

Evolution of High-Density Tart Cherry Orchards in Michigan



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Need for Technology and Horticultural Modernization in Tart Cherry

- Michigan Cherry Industry faces challenges from globalization
 - Inexpensive labor
 - Favorable growing conditions
 - Accessibility to suitable farmland
 - Subsidies
 - Tariff issues



- Montmorency: 250+ year-old cultivar
- Mahaleb: standard rootstock
- 20ft+ x 20ft+ spacings
- 30 year-old harvest technology

Trial #1: High Density Montmorency on Commercially Available Rootstocks



Planting established at NWMHRC in 2010

- Gisela 3[®]
- Gisela 5[®]
- Gisela 6[®]
- Mahaleb
- Montmorency on own root



- 12ft x 4.5ft
- Pruned/hedged to bush and central leader
- Irrigated and fertigated



Pruning

- Trained to central leader or bush
- Annual renewal pruning
 - Remove 2-3 of the largest scaffold limbs
 - Leave behind 8" stub for renewal growth
- Clean out dead wood and growth towards interior
- Simplify limbs for light penetration
- Current experimental pruning is too complex and time consuming for growers

Gi3 Central Leader



Gi3 Bush



Gi5 Central Leader



Gi5 Bush



Gi6 Central Leader



Gi6 Bush



Mahaleb Central Leader



Mahaleb Bush



Gi 6/CL

Gi 5/CL

Gi 3/CL



All trained to a central leader system. Picture taken in spring 2018.

Mahaleb

Gi6

Gi5

Gi3



Data Collection

- Amount of bloom
- Leaf area
- Trunk cross-sectional area
- Tree efficiency
- Yield – first harvest 2013
 - No crop in MI in 2012
 - 2015 and 2016
 - Light crop in 2015
 - Large crop in 2016



Harvest

- Hand harvest in '13 and '14
- OTR harvest in '17 and '18 (help from a limb shaker)



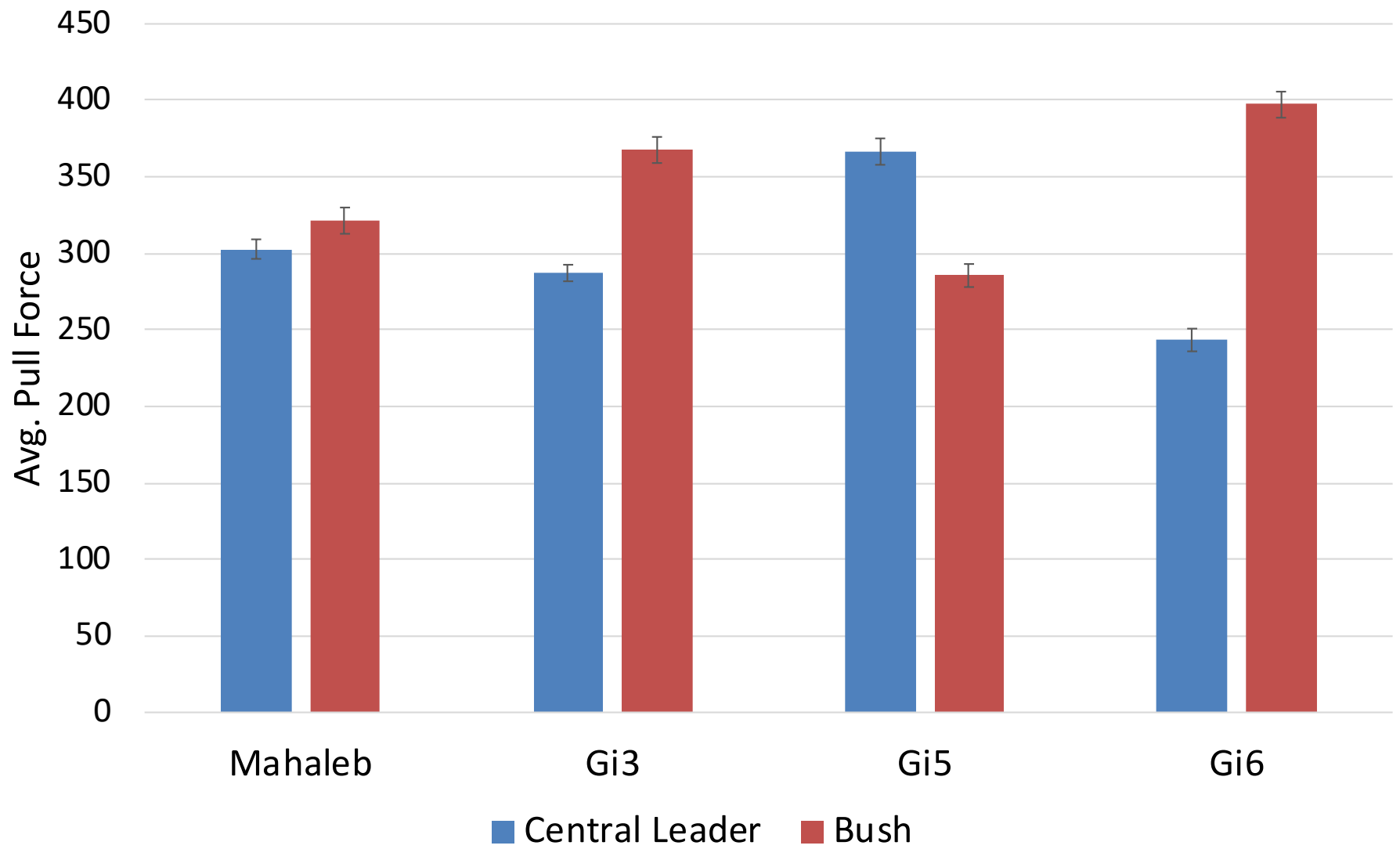


Fruit Quality

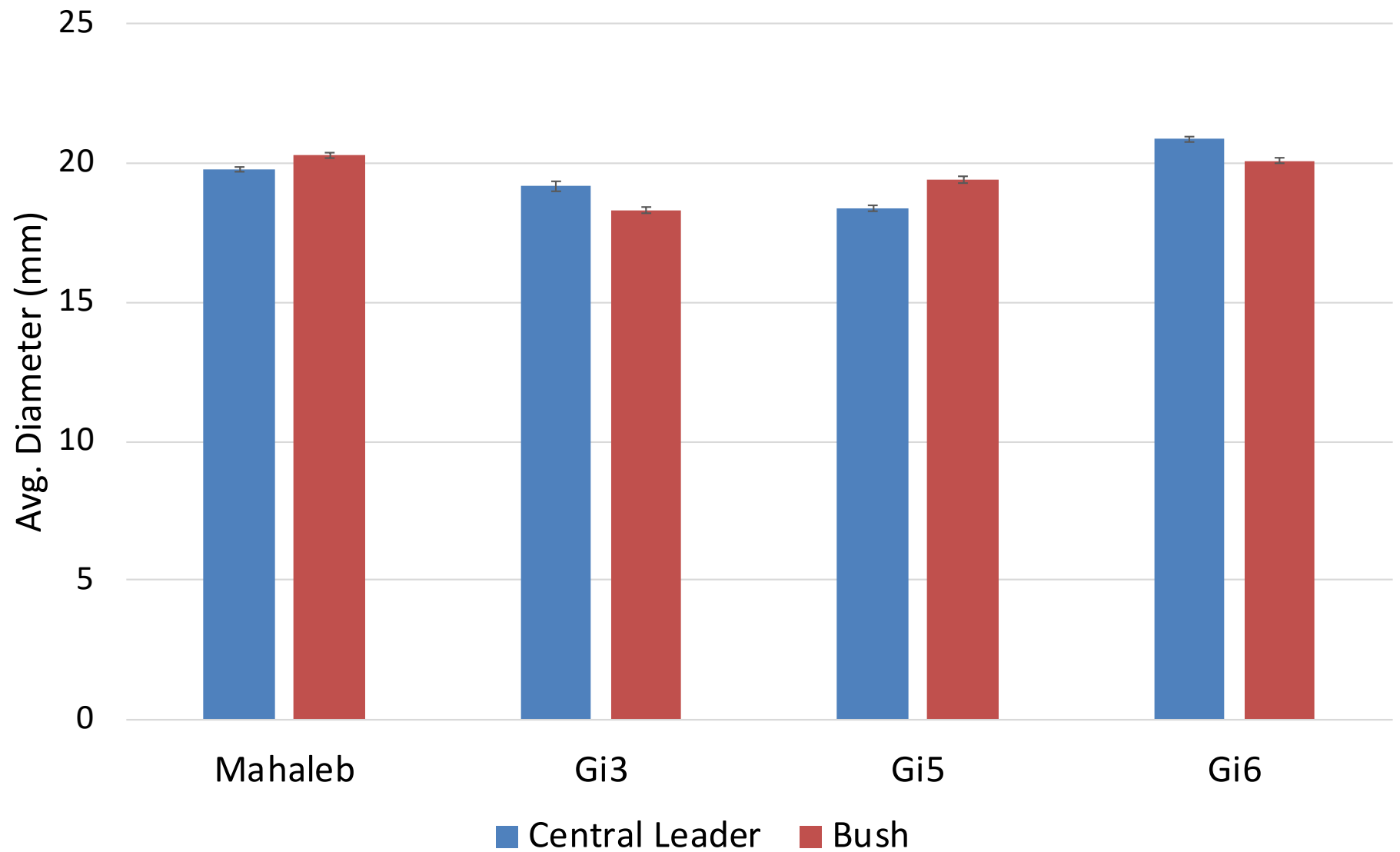
- Collect 150 fruit total from all reps
- Measured pull force, diameter, brix, and soft fruit



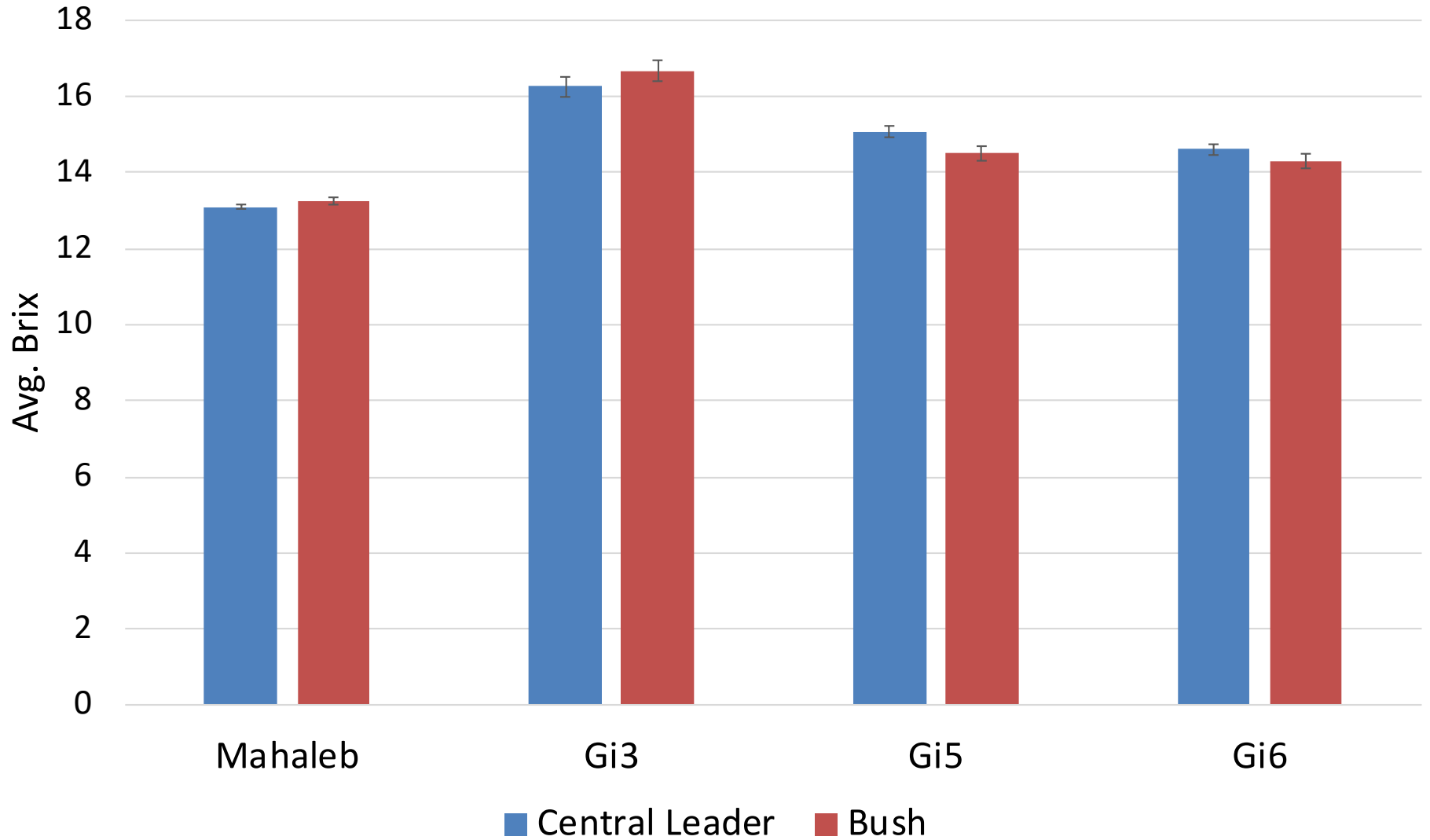
Pull Force



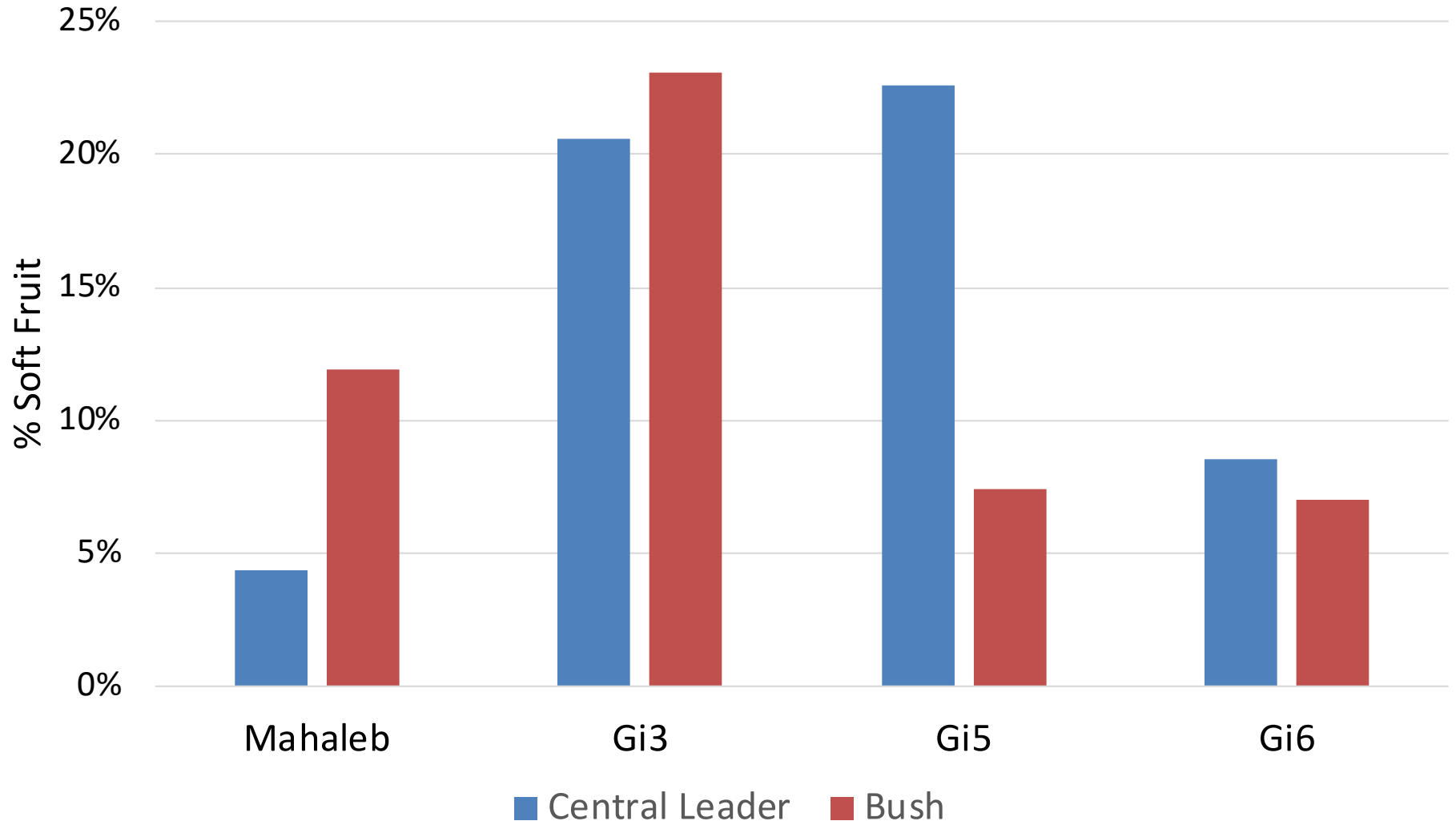
Fruit Diameter



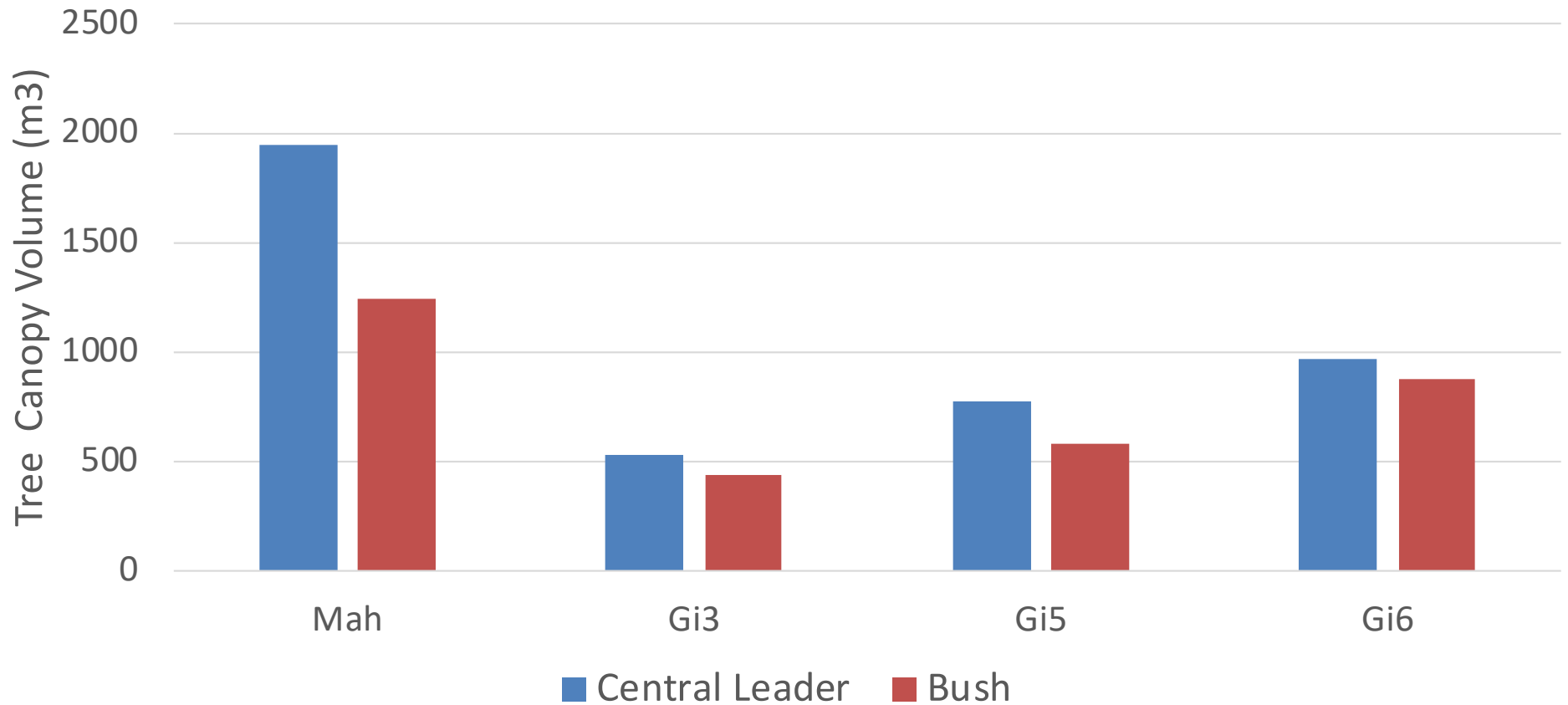
Brix



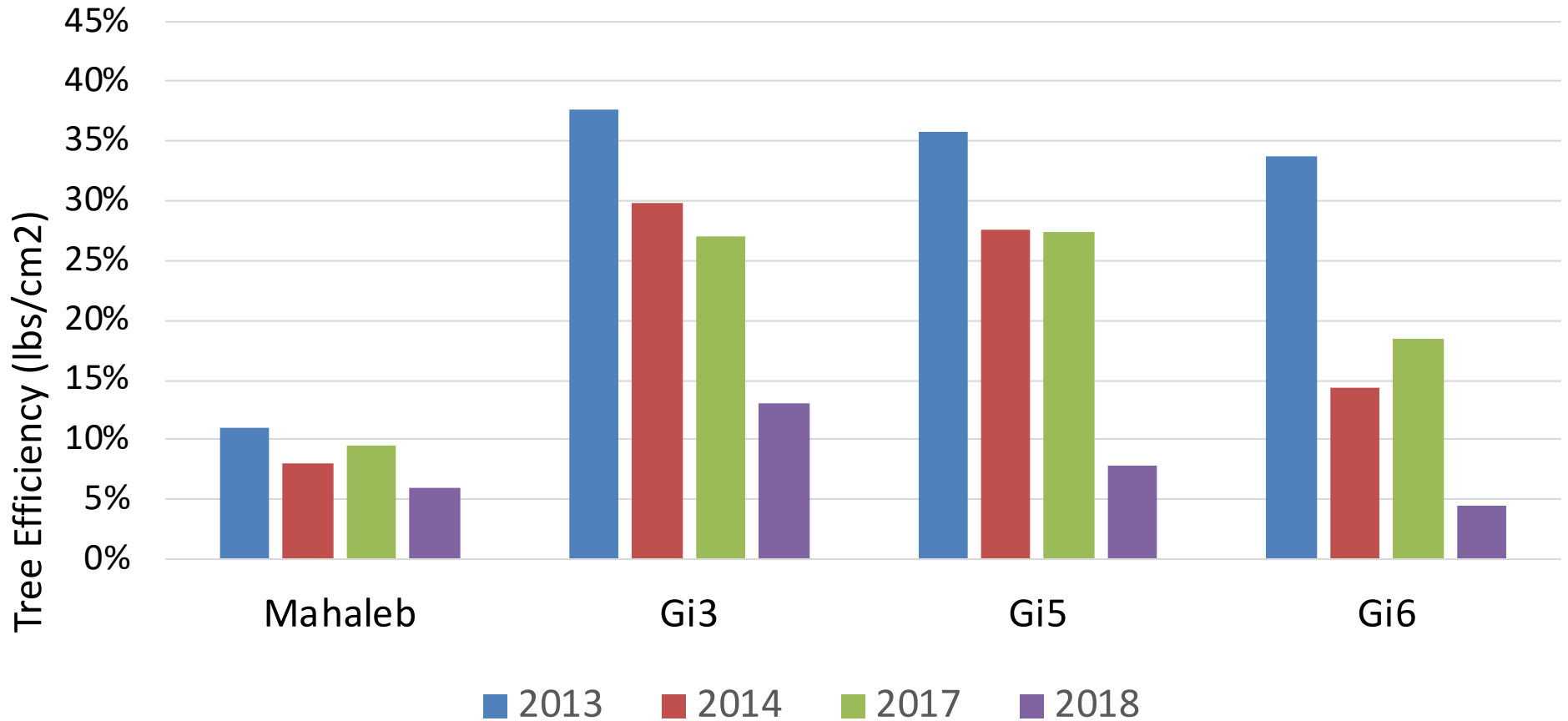
Percent Soft Fruit



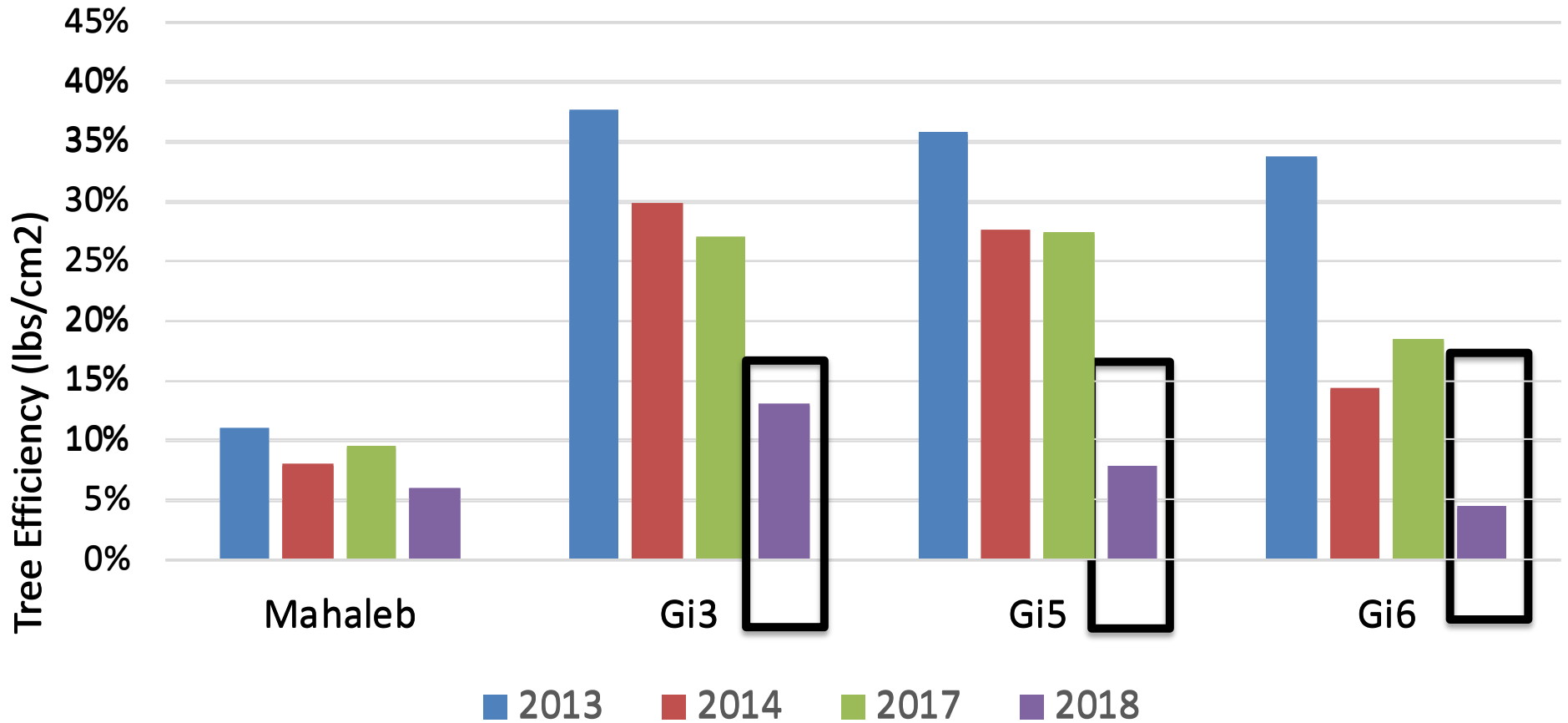
Tree Canopy Volume 2018



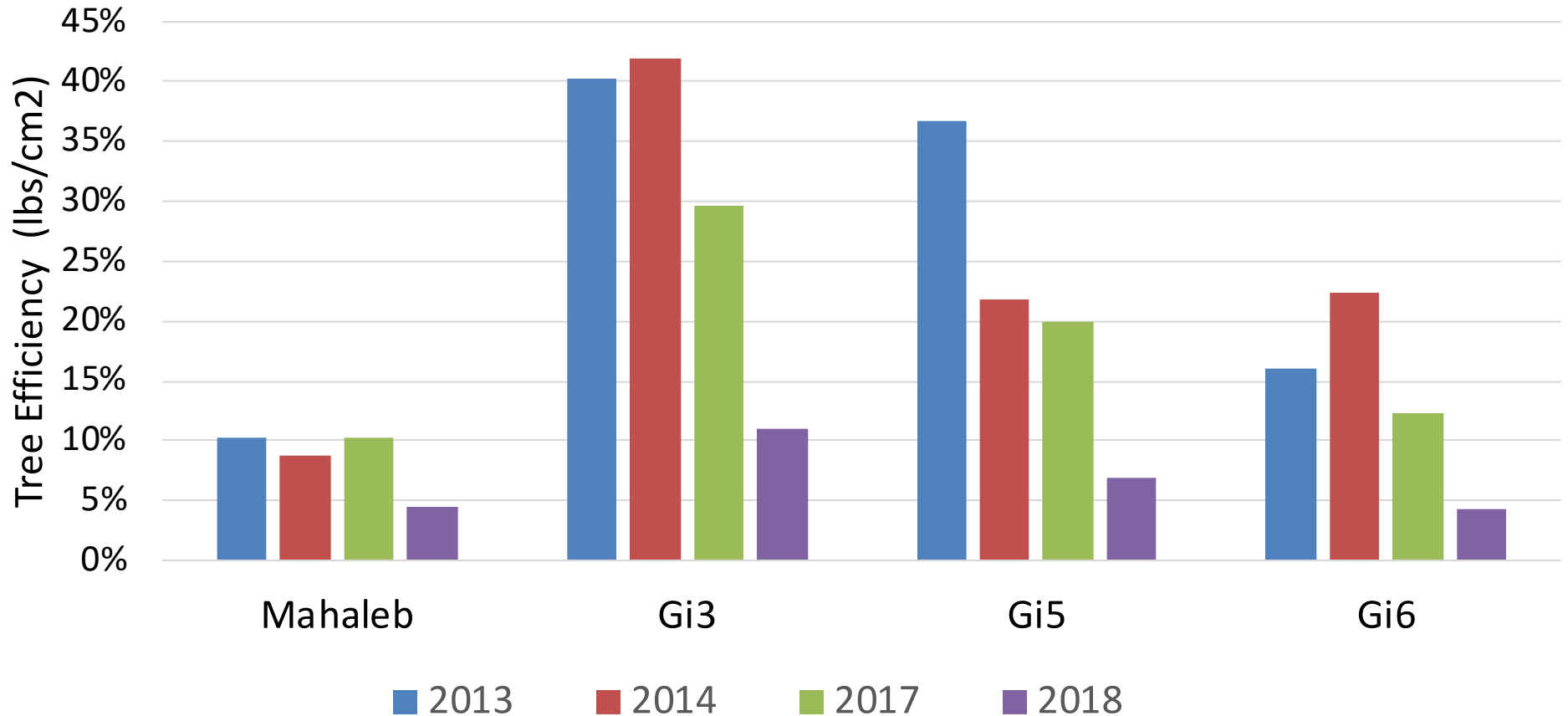
Tree Efficiency – Central Leader



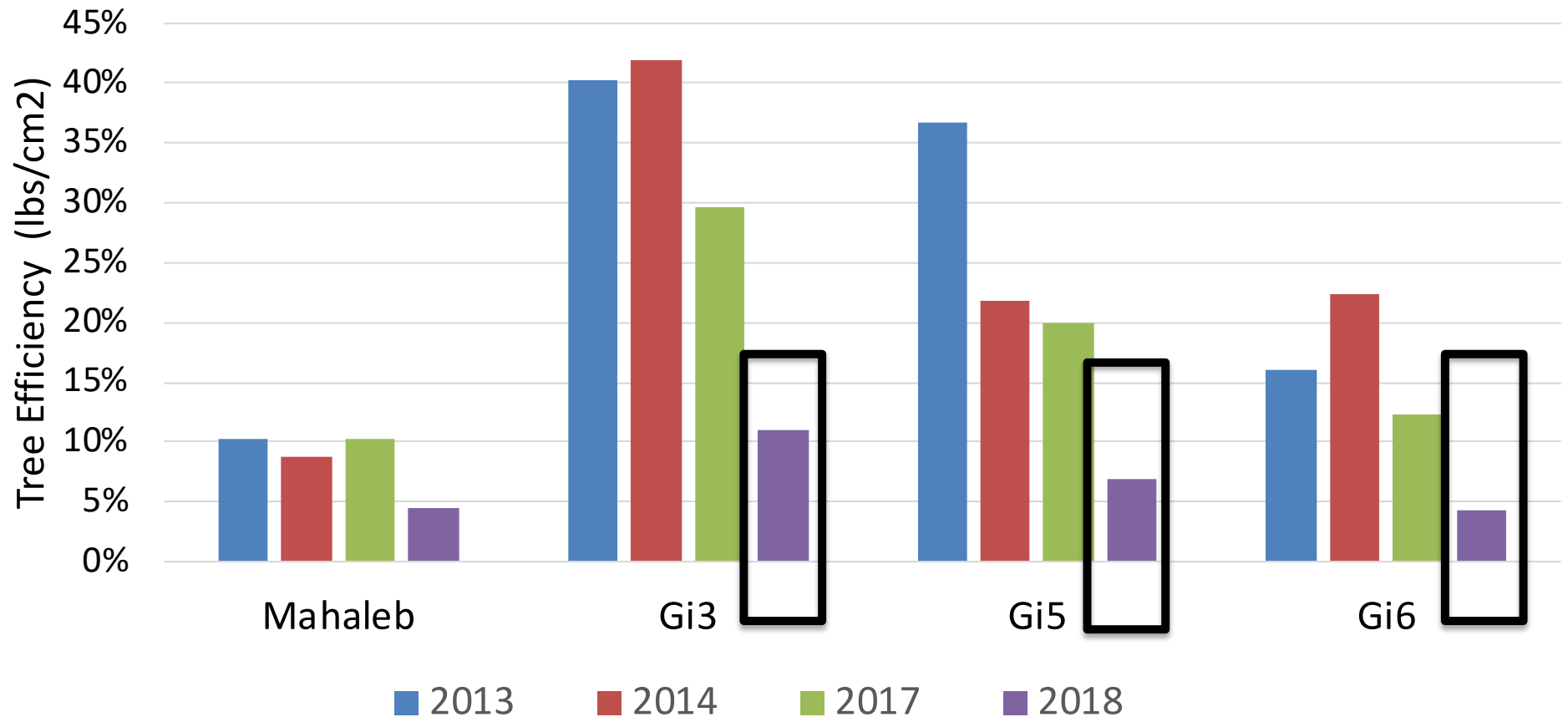
Tree Efficiency – Central Leader



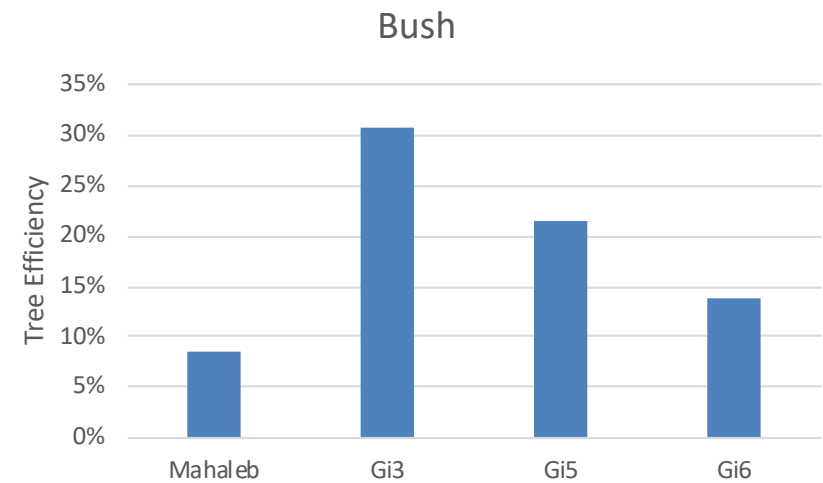
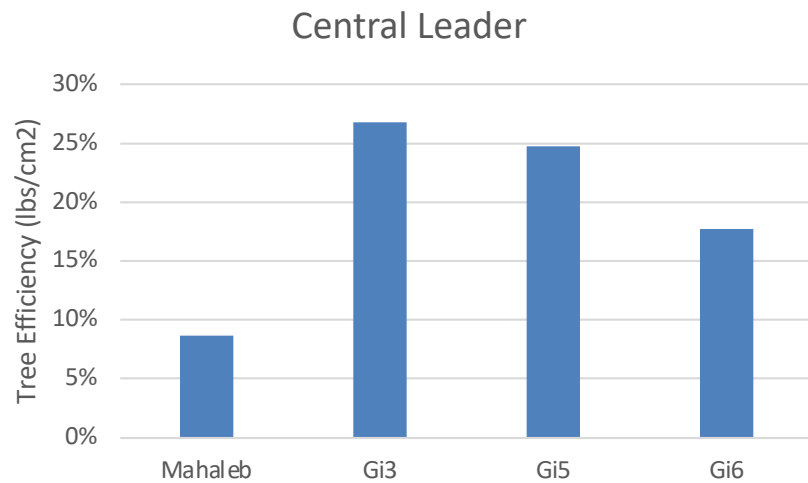
Tree Efficiency - Bush



Tree Efficiency - Bush

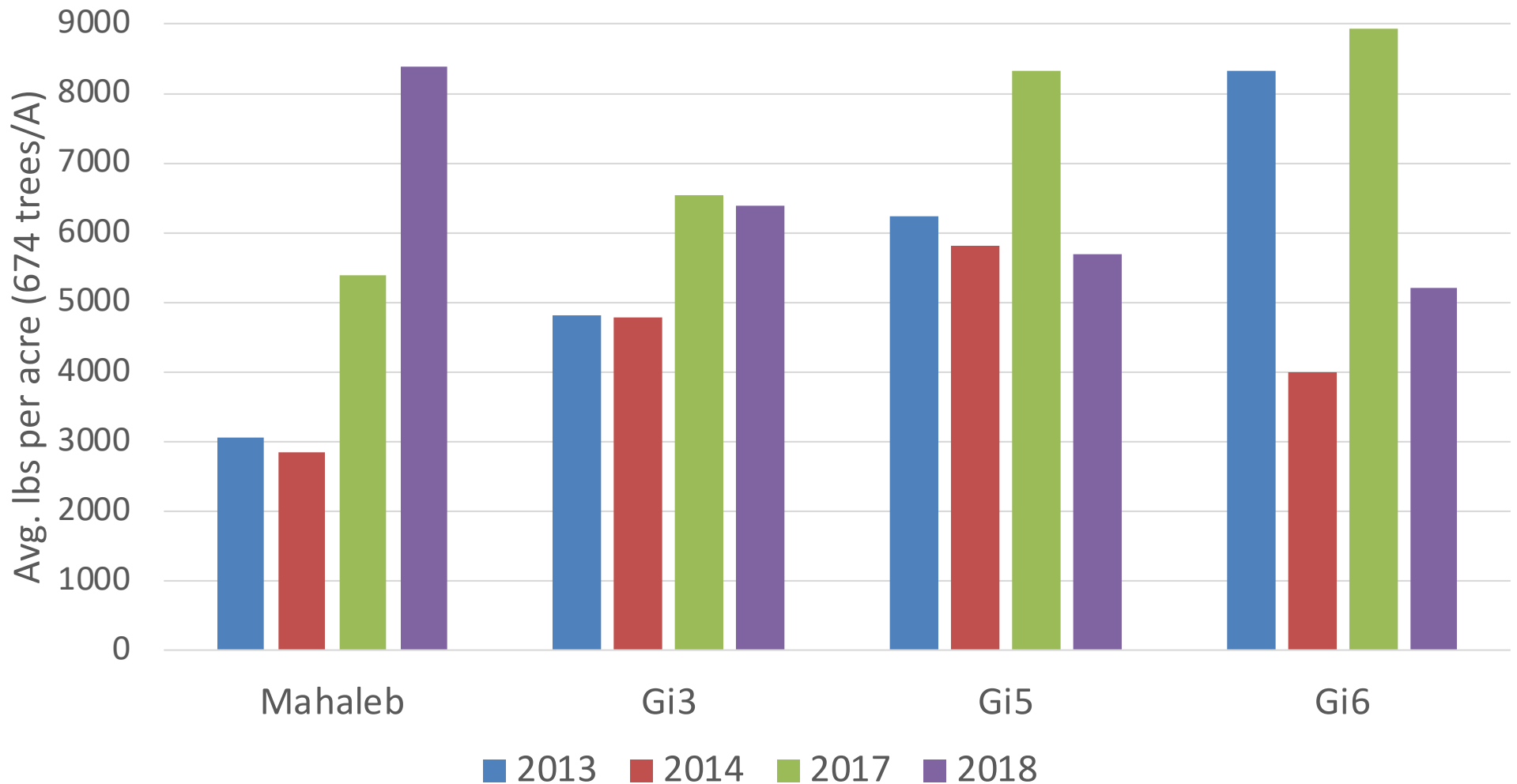


Avg. Tree Efficiency 2014-18



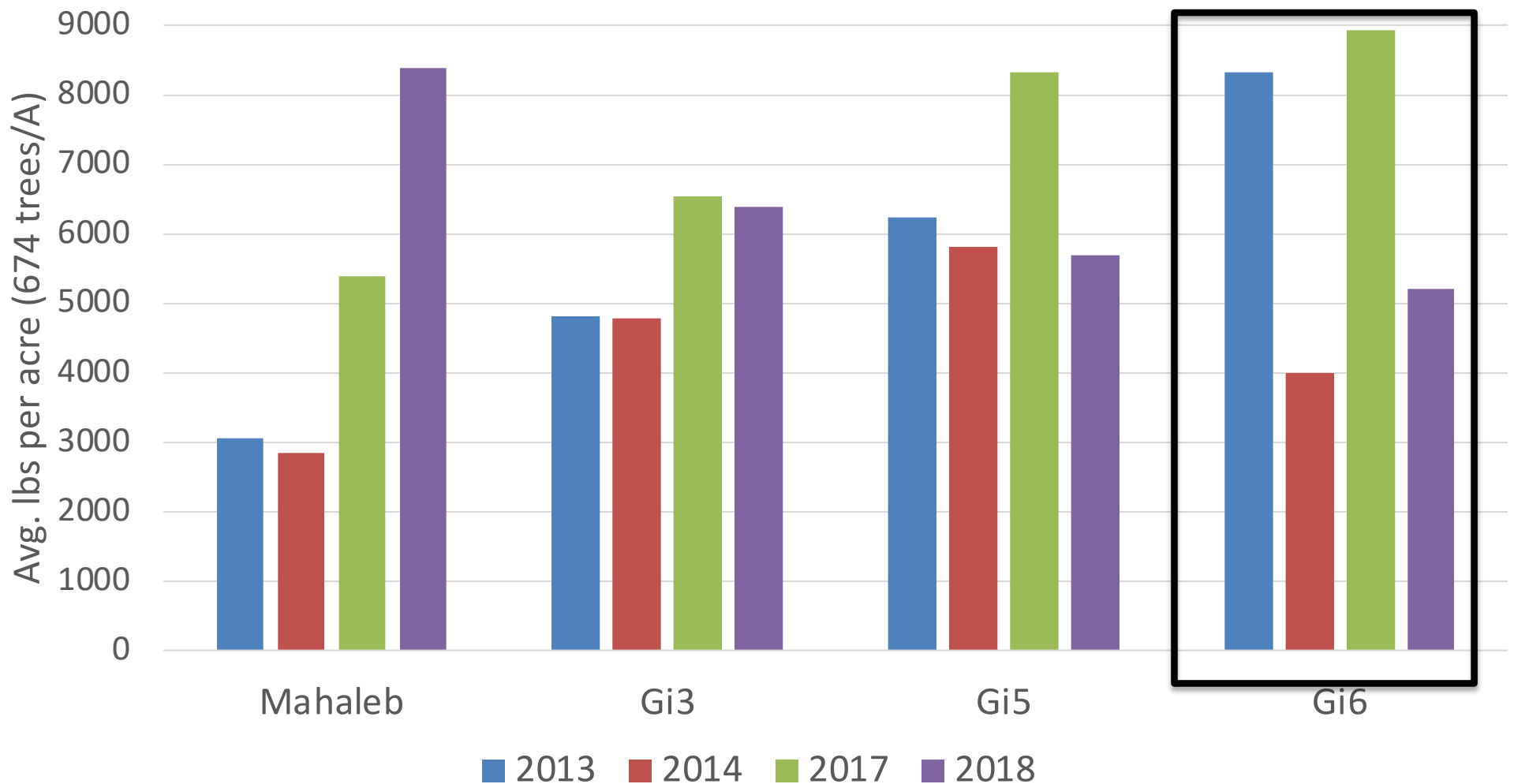
Average lbs per acre – Central Leader

- Based on current tree spacing 4m x 1.5m or 674 trees per acre



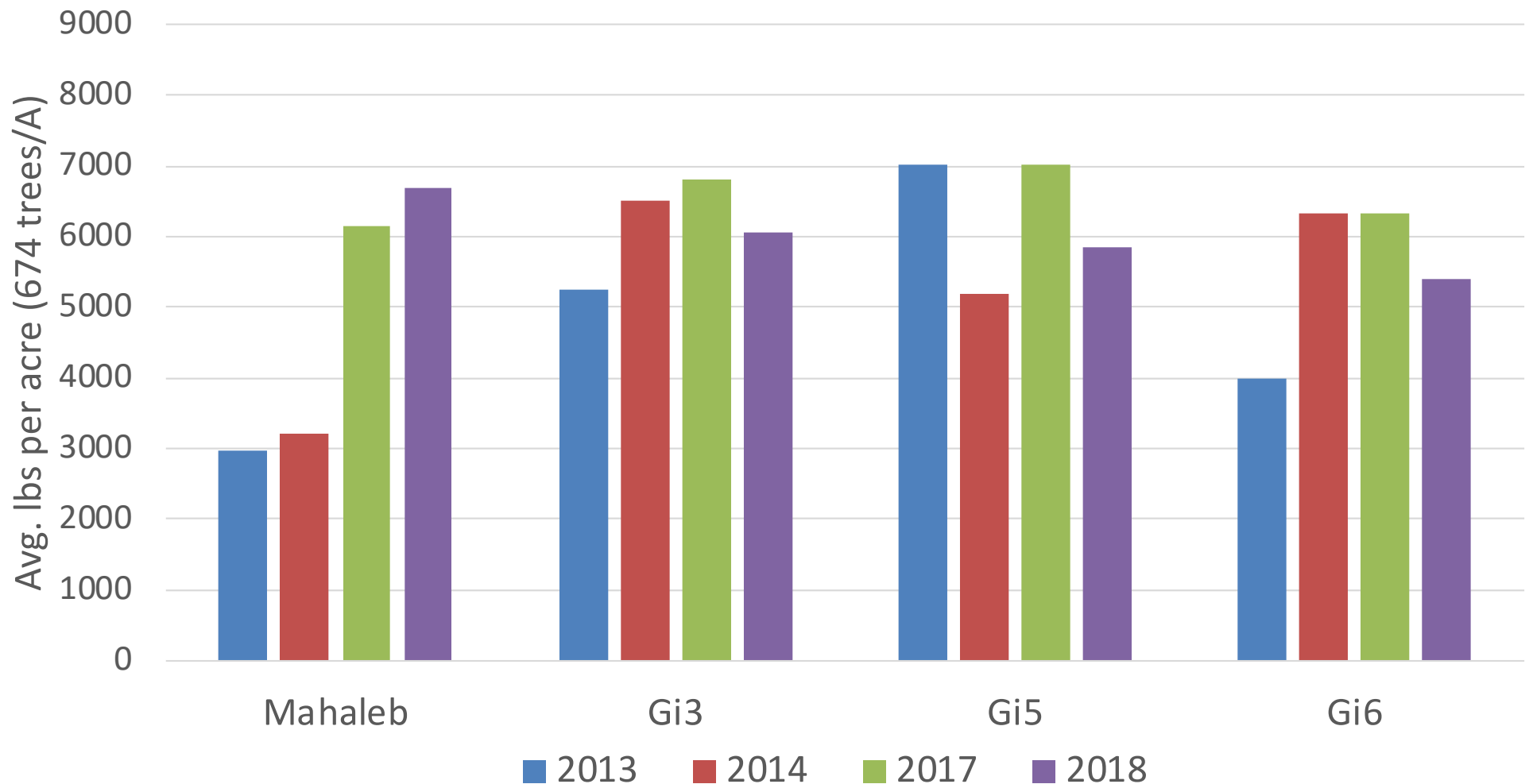
Average lbs per acre – Central Leader

- Based on current tree spacing 4m x 1.5m or 674 trees per acre

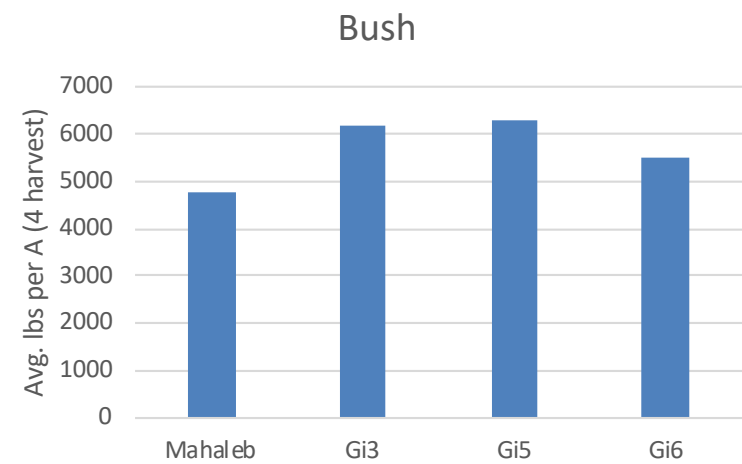
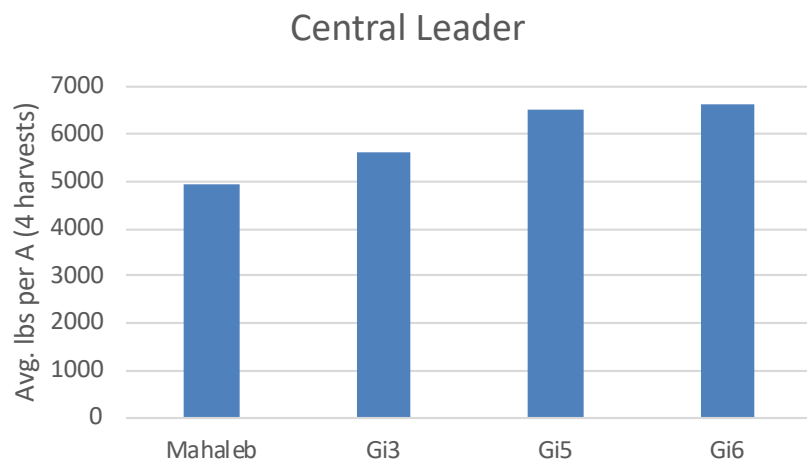


Average lbs per acre – Bush

- Based on current tree spacing 4m x 1.5m or 674 trees per acre



Avg. Pounds per Acre 2014-18



High Density Tarts Notes

Variable yields compared to NW averages

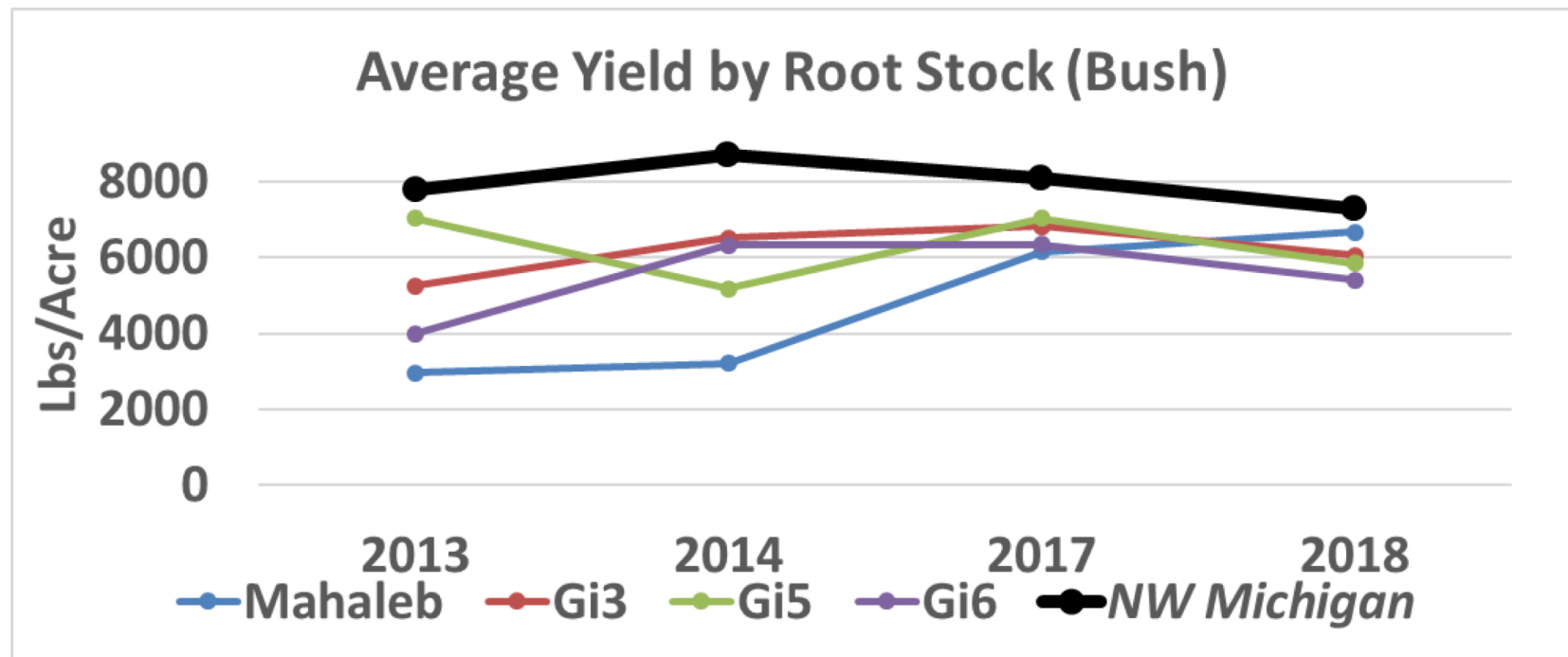
- Not even moving in the same direction for some rootstocks

Mahaleb central leader has promising trajectory

Missing 2015 and 2016 yields undermines long term viability of HD investment

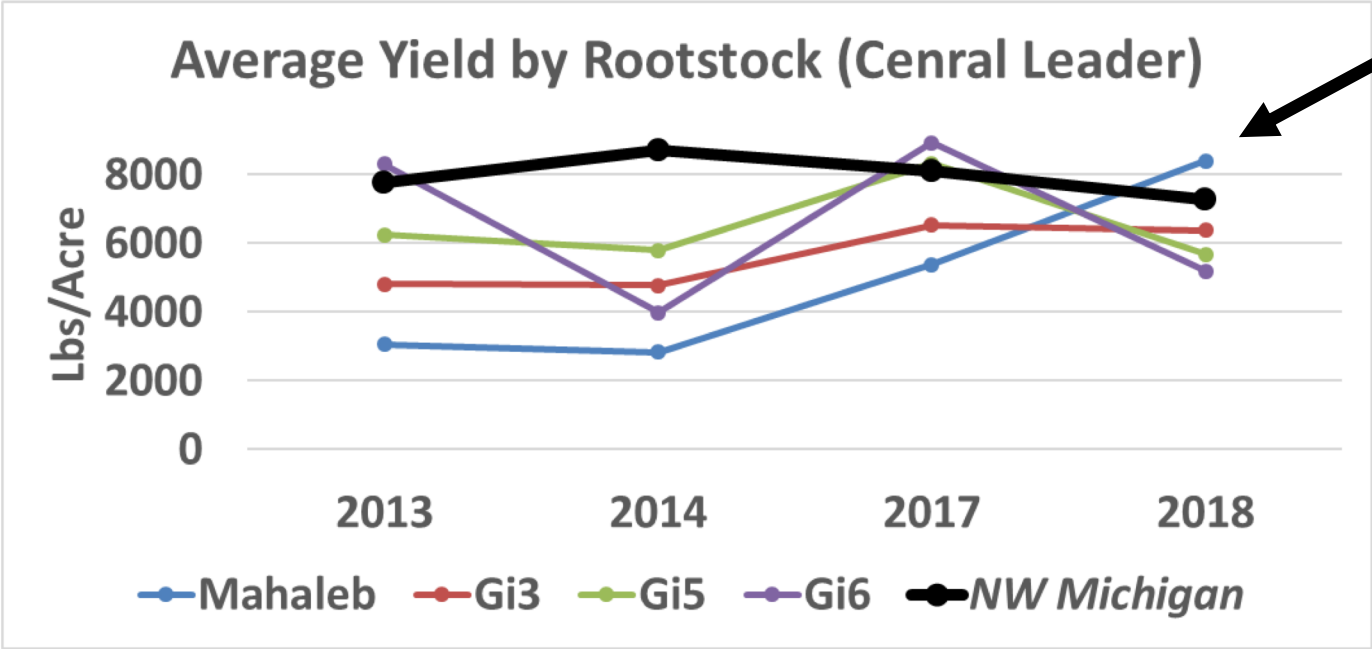
Yield required to be competitive with traditional system is 6875lbs per year from year 3 onward

Dwarf Yields (Bush) Vs. NW Average Yields



Dwarf Yields (Central Leader) Vs. NW Average Yields

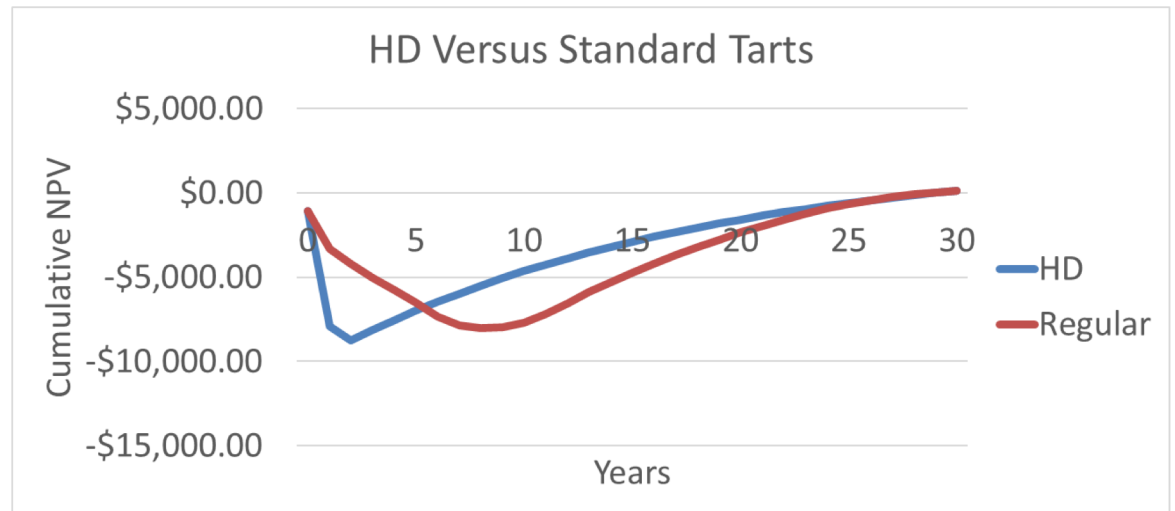
Mahaleb trajectory may be very important for projection accuracy*



Beat NW average in 2018 at only 7rs old

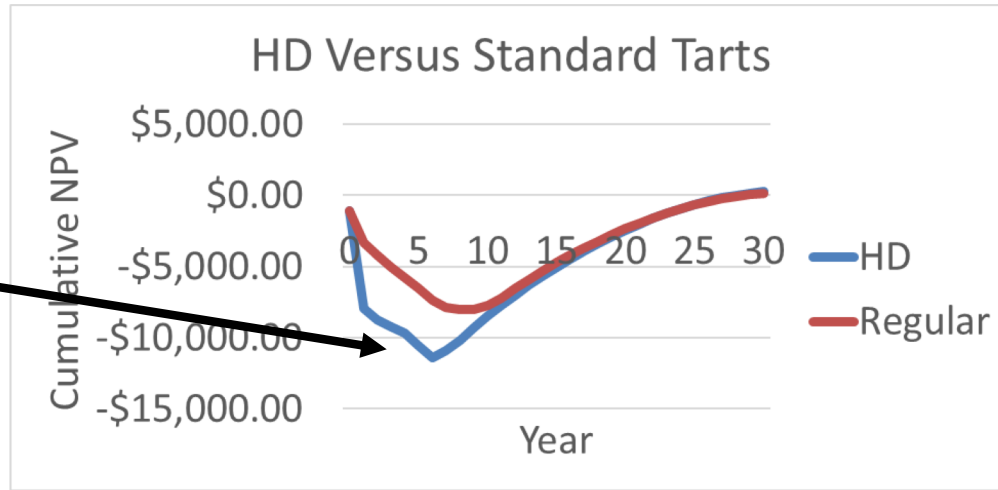
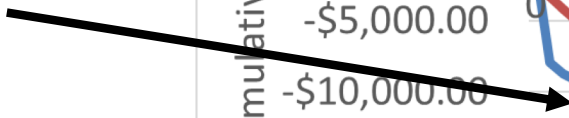
What constant yield on HD systems would be required to make them even with traditional plantings? \$6875lbs

- **Assumptions:**
- Price: \$0.36
- Interest: 6%
- Operating cost structures the same
- Startup costs:
 - Regular:\$3474
 - HD: \$8316

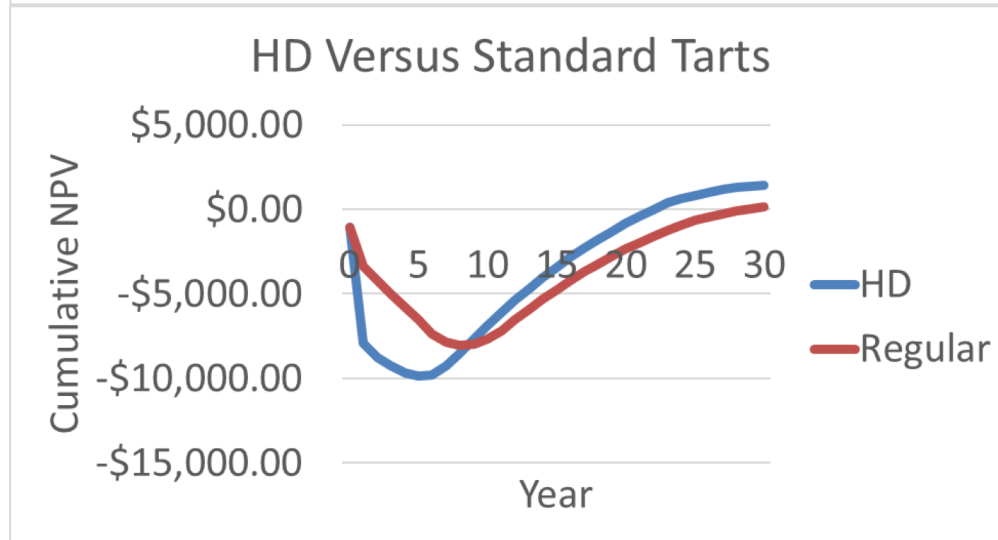


Projections - No Missing Years versus Missing '15 and '16

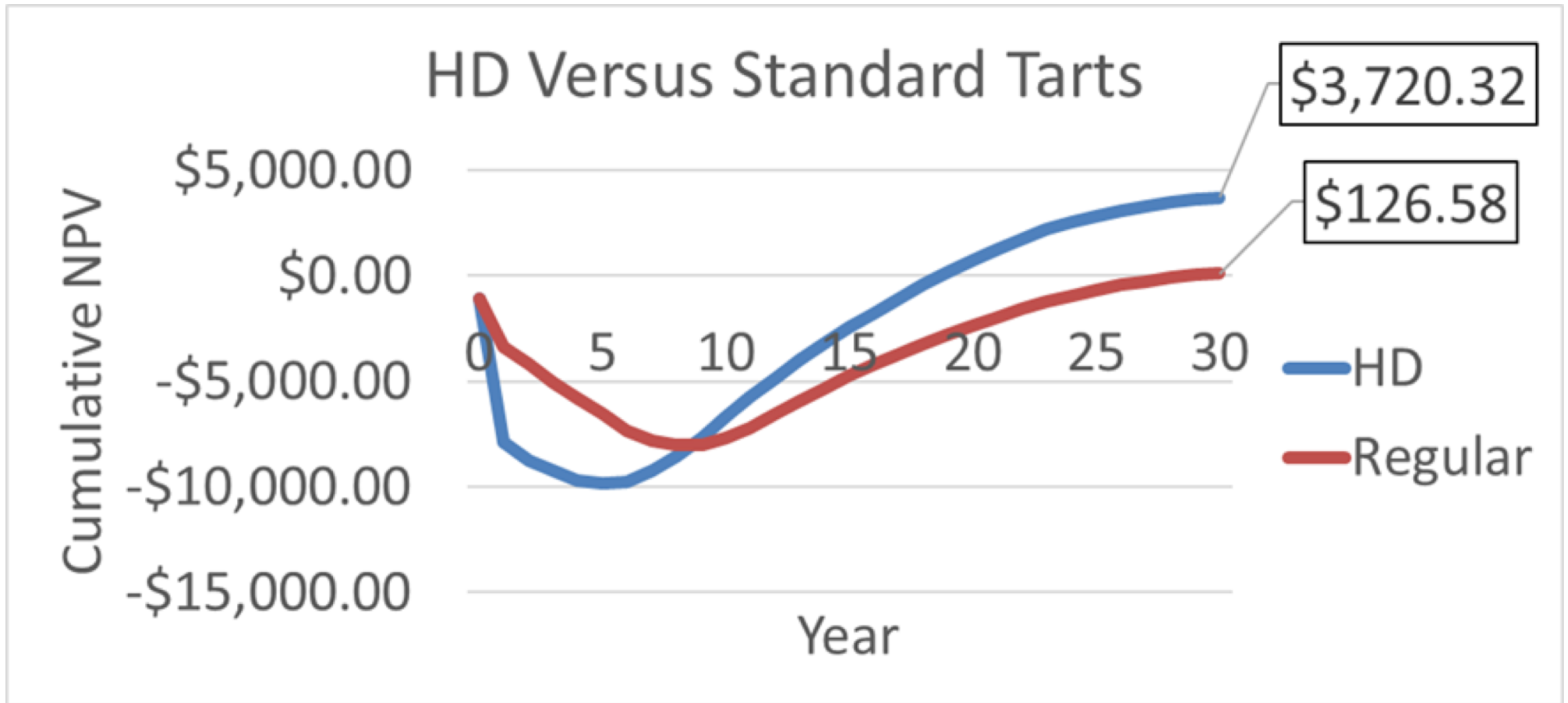
Crop Failure in '15 and '16



No Crop Failure in '15 and '16



High Density Mahaleb vs. Regular Planting



Projected out into 2020 and assumes no crop loss in '15 and '16

Key Ideas

- What is the yield by tree age relationship for HD tarts and for particular rootstocks?
- How similar is the operating and harvesting cost structure?
- What are the chances of an early crop failure like '15 and '16?
- Will Mahaleb continue on its upward trajectory?
 - If so, this rootstock may play a role in a viable HD system to replace standard planting

Conclusions

- No crop in two seasons ('15/'16)
 - Winter injury from two hard winters?
 - 2013-14/2014-15
 - Are Gisela more sensitive to cold temperatures?
 - Are we pruning too hard and removing too many buds?
 - Shading issues causing lower limb death
 - Intense pruning contributes to variability
 - Attempting to prune for increased light penetration at expense of yields
- Need to repeat trial in '19
 - Overall Gisela rootstocks have higher tree efficiencies and combined yields
 - Gisela yields dropped off in 2018
 - Will Mahaleb continue to increase yields over time?
Can this rootstock be used at high densities?
 - Further data are needed



MONTMORENCY

TART CHERRIES



MDARD Specialty Block Grant



Michigan Tree Fruit Commission

