

# Mechanical Harvest for Cider Apples

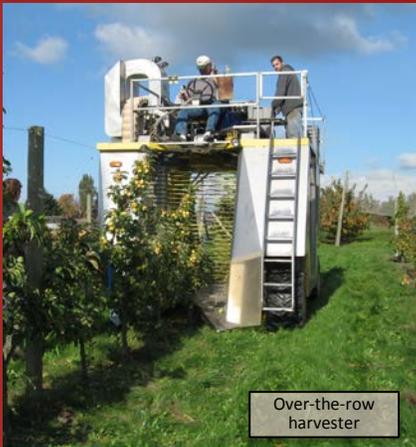
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## Mechanical Harvest

Cider fruit is harvested by hand, and hand harvest accounts for about 38%-46% of the total annual variable costs when an orchard is in full production (Galinato *et al.*, 2014; Galinato and Miles, 2015). To meet market demand for specialty cider apples and remain profitable, growers in the United States require cost effective orchard practices. From 2011-2015, two rows of replicated Brown Snout were hand harvested and mechanically harvested in a proof of concept experiment to evaluate the cost effectiveness of introducing mechanization to the harvest of cider apples. While the size, shape and yield of the trees in this study do not represent a commercial production system, they serve to provide a preliminary comparison of the two harvest methods in terms of weight of total harvested fruit, and total labor hours for harvest. Based on a 2-year average, study results showed that:

- The yield for hand harvest and mechanical harvest were 11,741 lb/ac and 11,624 lb/ac respectively; thus the picking efficiency of mechanical harvest relative to hand harvest was 99%;
- Total labor hours for mechanical harvest (including postharvest cleanup) was 37% lower than that of hand harvest



Over-the-row harvester



Fruit picked by rotating drums



Collection of fruit (left), conveyance of fruit (center), and delivery of fruit to bins (right)

### Case study: Costs and Returns of Cider Apple Production During Full Production<sup>a</sup> in Central WA (2015) and Compared with Projected Mechanical Harvest Costs and Returns.

Costs and returns	Hand harvest (\$/year)	Mechanical harvest (\$/year)
Yield (bin/acre) <sup>b</sup>	50.00	49.50
Price (\$/bin)	\$315.00	\$315.00
<b>Total Returns</b>	<b>\$15,750.00</b>	<b>\$15,592.50</b>
<b>Variable cost</b>		
Fertilizer and chemicals (materials & labor)	\$1,526	\$1,526
Pruning, training and thinning, and other labor	\$1,798	\$1,798
Irrigation water and electric charge	\$335	\$335
Harvest <sup>c</sup>		
Picking	\$3,000	\$1,871
Harvester rental	-	\$120
Maintenance and repairs	\$411	\$411
Beehives & crop insurance	\$245	\$245
Other variable costs	\$654	\$564
<b>Total Variable Cost</b>	<b>\$7,968</b>	<b>\$6,869</b>
<b>Fixed cost</b>		
Depreciation & interest costs of fixed capital	\$1,617	\$1,617
Other fixed costs	\$665	\$665
Amortized establishment costs	\$1,691	\$1,598
<b>Total Fixed Cost</b>	<b>\$3,973</b>	<b>\$3,879</b>
<b>Total Cost</b>	<b>\$11,941</b>	<b>\$10,748</b>
<b>Estimated Net Returns</b>	<b>\$3,809</b>	<b>\$4,844</b>
<b>Break-even Return</b>	<b>\$238.82</b>	<b>\$217.13</b>
<b>Picking efficiency of mechanical harvest relative to hand harvest</b>		<b>99%</b>

A. Full production is representative of all the remaining years that the cider apple orchard is in production (Year 6 through Year 30). The main differences between hand harvest and mechanical harvest are marked in blue.  
 B. The yield in mechanical harvest corresponds to a picking efficiency of about 99% relative to hand harvest. Harvested apples are immediately pressed.  
 C. Picking labor in mechanical harvest includes postharvest hand cleaning (tree, groundfall and machine).

## Materials & Methods

**Experimental units** – Four blocks of trellised Brown Snout hand harvested and mechanically harvested (Model OR0012, Littau Harvester Inc., Lynden, WA).

**Measurements** – Response variables included number of trees harvested, number of labor workers, pre-harvest groundfall yield (kg), harvest yield (kg), postharvest hand cleaning (tree, groundfall and machine; kg), and time of labor (min:sec).

**Statistics** – One-way analysis in JMP (version 11.0 for Windows; SAS Institute, Cary, NC).

**Enterprise budget** – developed for cider apple production in central Washington.



Before machine harvest



After machine harvest



Tree damage caused by machine harvest



Hand harvest



Popular specialty cider apple varieties

## Support

- WSU Center for Sustaining Agriculture and Natural Resources (CSANR)
- WSDA Specialty Crop Block Grant, with NABC
- Northwest Cider Association
- Specialty Crop Research Initiative (SCRI) Planning Grant (2014)
- WSU Emerging Research Issues (CAHNRS ARC)



## References

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- Galinato, S.P. and C.A. Miles. 2015. Feasibility of Different Harvest Methods for Cider Apples: Case Study for Central Washington. Working Paper.
- Miles, C.A. and J. King. 2014. Yield, Labor, and Fruit and Juice Quality Characteristics of Machine and Hand-harvested 'Brown Snout' Specialty Cider Apple. HortTechnology 24(5): 519-526.

## WEB SITE

Hard Cider Research at WSU NWREC  
<http://maritimefruit.wsu.edu/hard-cider/>