

Comparing the efficiency of future harvest technologies for sweet cherry

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Abstract

The objective of this research was to compare the efficiency of potential mechanical and mechanical-assist harvest systems with manual harvest of sweet cherries. Data were collected from harvesting Y-trellised sweet cherries using a prototype fully mechanical harvester, hand-held shakers (portable, high-speed, reciprocating, gasoline-powered tool), and commercial picking crews in Washington. In Prosser, a USDA-ARS-designed mechanical harvest system comprised of two independently operated, mirror-image halves was used to harvest entire rows of 'Bing'. In Pasco, two teams of three used hand-held shakers (Stihl SP200) and canvas catching surfaces to harvest 'Skeena'. In these teams, one person operated the hand-held shaker and two held the catching surface. Both mechanical systems remove fruit at the fruit-pedicle junction (i.e., harvest stem-free fruit). A portable labor monitoring system (LMS) comprised of a digital weighing scale, a RFID reader and a computational unit was used to calculate the harvest rate of the mechanical-assist system and hand harvest. Three approaches were compared: traditional hand harvest (i.e., fruit with pedicle), hand harvested stem-free and mechanically-assisted harvest. All tests were conducted in a commercial 'Skeena'/Mazzard orchard. The pickers and each mechanical-assist team were identified with RFID tags. As fruit were dumped into a standard collection bin (capacity ~170 kg), the LMS read simultaneously a picker's ID and measured the weight of fruit. These data were compared with previously collected assessments of machine harvest efficiency in a 'Bing' orchard. The mean picking rate for stem-free 'Skeena' cherries was 40–50% greater than fruit with stems when picked by the same crew in the same orchard. Preliminary tests showed that the mean harvest rate for the mechanical-assist systems was 3.75 kg/min (1.25 kg/person/min) and for the mechanical harvester was 22 kg/min. These results show the potential to vastly improve harvest efficiency.