

Revolutionizing Cherry Production Systems

Daniel Guyer¹, Ron Perry², Mollie Woods³, Jacob McManus³

¹ Department of Biosystems and Agricultural Engineering

² Department of Horticulture

³ Department of Ag., Food, and Resource Economics
Michigan State University



Objective.....

- Investigate and develop alternative approaches to overall tart cherry production systems that address economic and environmental sustainability challenges through a combined/integrated approach of automation and orchard production systems

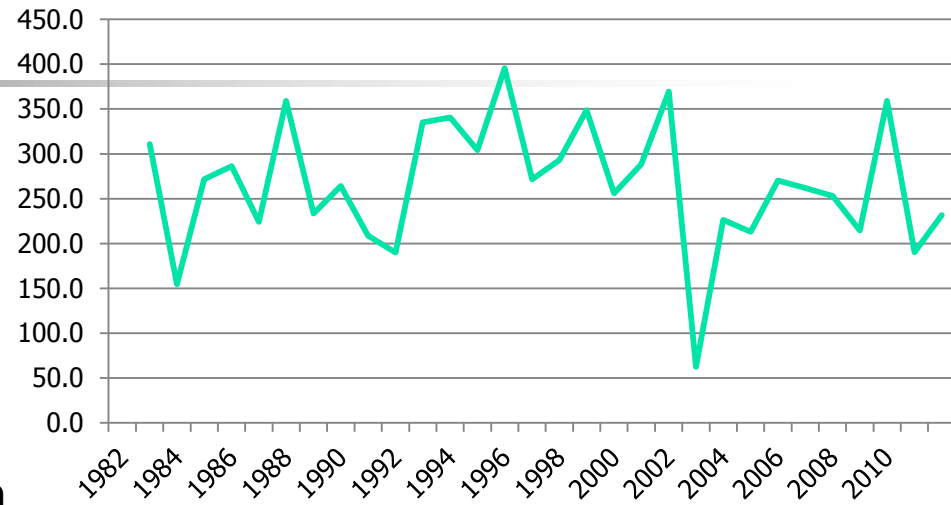


Drivers...

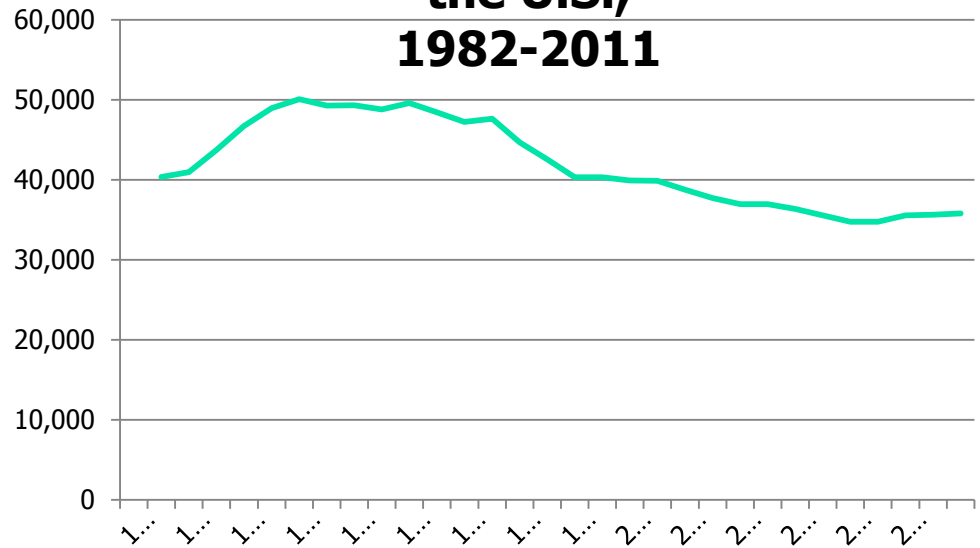
- Economic
 - Yield / Acre
 - Fruit uniformity
 - Years to commercial production / output
- Fruit Quality
 - Returns to growers
 - Market utilization (including pit issue)
- Land Use
 - Productive cherry land = productive real estate
 - Spray drift / noise



U.S. Tart Cherry Production (mil lbs)

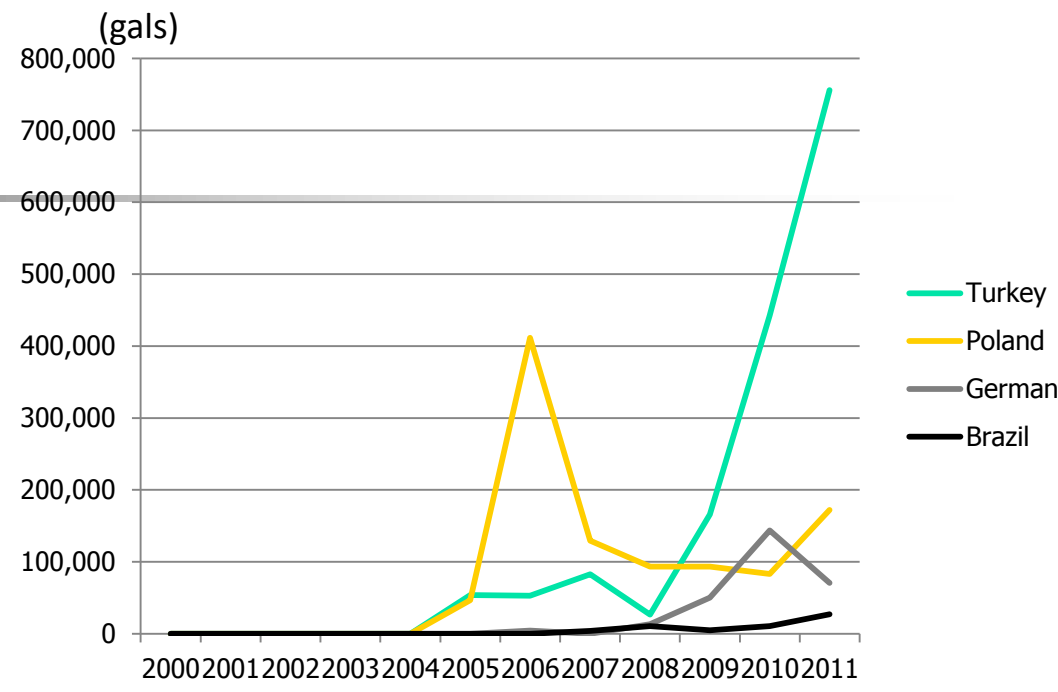


Bearing Acres of Tart Cherries in the U.S., 1982-2011

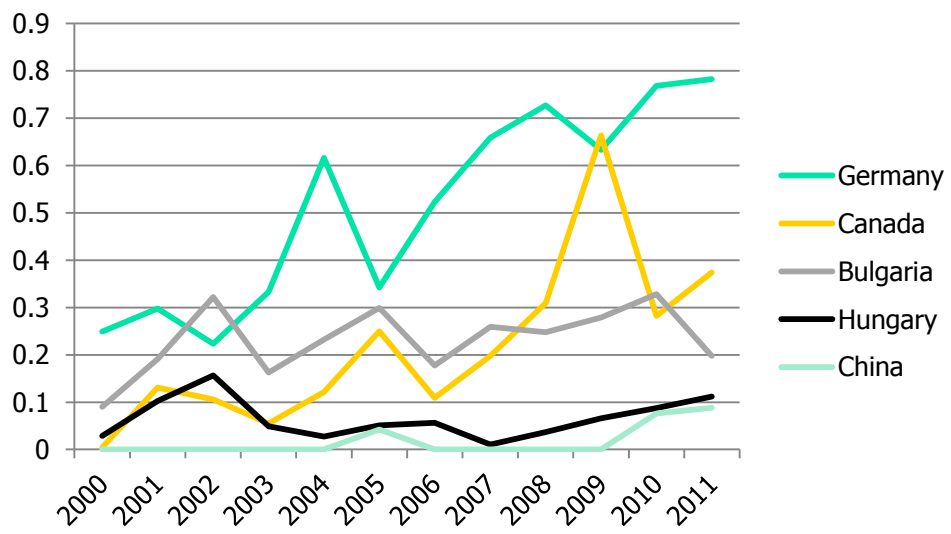




Imports of TC Juice Concentrate



Imports of Prepared or Preserved TC Products (mil lbs)





Net Present Value Analysis

Sensitivity Analysis	Standard Orchard (US)	High-Density
Base (8,200/16,900)	-\$1,034.04	\$5,646.59
Best (11,271/18,409)	\$5,596.56	\$11,591.52
Worst(5,341/10,986)	-\$5,788.57	-\$3,042.47
Base(8,200/16,900)w/4.3 % discount rate	\$3,531.22	\$18,489.97

Source: Jacob Mcmanus, preliminary analysis from thesis research, Department of Agricultural, Food and Resource Economics, Michigan State University.



Thoughts / Hypotheses for smaller plant and canopy shaking

- Gentler system – can work with trees/plants in 2nd leaf vs 4th-5th leaf after planting
- Less drop height
- Decrease trunk damage / disease
- Increase harvest efficiency w/ continuous harvest
- Increased fruit uniformity



Concepts Evaluated/Tested

- Harvesting variables:
 - Preliminary commercial and prototype tine shakers
 - Bramble and Citrus systems
 - Over-the-Row (OTR)
 - Korvan (OXBO)
 - Dual spindle-tine canopy shaker – horizontal amplitude only
 - Amplitude and frequency of oscillation
 - BEI
 - Dual spindle-tine canopy shaker – horizontal amplitude only
 - “Black Ice” – oscillating air blast

Traditional / Current System



Preliminary evaluations...



Korvan / OXBO self propelled Spindle/tine shaker (commercial blueberry harvester – unmodified)



BEI, Inc. dual spindle harvester



BEI, Inc. "Black Ice" harvester concept



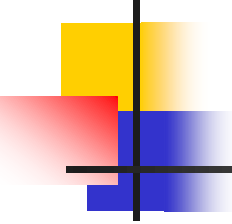
Fruit Quality...very good!
Tree Damage...evident, but
minimized.



Concepts Evaluated/Tested

- Orchard Systems variables (optimized for harvester and yield):
 - Varieties
 - Genetics approach; varieties which are naturally small and compact
 - Long fruit stem vs. short stem
 - Multi-stemmed trunks vs. Single trunk
 - Spur
- vs
- Willowy growth





Orchard System Variables (continued)

- Futuristic High Density Tart Cherry Orchard
 - Planting at spacings of 1.5 m X 4 m
 - Horticultural practices on traditional variety: Montmorency
 - Trunk
 - Single with multiple branching
 - Multi-stem / bush
 - Canopy structure / pruning
 - Shape
 - branch recycling
 - hedging
 - Trellising

Genetic Compacts



- Carmine Jewel and others
Univ of Saskatchewan
- *P. Cerasus x Fruticosa* hybrids



- MSU Tart Cherry
Breeding program, A.
Iezzoni

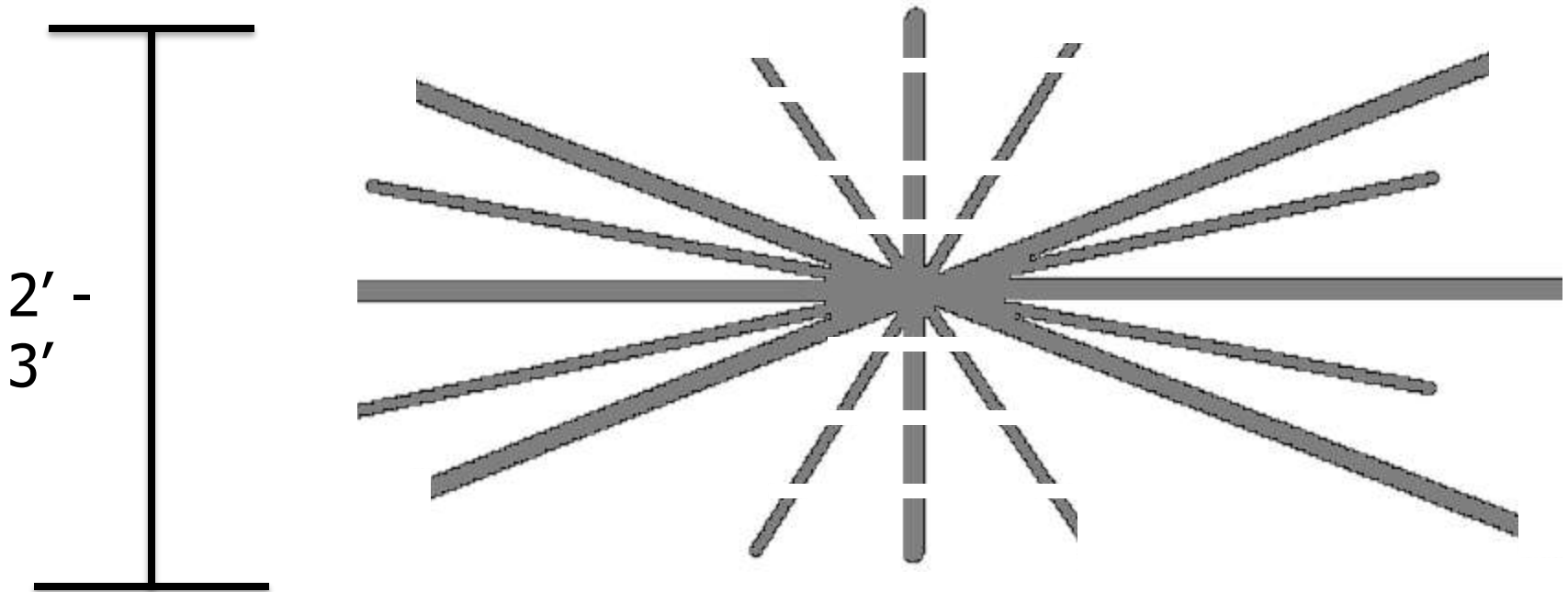
Horticultural Practices



- Bush form
- Recycling branches
- Avoid branches perpendicular to row



Top View



Dotted branches are recyclable, maintained within the 2' – 3' threshold for O.T.R. harvest. Jamie Burns, Res. Assistant, MSU, BSAE



Results.....

- Spindle/Tine shakers very positive w/out any modification from commercial blueberry harvester
- Some features of each mfr. desirable over others
- Fruit removal very good except strictly horizontal branches
- Fruit quality very good – high grade
- Worked well in young traditional orchard (expanded equipment utilization)
- “Black Ice” concept provided inferior performance for this application
- Strictly horizontal branching causes problems



Concerns / Questions....

- Some tree / bark damage – tree decline?
- Potential for sweet cherries?
- Handling / logistics of harvested fruit
- Fruit damage due to opportunity for multiple vibrating contact points (tines)