Evaluating Citrus Mechanical Harvesting Systems

Contact Information for Mechanical Harvester Contractors

**Trunk Shake and Catch System**
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Objectives of Mechanical Harvesting

» Decrease harvesting costs
» Increase “on-tree” revenue
» Increase overall labor productivity
» Reduce the number of needed harvest workers

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**Trunk-Shake-Catch (TSC)**

A TSC set includes three machines—a shaker, a receiver, and a field truck (goat). Trunks are shaken between 5 and 10 seconds to remove fruit. Trees have to be “skirted” to allow shaker and receiving units to position underneath the tree canopy. Fruit is caught and conveyed to a cart holding up to 90 boxes of fruit.

**Continuous Canopy Shake & Catch (CCSC)**

One CCSC set includes a minimum of four machines—two harvesting units and two field trucks. Working in parallel, a CCSC system travels between 1 and 2 mph down each side of the tree row. Shaker heads penetrate the canopy to remove fruit. Caught fruit is conveyed to a trailing field truck. CCSC system is well suited for long rows and uniform sized trees. Trees have to be “skirted” to allow optimal fruit collection.

**Tractor Drawn Canopy Shake (T-CS)**

T-CS uses a harvesting mechanism similar to the CCSC. T-CS harvests fruit from one side of the tree canopy at a time, dropping fruit to the ground. A hand crew picks up ground fruit and gleans remaining fruit in the tree. Suited for older, non-uniform trees. Skirting is recommended but not necessary.

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### Machine Performance Statistics

Average values collected from the 2000-2004 seasons.

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<thead>
<tr>
<th></th>
<th>TSC</th>
<th></th>
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<th>CCSC</th>
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<th>T-CS</th>
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<tbody>
<tr>
<td></td>
<td>Hamlin</td>
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<tr>
<td>Avg. Yield (Bx/acre)</td>
<td>554</td>
<td>371</td>
<td>460</td>
<td>375</td>
<td>377</td>
<td>312</td>
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<tr>
<td>Removal (%)</td>
<td>95%</td>
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<td>95%</td>
<td>95%</td>
<td>91%</td>
<td>90%</td>
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<tr>
<td>Recovery (%)</td>
<td>87%</td>
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<td>90%</td>
<td>90%</td>
<td>99%</td>
<td>99%</td>
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<td>Harvest Speed (Tree/hr)</td>
<td>190</td>
<td>229</td>
<td>361</td>
<td>466</td>
<td>184</td>
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<tr>
<td>Labor Productivity (Bx/man-hr)</td>
<td>96</td>
<td>76</td>
<td>103</td>
<td>122</td>
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The data above represents systems used in a variety of grove conditions without abscission chemicals.

### Calculating the Adoption Decision

**Grower Benefits ($/Acre)**

- Difference between hand and mechanical harvesting price
- Recovery % (with or without gleaning services)
- Yield (bx/acre)

**Grower Costs ($/Acre)**

- Value of non-harvested fruit/delivered-in price
- Annual skirting
- Cost of grove/tree preparation

If Benefits > Cost, Consider Mechanical Harvesting

Website for spreadsheet model available at the University of Florida, Southwest Florida Research & Education Center’s website: [http://www.imok.ufl.edu/economics](http://www.imok.ufl.edu/economics)