

## Extension

### Robot Pickers: Automation Coming to Orchards

In the not too distant future, the apple you place in your child's lunchbox may be picked from the tree by a robotic arm.

"We will have trained people operating equipment with robotic components" in the next several years, said **Karen Lewis**, a Washington State University Extension educator who has been working with state tree fruit growers for 20 years.

Robotic equipment is just one of the technologies expected to help Washington's apple, pear and cherry growers compete for markets domestically and abroad. Improved genetics, genomics, plant materials, pest management tools, efficient orchard systems and working platforms are part of the equation, as well.

Lewis, who specializes in tree fruit production, farm labor management and employer-employee relations, is a member of a team of WSU and Oregon State University Extension educators and researchers helping tree fruit growers assess and adopt technologies that improve production efficiency and deliver a consistently high quality eating experience. The team includes economists, entomologists, pathologists, horticulturists and technology specialists.

Their collective goal is to trim production costs 30 percent by 2010.

### Labor efficiency and safety

Labor is by far the largest production input. Depending on the technologies employed and the production system, it takes 130 to 210 man hours annually to grow an acre of apples or pears. Cherries are even more labor intensive, ranging from 300 to 400 hours per acre. Put another way, 35 to 50 percent of the cost of producing an apple or pear is labor. For cherries, it's about 70 percent.

A number of labor-saving devices are being employed or are in development to reduce labor costs, including semi-autonomous, self-steering, creeping platforms. The platforms transport workers down tree rows and position them to thin blossoms and green fruit, prune and train limbs, and place pheromones.

Platforms increase efficiency because workers no longer have to carry, climb and reset ladders. They also enhance safety.

"Our industry is burdened with a significant number of injuries resulting from ladder use. These injuries can be life altering for the employee and costly to both the employee and employer," Lewis said.

"Our traditional workforce is aging and shrinking," she said. "In the near term, we need to make it easier for more people to work in the industry. One way to do that is to put them on a platform where the physical demands of climbing, moving and resetting a ladder no longer exist."

In a time when growers don't know if they will be able to recruit enough workers to harvest their crop, automation is a possible solution.

### Tailoring technology

The Washington Tree Fruit Research Commission is funding Lewis' field research. Industry partners include Vinetech Manufacturing, Prosser, and BlueLine Manufacturing, Moxee. The commission is supporting the development of robotic software and hardware in the private sector. The good news is that some of this technology is already available and needs only to be adapted to local conditions and specifications.

"The apple has to be picked with a rotation of the wrist so that the stem remains intact," Lewis said.

Robots will have to mimic that motion and then gently place fruit in a bin, box or conveyor belt so it doesn't bruise.

The technology will employ vision robotics to locate the fruit.

"The orchard will be mapped ahead of time to show where the fruit can be found," Lewis said. "That map will tell the arm and hand where to go to get the apple."

A different approach is being considered for cherries. **Matt Whiting**, a WSU horticulturist at Prosser, and **Erick Smith**, a WSU graduate student from Castle Rock, are testing a mechanical cherry harvester developed by the U.S. Department of Agriculture Agricultural Research Service that knocks off stem-free cherries from trees. He estimates it could reduce harvest costs by 80-90 percent.

### Designing for the future

The biggest barrier for wide use of platforms, mechanical pickers and similar technology is orchard design.

"Orchards must be redesigned to accommodate the equipment," Lewis said. "All limbs of the tree must be trellised so that they are out of the drive row, stay in place over the season and are easily accessible to either the human or robotic arm."

The term used in the industry to describe the result is a "fruiting wall." Fruit is no farther than about 18 inches from the edge.

"New orchards ... are taking into consideration the need to build systems that are human friendly, machine friendly and robotic friendly," Lewis said.

While the orchard of tomorrow is expected to employ fewer people, the jobs that remain will be better.

"We will reduce the physical risk and drudgery and increase the intellectual contribution of those who are employed," Lewis said.

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