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

- Montmorency: 250+ year-old cultivar
- Mahalab: 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

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

Gi3 Central Leader

Gi3 Bush

Gi5 Central Leader

Gi5 Bush

Gi6 Central Leader

Gi6 Bush

Mah Central Leader

Mah Bush

Gi 6/CL Gi 5/CL Gi 3/CL


All trained to a central leader system. Picture taken in spring 2018.
Mah
Gi6
Gi5
Gi3

Data Collection

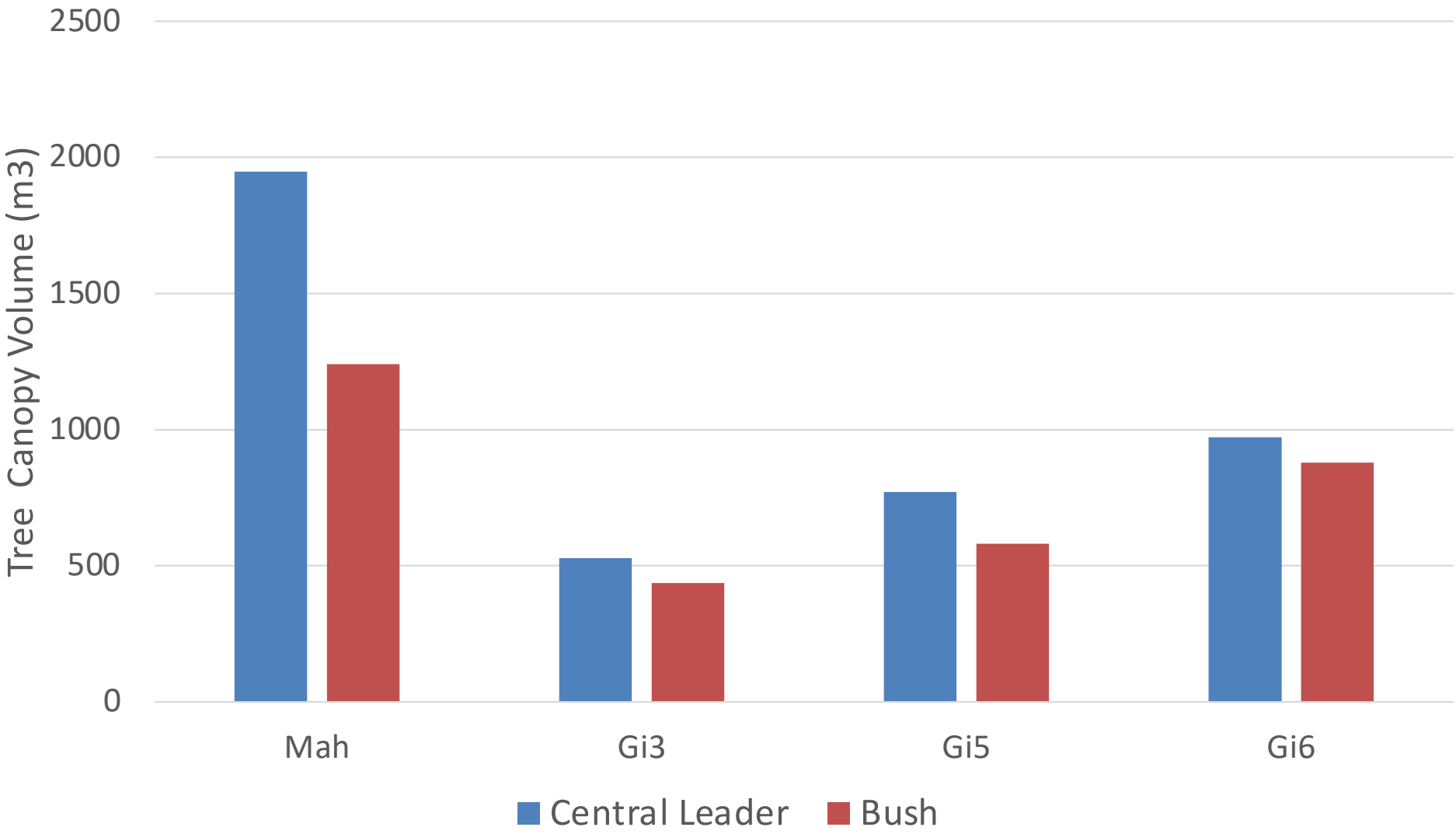
- Amount of bloom
- Leaf area
- Trunk cross-sectional area
- Tree efficiency
- Yield – first harvest 2013
  - No crop in MI in 2012
  - 2015 and 2016
    - Light crop in 2015
    - Large crop in 2016*

Harvest

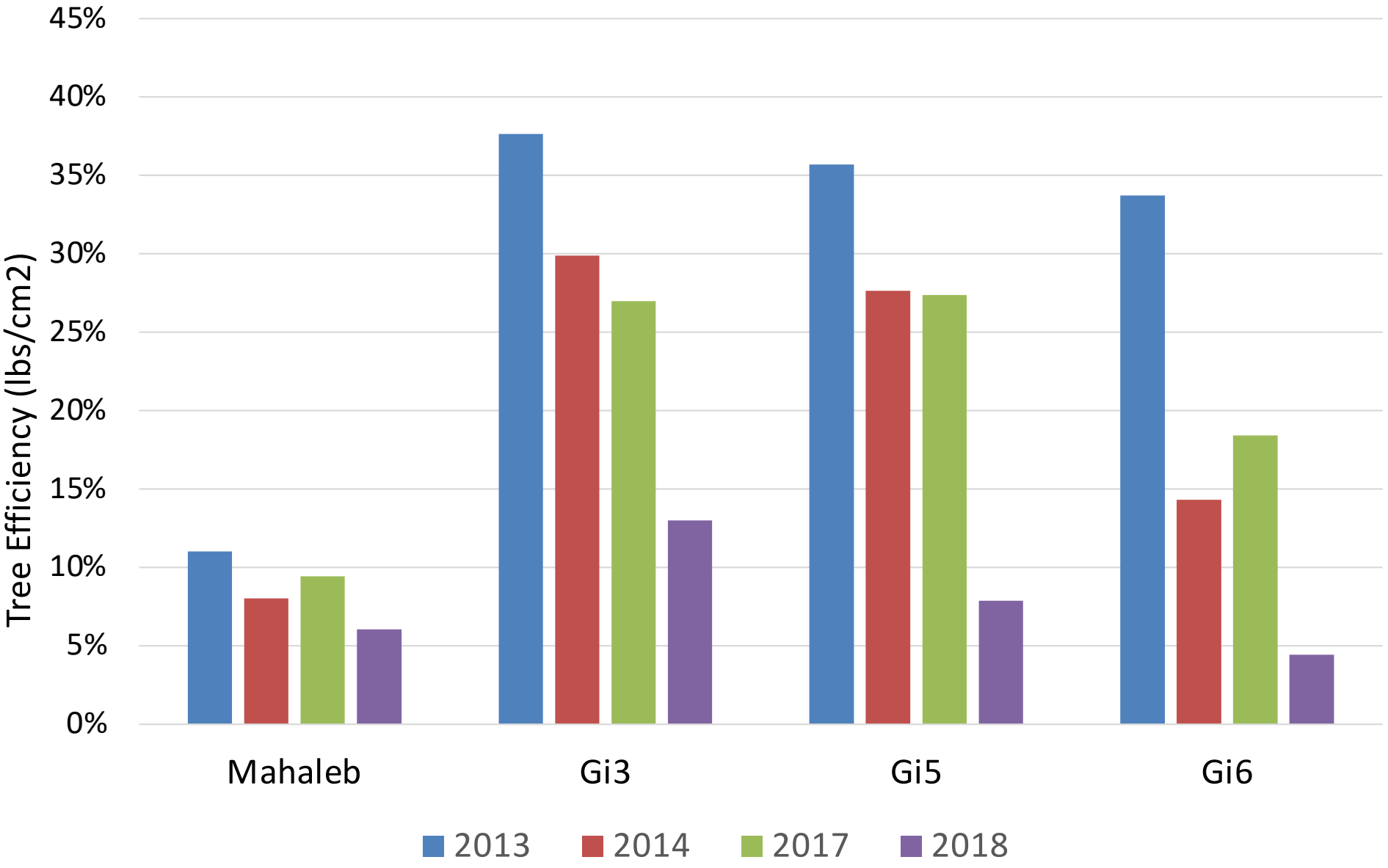
- Hand harvest in ‘13 and ’14 (help from a limb shaker)

- OTR harvest in ‘17 and ’18

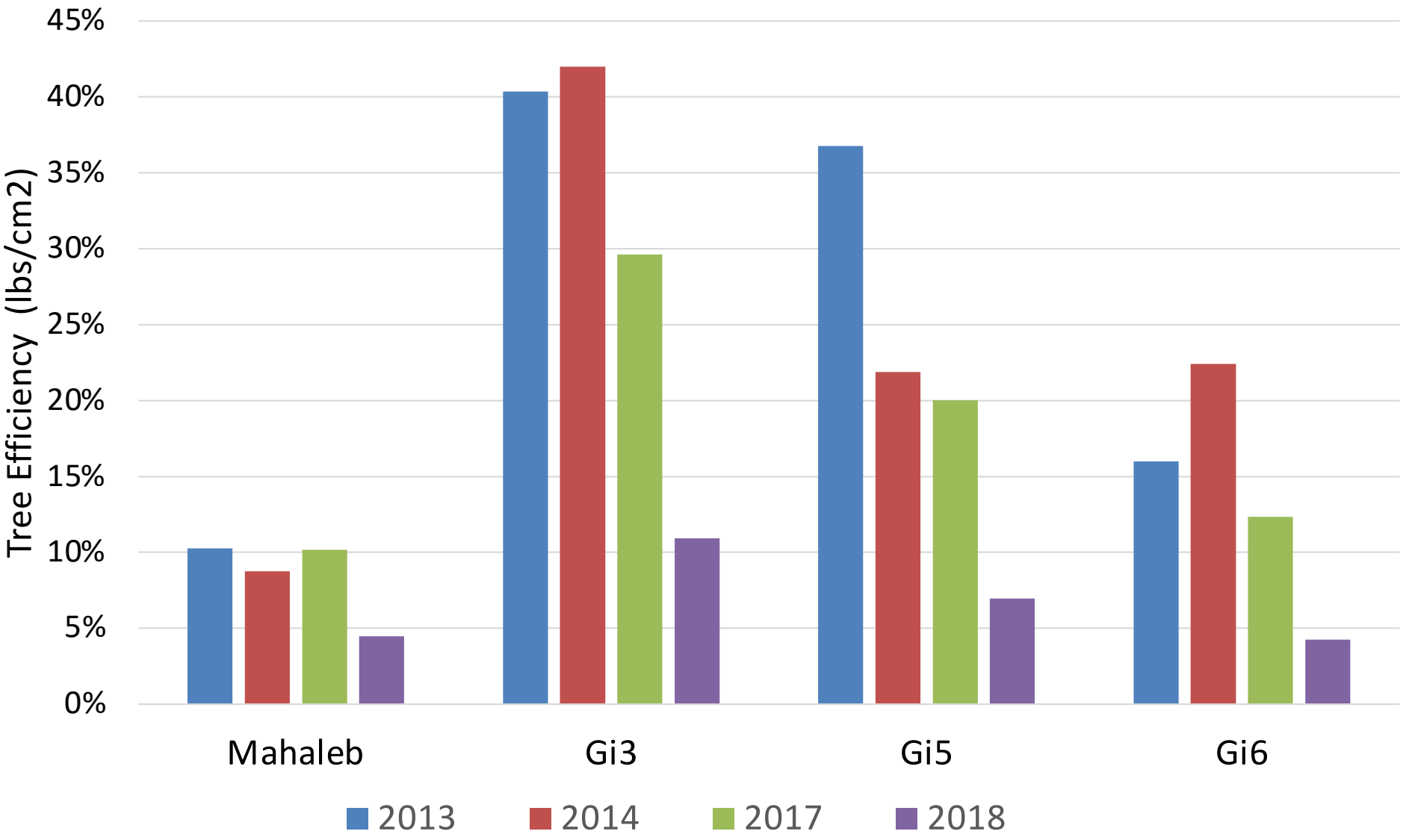
Tree Canopy Volume 2018



Tree Efficiency – Central Leader

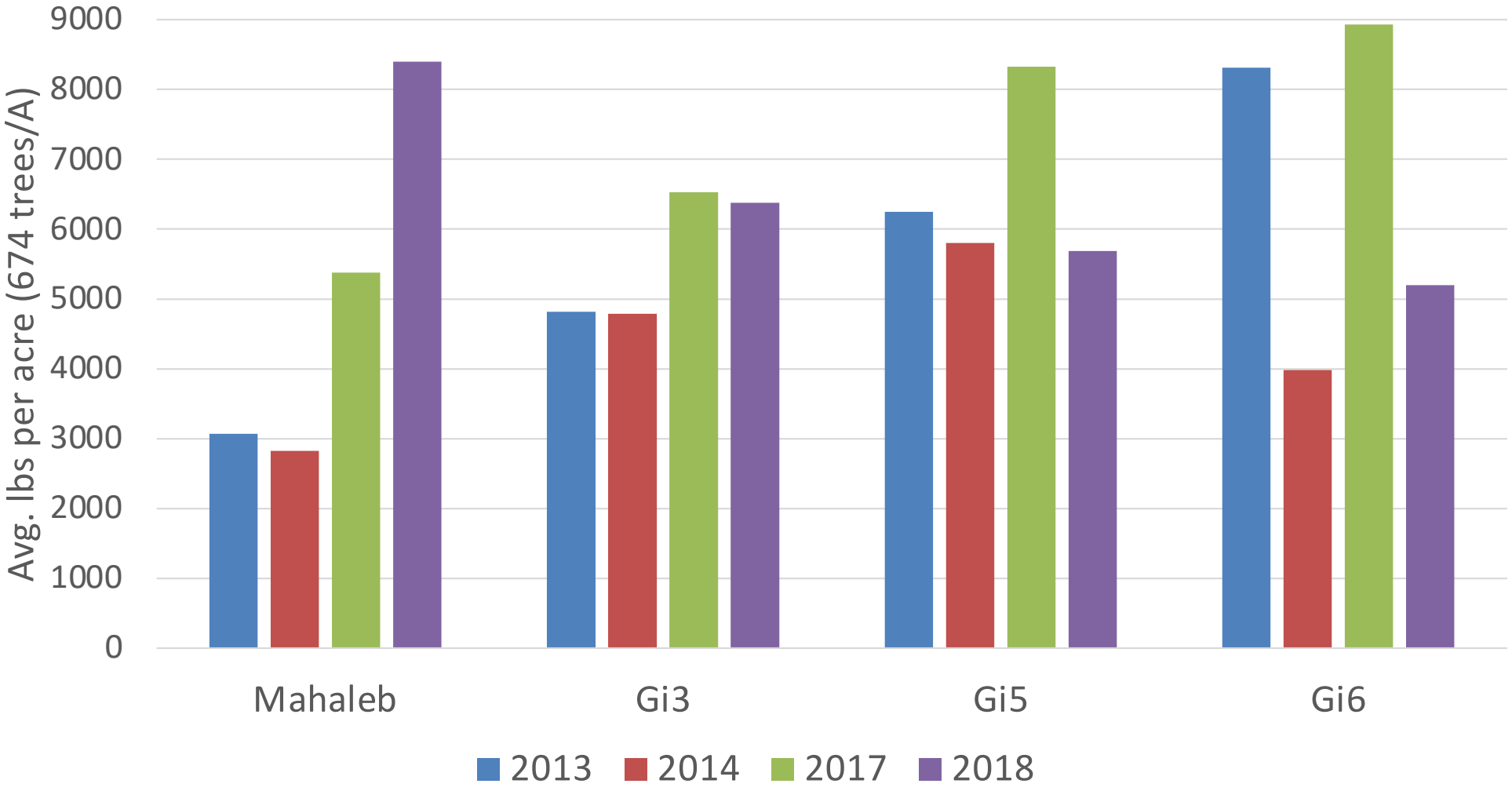


Tree Efficiency - Bush



Average lbs per acre – Central Leader

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



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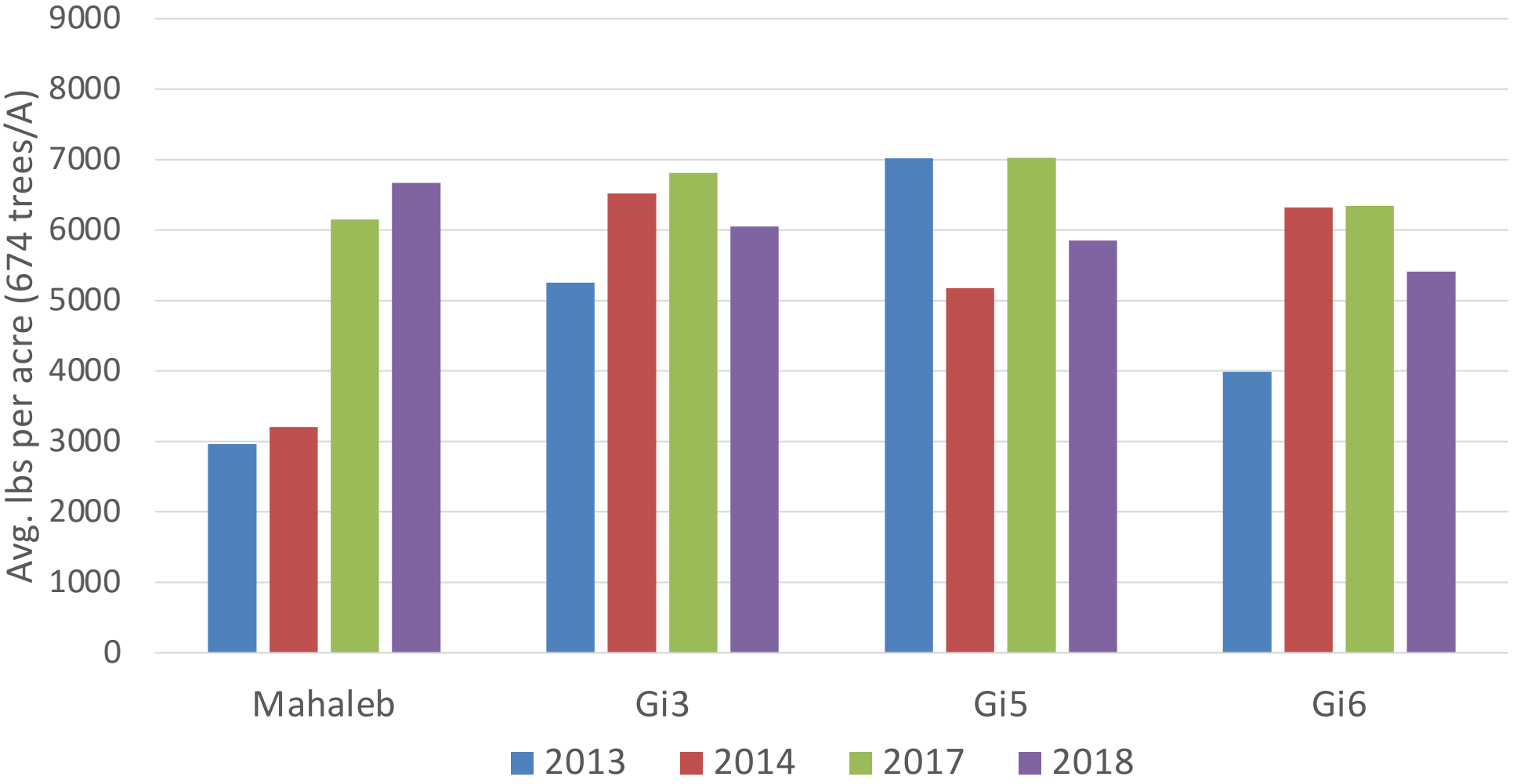
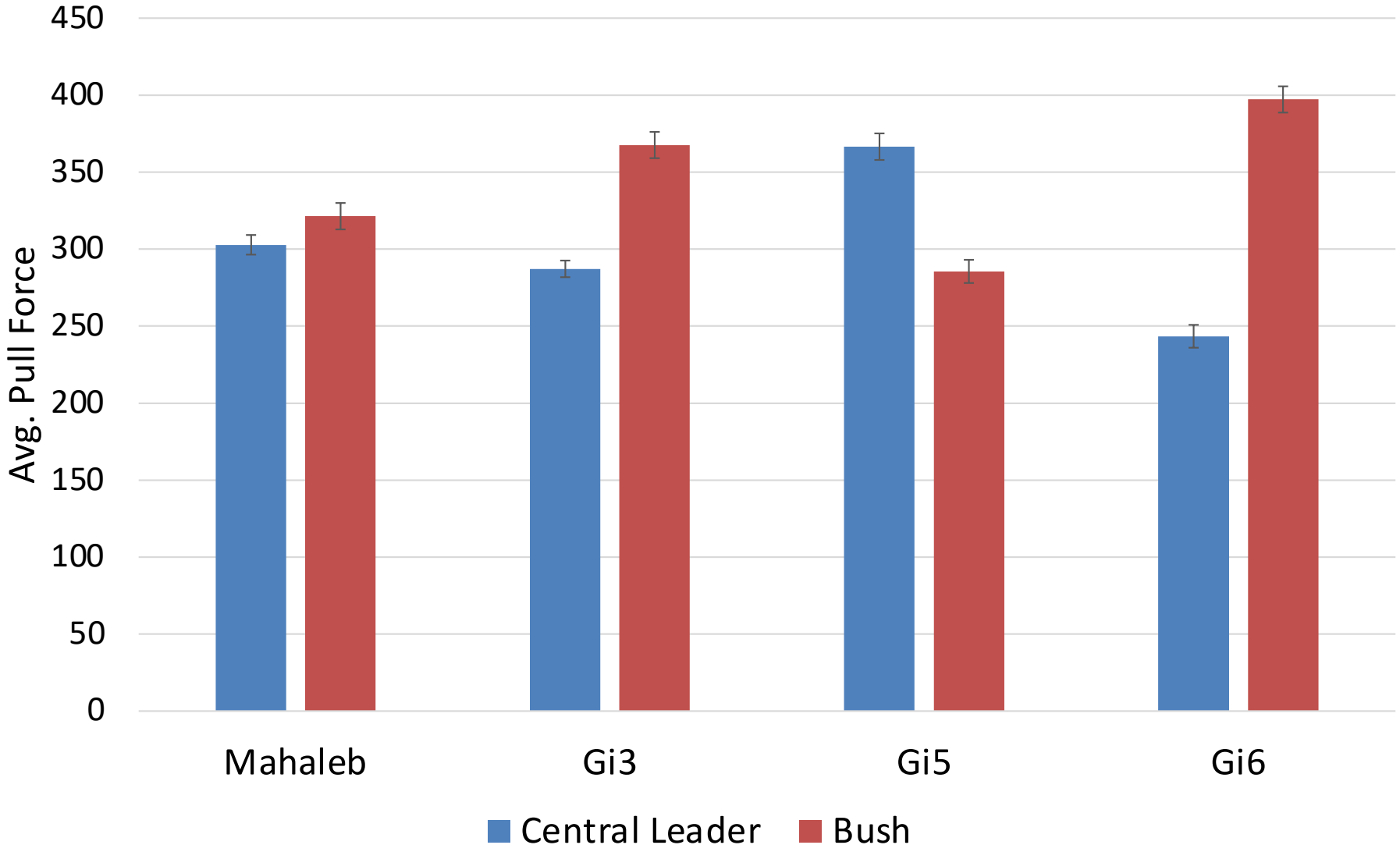


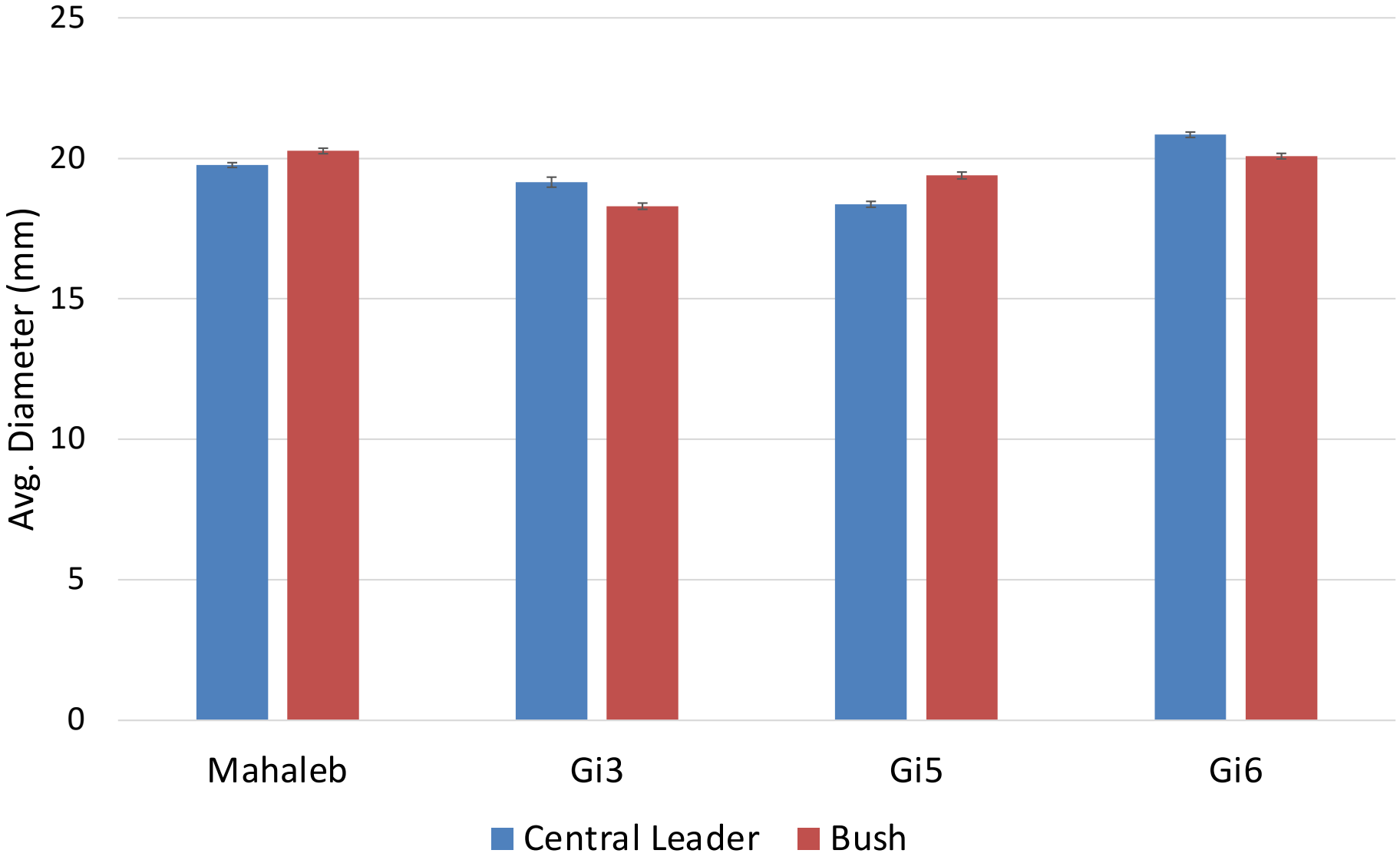
Fruit Quality

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

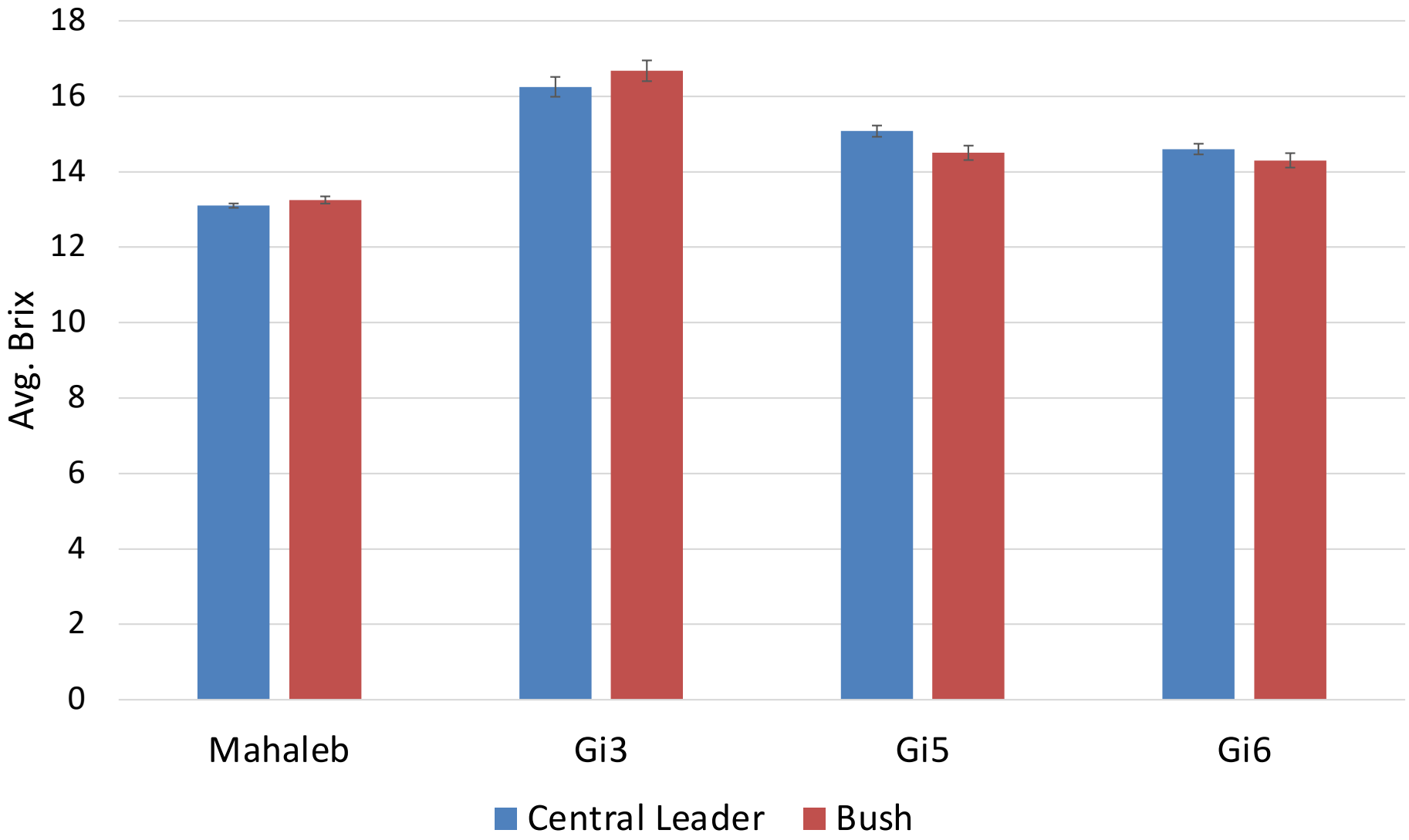
Pull Force


450
400
350
300
250
200
150
100
50
0
Avg. Pull Force
Mahaleb
Gi3
Gi5
Gi6
Central Leader
Bush

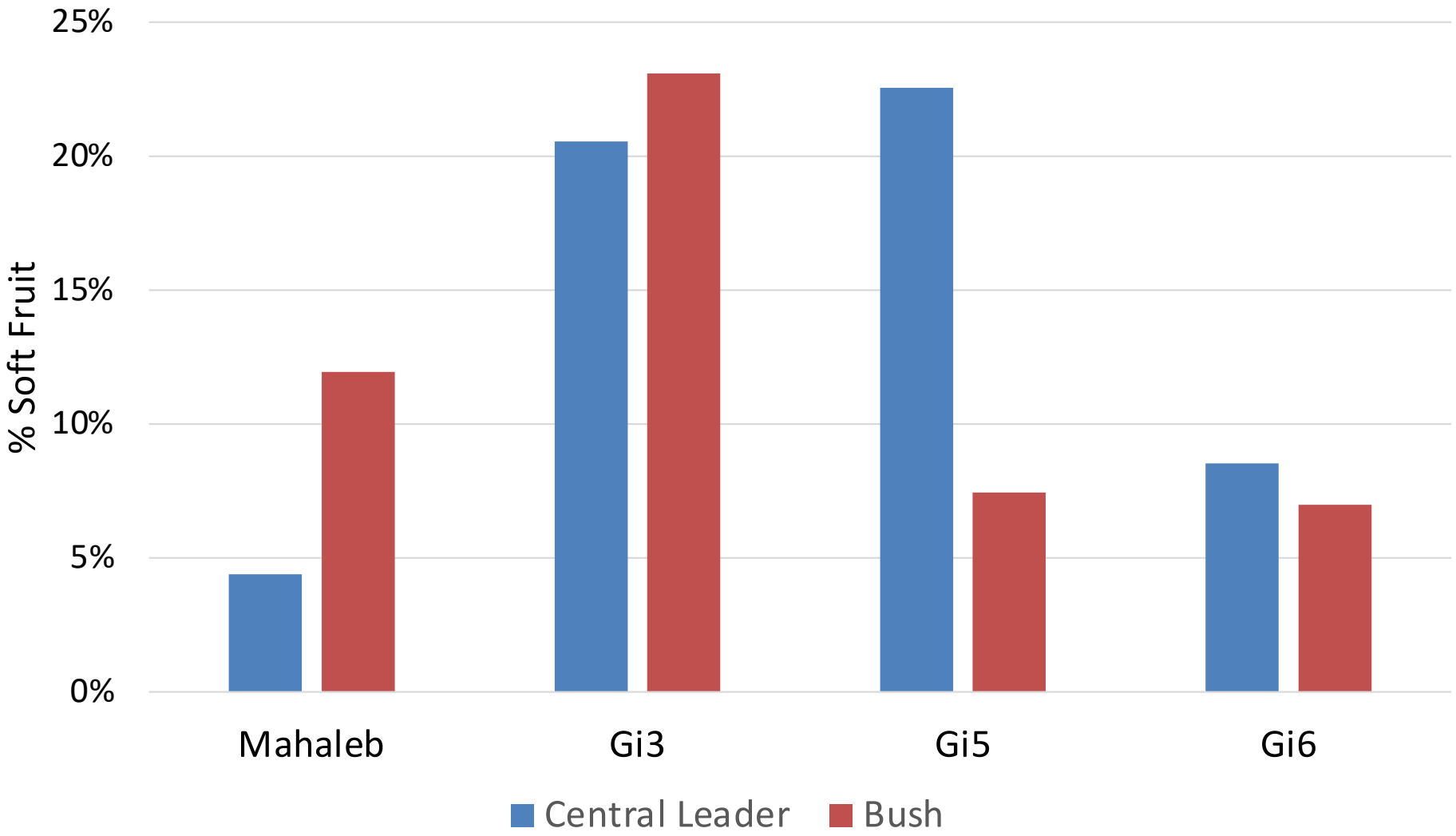
Fruit Diameter



Brix


18
16
14
12
10
8
6
4
2
0
Avg. Brix
Mahaleb
Gi3
Gi5
Gi6
Central Leader
Bush

Percent Soft Fruit



Trial #1 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?
    - Does increased bacterial canker in Gisela reduce bud survivorship?
  - Are we pruning too hard and removing too many buds?
    - Shading issues causing lower limb death
    - Attempting to prune for increased light penetration
- Difficulty in new shoot regeneration
  - Decreasing overall fruiting capacity?
- Gi3 and Gi5 are weak trees with few fruit buds
  - Are they too weak for MI sands?
  - Increase water/fertilizer?
- Do high density tart plantings on Gisela have to be on optimum sites?
  - Current planting is on a good site
  - Adjacent blocks on Mahaleb rootstock had a crop in 2016
    - Is our site not good enough?

Trial #2: Over-The-Row Harvest of Tart Cherry

Spring 2011
Established a High-Density Research Orchard @ NWMHRC

NWMHRC
Hand Harvest
July 28, 2014

NWMHRC
Berry
Harvester
July 2015
& 2016

Lbs / tree	2013	2014	2015	2016	Cumulative
Carmine Jewel	0.3	10.9	5.2	21.8	38.2
Crimson Passion	0.04	2.3	3.0	12.8	18.1
Montmorency	1.94	18.7	16.2	9.2	46.1
MSU 27-12-2	0.41	6.6	3.6	5.6	16.1
Nana	3.2	12.6	3.7	13.3	32.7

Lbs / Acre	Year 3	Year 4	Year 5	Year 6	Cumulative
Varieties	**2013**	**2014**	**2015**	**2016**	
Carmine Jwl	202	7320	3520	14680	25722
Crimson Psn	27	1521	2046	8602	12196
Mont	1306	12610	10916	6162	30994
MSU 27-12-2	276	4413	2396	3744	10828
Nana	2154	8477	2483	8917	22031

* 673 trees per acre

Yield for 5 varieties

No Canopy or root pruning treatments

Cherries

Lbs / tree	2013	2014	2015	2016	Cumulative
Carmine Jewel	0.3	10.9	5.2	21.8	38.2
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Cherries


Carmine Jewel

Conclusions from Trial #2: OTR

- Carmine Jewel shows potential to have yields similar to Montmorency/Mahaleb
- Crimson Passion and Carmine Jewel are harvested later than Montmorency
  - Concerns about SWD
  - Both are susceptible to leaf spot and mildew
- Nana are weak trees
- Korvan 9000 OTR shaker has good fruit removal
  - Fruit had decreased quality compared with conventional harvester
  - Willowy-type trees have better fruit removal
- Trees cannot be 10ft+ to fit through without damage


Thank You!
Michigan Tree Fruit Commission

Thank You

- High density team:
  - Dr. Dan Guyer
  - Dr. Greg Lang
  - Dr. Jim Flore
- Grower Cooperators:
  - Oxley Farms
  - Lutz Farms
  - Engle Farms
- Harvester Cooperator:
  - Spring Brook Supply, South Haven, MI (Littau Harvester, OR)
- NWMHRC staff
- MSU Horticulture undergraduate students