Revolutionizing Cherry Production Systems

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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
## Net Present Value Analysis

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

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
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)