

Design a hazelnut orchard in Ontario

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Topics

- orchard-planning and design considerations:
- tree density, pollinizer placement
- planting designs, row length
- loading areas

A Well designed orchard ensures:

- Earliest economic return per acre
- Maximum production per acre at tree maturity
- Least management cost

Pre-planting considerations

- carefully assess all the factors that will affect fruit quality and orchard sustainability
- cold-air drainage and soil quality
 - avoid cold air pockets, prone to spring frost damage
 - soil texture, parent material, native fertility, erosion levels, and water-holding capacity
 - analysis of pH, nutrient imbalances, and organic matter content

- optimum tree height = half the row spacing plus 3 feet
- high densities requires careful assessment of the vigor potential of a site
- topography, equipment size, and worker access
- Windbreak

Tree growth habit

- 1- Upright: Clark, Jefferson,
- 2- Vase shaped: Butler, Santiam
- 3- Rounded bush: Tonda di Giffoni
- 4- Spreading: Yamhill
- 5- Horizontal spreading: *C. avellana* var: *pendula*
- 6- Weeping: *C. avellana* var: *contorta*



Jefferson



Santiam: slightly
rounded to Up-right



upright



vase shaped



rounded bush



Yamhill



spreading



horizontal spreading



weeping

- spot treatments of weeds
- cover – crop for several years to suppress weeds, nematodes, and soil-borne fungi and to increase soil organic matter
- soil drainage corrected with subsurface drainage systems or surface modifications such as ridging
- the fertility status of the soil is ameliorated to the depth of the root zone, lime and phosphorus are not very mobile and potassium moves slowly

Tree density and row spacing

- Harvesting equipment is large. Space rows no less than 18 ft.
- square planting configuration
- rectangular planting configuration
- offset configuration
 - the offset system is a variant of the rectangular/square except trees in adjacent rows are offset

O	x	x	O	x	x	O	x	x	O
x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x
O	x	x	O	x	x	O	x	x	O
x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x
O	x	x	O	x	x	O	x	x	O
x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x
O	x	x	O	x	x	O	x	x	O
x	x	x	x	x	x	x	x	x	x
x	x	x	x	x	x	x	x	x	x
O	x	x	O	x	x	O	x	x	O

Square design, pollinizer placement of every third tree in every third row.
 For multiple pollinizers, repeat the pattern across the field
 X = main variety O = pollinizer variety

Pollnizier 1	Pollnizier 2										Pollnizier 1	Pollnizier 3
O	O	x	x	x	x	x	x	x	x		O	O
O	O	x	x	x	x	x	x	x	x		O	O
O	O	x	x	x	x	x	x	x	x		O	O
O	O	x	x	x	x	x	x	x	x		O	O
O	O	x	x	x	x	x	x	x	x		O	O
O	O	x	x	x	x	x	x	x	x		O	O
O	O	x	x	x	x	x	x	x	x		O	O
O	O	x	x	x	x	x	x	x	x		O	O
O	O	x	x	x	x	x	x	x	x		O	O
O	O	x	x	x	x	x	x	x	x		O	O

Rectangular design, pollinizer placement of two rows in every eight rows.
Multiple pollinizers can be planted in these two rows across the field
X = main variety O = pollinizer variety

Standard 20×20 -foot, Oregon

- 108 trees/acre
- adaptable to a variety of soils and cultivars
- advantage
 - provides a good, productive environment that has plenty of sunlight
- disadvantage
 - lower early yield
- Number of trees = $43560 / \text{r.s. (ft)} \times \text{t.s. (ft)}$
- Intercropping

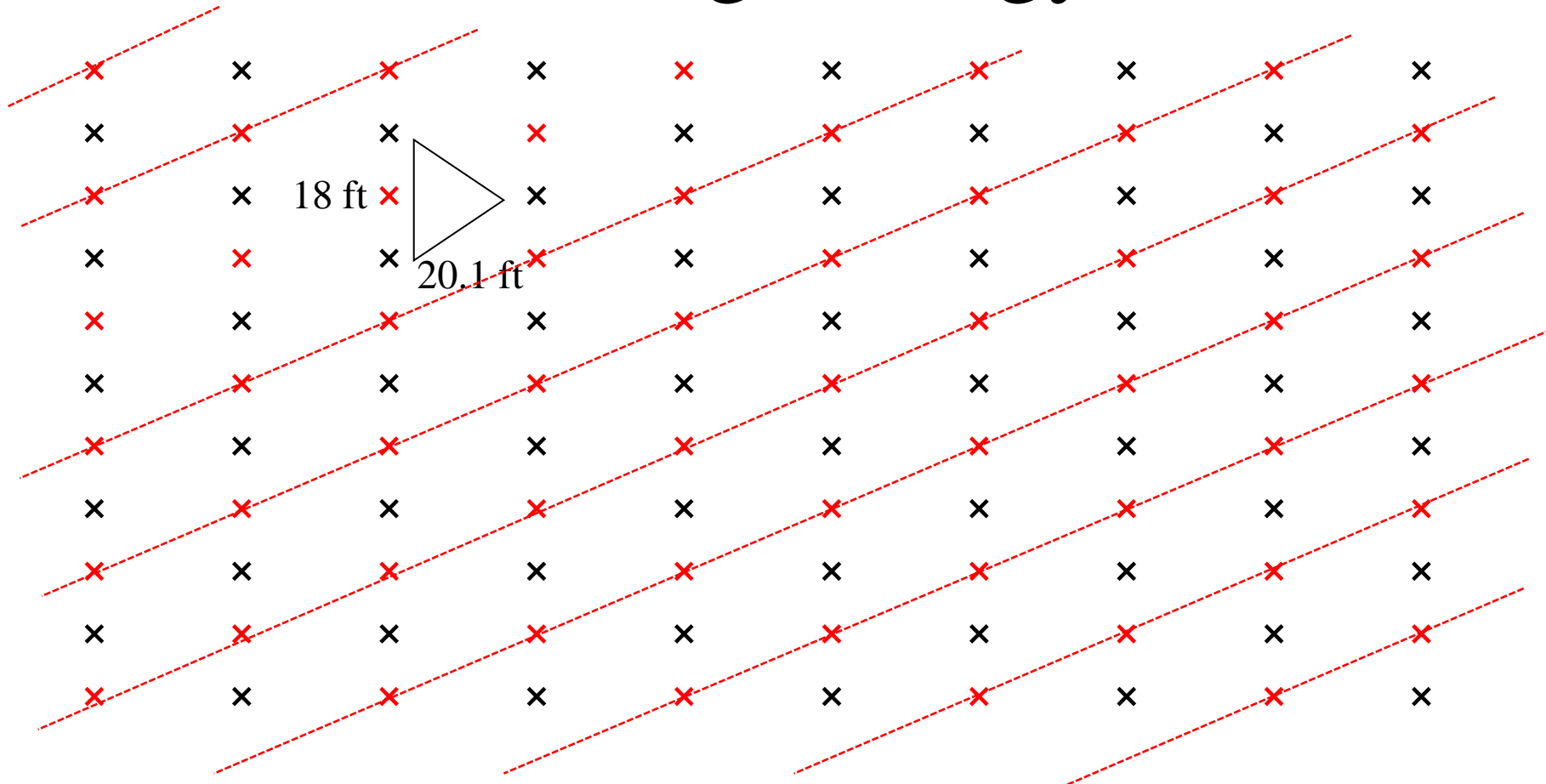
Well-managed with 18×18 -foot, ON

- 134 trees/acre, good permanent spacing for some soils and varieties.
- accommodates standard-size equipment
- possible to work the orchard in three directions
- avoid grooves in the soil surface, cross-flail
- Disadvantage
 - More difficult to interplant between the rows

Double spacing 9×18 -foot

- Can be thinned to form a 18×20.1 -foot triangle (5.4 \times 6 meters) by removing every other tree
- Advantage
 - Early yield
- Disadvantages
 - Inability to cross-flail, higher costs to purchase and maintain additional trees, and the cost of tree removal at thinning time.
- Use this arrangement if you are willing to provide intensive management
- Set orchards in large blocks with future plots in close proximity 200-300 ft.

Double spacing showing tree thinning strategy



Rectangular 18×9 -foot design after year 10 will be thinned to 18×18 offset rectangular

× permanent plants

× temporary plants

Yield estimates for establishment of standard- and double-density hazelnut orchards

Year	Yield (lb/acre) for 20 × 20 foot spacing 108 trees/acre	Yield (lb/acre) for 10 × 20 foot spacing 216 trees/acre
3	75	150
4	285	570
5	440	880
6	600	1200
7	1,100	2,200
8	1,600	2,400
9	1,600	2,400
10	2,000	3,000
11	2,300	2,300*
12	2,800	2,800*

* In double-density orchard, temporary trees are removed after year 10, resulting in the standard 108 trees/acre in years 11 and 12.

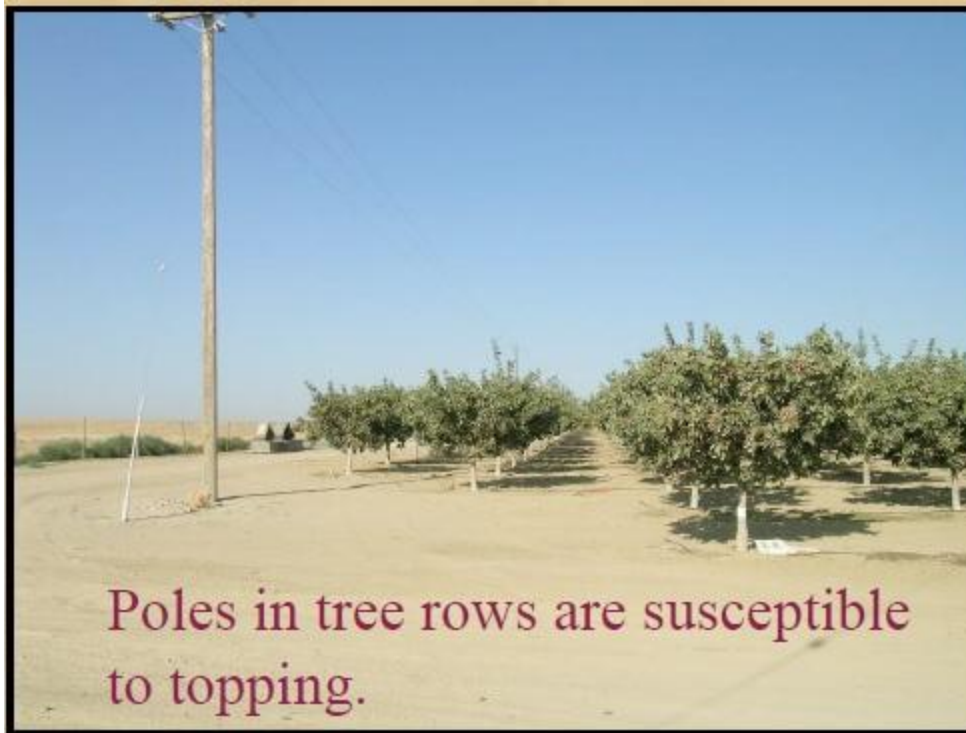
Loading area

- leave enough room at the edges of the orchard to comfortably turn a tractor and sprayer or harvester (35 ft)
- leave enough room to turn into the next row without stopping and backing up
 - Tractor 10ft, harvester 12 ft, bin wagon 10 ft long
- leave some open area to stack tote bins during harvest
- place loading area near a road will reduce the time needed to fill a truck for delivery to the receiving station.



Minimize obstruction

- Poles
 - Leave plenty of room around county roads, Poles, Reservoirs, filters, and pumps so that harvesting and other equipment can turn or pass easily.
- Valves (irrigation, air-release)
 - Use buried vaults
- Pesticide drift, use buffer between orchard and neighboring schools, houses, roads



Poles in tree rows are susceptible to topping.





This air-release valve is still too tall in the tree row.



Thank you

Questions?

References

- USDA, NASS, Oregon Field Office, 2008, Hazelnut tree report, National Agricultural Statistics Service
- Olsen, J., 2013, Growing hazelnuts in the Pacific Northwest, Orchard Design, OSU Extension Catalog, EM 9077
- Craig Kallsen, design of efficient pistachio orchards, citrus and pistachio farm advisor, university of california cooperative extension, 661-868-6221