



Mid-Columbia Agricultural Research and Extension Center

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WTFRC Quarterly Report

Project No.:	TR-04-437
Project Title:	Estimating Economic Benefits & Measuring Technological Efficiencies
Project PI:	Clark Seavert and Dana Faubion
Project Funding:	\$12,000 for 2004
Project Initiation Date:	November 2003
Quarterly report	1 st Qtr of 2005

Objectives:

1. Determine the economic benefits of employing mechanical assisted harvest machines that reduce pruning, thinning, pheromone placement, and harvest labor in apple orchards.
2. Determine the economic benefits of employing platforms that reduce pruning, thinning, and pheromone placement in apple orchards.
3. Measure efficiencies of mechanical assisted harvest machine and platforms vs. orchard ladders and express those findings in labor per hour, bins, boxes, and pounds of fruit sold.

Significant findings:

- The bin fillers on the Munchkof, Argiles and Peterson harvester cause too much bruising to be considered viable in our industry.
- Green fruit thinning with two styles of platforms did not improve worker productivity.
- The Ruben Canales harvest concept improved harvest labor productivity by 30%.
- Developed and demonstrated that a single mechanized platform can be perform satisfactorily in two orchard systems (14 foot angle canopy, and 8.2 foot upright canopy).
- Early indications are that a 15 to 20% improvement in productivity can be gained with a continuous creep, autosteer, mechanized platform during dormant pruning.

Progress since 3rd quarter 2004:

- 1). **Fruit Handling:** Evaluated the fruit handling characteristics of three mechanical assist harvest machines (Peterson, Munckhof, and Argiles). All three systems bruised more fruit than a hand crew. The Argiles system performed the best and had the greatest range of adjustability with respect to fruit handling. A test



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conducted with PinkLady fruit, postharvest, evaluated just the fruit handling systems of the Munckhof and Argiles in a controlled environment. The fruit handling systems were optimized with soft Jonagolds prior to testing with PinkLady. Bruising levels per bin averaged at 80% with the Munckhof and 40% with the Argiles (bruise dia. >7mm). The Techmark impact recording device (Malcolm Hanks) has been used to quantify the “impacts” with both systems as well as three commercial packing lines.

2). **Worker Productivity:**

Two different systems were used to test worker productivity of the Ruben Canales harvest concept (bins close to ground pickers and elevate pickers to eliminate ladders). The systems were the Peterson system and the mock up. On both systems support labor and equipment was not factored into the productivity of the systems. It was assumed that those expenses would be replaced by the harvest machine when developed.

Table 1. Harvest labor productivity and fruit quality of three harvest systems

Format	Crew #	Minutes/bin/person¹	Fruit quality
Traditional bag and ladder	2	56.0	Acceptable
Canales - mock up system	2	40.2	Acceptable
Canales - USDA Peterson	4	42.3	Not acceptable - bruising

¹ These results and economic implications will be discussed at the review.

3). **Platform Modification:** I have significantly changed the Peterson harvest aid to an autosteer, continues movement (creep), work platform (Figures 1 and 2). The platform dimensions are 14 feet long by 5 feet wide. All of the fruit handling systems have been removed. These major modifications were completed 2/11/05. This machine has been field tested with minor modifications for about 2 weeks and will start pruning system evaluation 2/28/05. Initial informal evaluation of the work environment by the platform crew show that they feel safer and are less tired at the end of the day.

Figure 1. The modified Peterson machine with fruit handling system removed. Major modifications have been made to the worker platform, wheelbase, autosteering, and row sensing electronics modified. The machine is in an 8.2 foot wide unpruned gala row.



Figure 2. The modified Peterson machine being field trailed in 8 foot wide Braeburn block with actual row width at photo of less than 8 feet. The new adjustable row finding sensor is indicated at lower left.



4). **New Platform Design:**

Have applied knowledge gained to help facilitate the design process of two new mechanical platforms at Blueline, Moxee. As well as an unsuccessful attempt with Genie Industries and Wade Smith.

Summary: We have made good progress in showing what does not work as well as indicating the potential of slow moving platforms to improve productivity, safety and job quality.