

The Orchard Ergonomics Pilot Study: New Attachment for an Apple Picking Bucket Aimed at Reducing Worker Discomfort and Injury Due to Strain

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Thanks to collaborative efforts between apple growers, apple harvesters and industry specialists, NYCAMH recently launched a research initiative focusing on improving apple harvesting equipment. The aim of this project is to reduce injuries due to sprains and strains and to improve picking comfort, while maintaining or improving harvesting efficiency.

Prior research from NYCAMH has indicated that sprains and strains of the back, neck and shoulders are common among apple harvest workers. Although these types of injuries result in lost work time and medical visits by farmworkers, there is little data available on equipment changes that might alleviate this problem (Earle-Richardson et al., 2003). For this reason, NYCAMH was awarded a grant from NIOSH to develop and test ergonomically improved apple harvesting equipment.

You may have heard the term “ergonomics” used in talking about office improvements (like better computer keyboards). The purpose of ergonomics is to design the work environment to fit the worker. In agriculture, the work environment is much different, posing a real challenge for preventing muscle strain injuries. Although agricultural workers are frequently moving rather than sitting, designing comfortable and safe equipment is equally important.

The first step in improving agricul-

tural ergonomics is to analyze the job tasks. For apple harvesting, this was accomplished in 1999 when Scott Fulmer, an ergonomist from the University of Massachusetts at Lowell, and researchers from NYCAMH conducted field observations at 12 orchards in New York and Pennsylvania. Based on these observations, Fulmer identified the ergonomic risk factors to the harvesters, such as reaching with arms over shoulder height (increases pressure to the shoulder), and bending down (back muscles must counter the load from the upper body). He then developed a list of potentially effective ergonomic improvements (Fulmer et al., 2002).

Two advisory teams, made up of orchard owners, apple pickers, industry experts and researchers, were charged with narrowing down the list of ergonomic improvement options into two viable improvements. There were several considerations to keep in mind during this process: the improvements had to have the potential to reduce strain, be accepted by the worker, not show a negative effect on harvesting efficiency, and be economically feasible to produce. The discussion covered possible changes to the apple bin, changes to the ladder, and changes to the bucket/harness system. In Western New York, the team members were Cliff Demay, Gary Fitch, and a crew leader from Singer Farms. In the Hudson Valley, team members were Mike Fargione, War-

A new improvement that can easily be attached to an existing apple harvesting bucket & harness system is currently being tested at NYCAMH. Preliminary results indicate improved comfort, and possible strain reduction. This article includes background on the project and also demonstrates the importance of working together towards the common goal of worker safety.

ren Smith and James O’Barr.

An important part of the success of this project was the involvement of those who “know apples”—the growers and the workers. While the research team could suggest a “perfect-in-the-lab” ergonomic solution, without the employers’ and workers’ insight about how it is likely to work in the field, the idea could fall flat. Jim Bittner, managing partner of Singer Farms in Appleton, NY, agrees: “The fact that you’re working directly with the workers is huge. If the worker doesn’t like it, it’s not going to be used—no matter how good, how improved.”

By mid-summer, two promising equipment changes were selected for testing. Both focused upon ways to reduce the force applied to the shoulders and back by the standard apple bucket. Models of each improvement were constructed, and then taken out into the orchards for informal testing. These models were revised three times, based on farmworker comments, before the formal trials in the test orchards began. Estimated cost for each set of models is approximately \$ 65. However, this cost is expected to be greatly reduced by using wholesale materials for the next phase of construction.

In late September 2002, tests of the improvements were done in the selected orchards. Workers were observed using each improvement separately, using their own equipment, and then using both im-

provements combined. Researchers made a series of observations of body posture, work task, and equipment usage every 45 seconds over 90-minute periods. This observation pattern was repeated at each orchard for a total of eight sessions per orchard.

According to Chuck Mead, co-owner of Mead Orchards in Tivoli, NY, it was not a problem for the researchers to “invade” the orchard during work in progress. “Information gathering takes time. There may have been some minor disruptions, but from what the workers told me, they were impressed,” Mead said.

The goal of this data collection was to determine the proportion of work time spent in each of several stances. This information is currently being combined with laboratory data that will indicate how much weight and/or pressure reduction the improvements bring about in each stance

In addition, each worker was interviewed after each 90-minute period to obtain worker satisfaction information. Translators who could speak fluent Spanish accompanied the research team where appropriate, so that each worker could be interviewed in his or her native language. Overall, workers found the improvements comfortable and would use them if available. All of the respondents at one test orchard said that their shoulder/neck felt differently after using the improvements, as compared to when they use their regular picking equipment. According to Bittner, improving worker comfort is important. In fact, informal comments as to the comfort of the new system were highly favorable at both of the test orchards, and in the preliminary orchard focus groups.

Field observations and lab data are currently being analyzed, and are expected to be complete by early 2003. In response to suggestions made by the farmworkers, minor adjustments to the design of these improvements are under serious consideration. If proven to be effective, these improvements will be made available to apple orchards throughout the state.

The value of this project becomes apparent when you think about the significant contribution manual laborers make to food production in the United States, apple harvesting included. “If you can

find ways for workers to avoid injury, discomfort, or strain, everyone benefits—workers, and employers,” said Bittner. Another benefit mentioned by Mead is that “the bucket improvements have good potential to improve harvest efficiency and reduce fatigue.”

An improved apple harvesting system that helps to reduce potential for injury, provide comfort to the worker, and aid in an efficient, quality harvest will undoubtedly be beneficial to both apple growers and apple workers. Ultimately all will benefit, as we continue to enjoy the fruits of the New York orchards.

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References

Earle-Richardson G. et al. 2003. Occupational Injury and illness among migrant and seasonal farmworkers in New York State and Pennsylvania; 1997-1999: Pilot study of a new surveillance method, *Am J. Indust. Med.* (Accepted for publication).

Fulmer et al. 2002. Ergonomic Exposures in Apple Harvesting: Preliminary Observations, *Am J. Indust. Med.* 2002; Aug. suppl:3-9.

The New York Center for Agricultural Medicine and Health (NYCAMH) was established by the New York State Legislature in 1988 to research the causes and prevention of agricultural injury and illness, and to educate the farm community and professionals serving the farm community about prevention activities. NYCAMH is also charged with providing clinical help for farm-related health problems.

