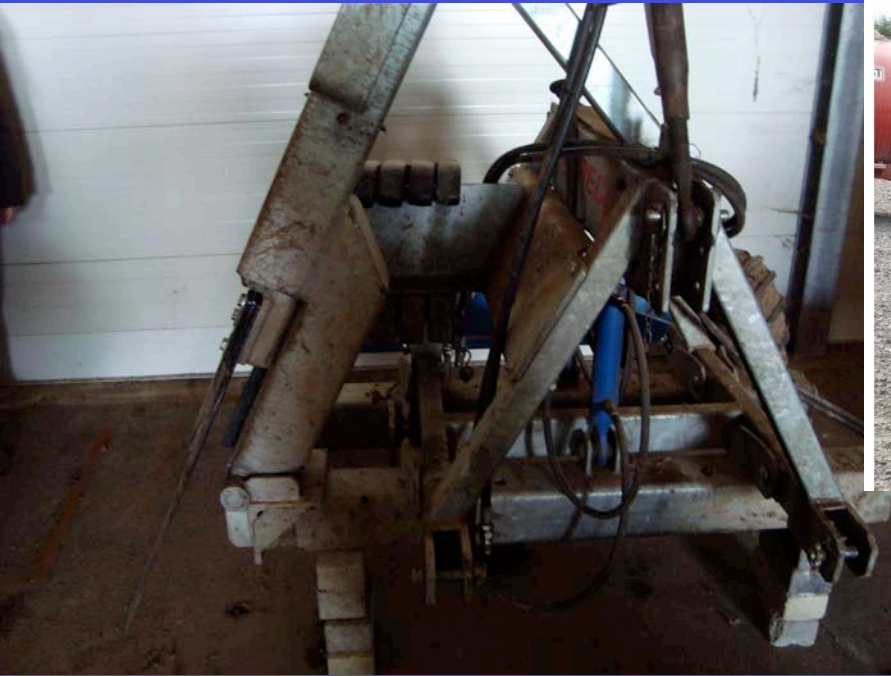


Branch Renewal or Permanent Branches

- Permanent branch structure is common on wide spaced central leader trees
- Branch renewal is critical to management of high density pear orchards



Root pruning to control Vigor



Trunk Ringing to induce Flowering



Growth Regulators

- Maxcel for Chemical Thinning(100-150ppm)
- Promalin to improve set
- ReTain to improve set
- GA3, 4+7 to improve set after a frost
- Prohexadione-Ca to improve set (risk of reduced return bloom)
- Fall foliar Urea (2-4%) to improve fruit set
- Boron in pink bud stage to improve fruit set
- NAA during the summer to improve return bloom



Conclusions

- You can reduce tree size of trees on *Pyrus* rootstocks by planting high tree densities. (The highest density systems had trees about 60% the size of the lowest density system after 8 years).
- You can increase yields by planting high tree densities. (The Super Spindle was 5 times as productive as the traditional Central Leader system which was the least productive).
- OHF 87 or Pyro 2-33 are both good rootstock options for high density pear orchards
- Increasing tree density resulted in smaller fruit size. (Thinning and irrigation will be essential to manage fruit size)
- Apple management strategies can improve early yield. (Tying limbs down, using PGR to increase flowering and fruit set)
- Apple tree pruning can help with long term canopy management. (Limb renewal pruning, root pruning, ringing or growth regulators)
- The best option with *Pyrus* rootstocks appears to be the Tall Spindle (3X12 feet) or Bi-axis Tall Spindle (4X12 feet)
- Fire blight resistant varieties offer an opportunity for pear growers in the east

Questions?

Thank you for your attention

