

To glean or not to glean?

Mechanical harvesting and the cost of gleaning

By Fritz Roka

To glean or not to glean is one of the questions facing growers who adopt mechanical harvesting. Gleaning is the hand-harvest of wholesome fruit that is not collected by a mechanical system.

To be clear, in this article, we refer to gleaning as a decision made in conjunction with a mechanical system that shakes and catches fruit in the same operation. For mechanical equipment

that only shakes fruit to the ground, a hand crew is a necessary part of that system and those workers would not be considered “gleaners.”

Some growers insist on gleaning fruit simply because they want the aesthetic appearance of a “clean” harvested grove. From an economic perspective, however, a grower should glean fruit only when the cost to harvest and haul gleaned fruit is less than the delivered-in price of fruit. For instance,

if the fruit price is \$1.50/p.s., hauling costs are 75 cents per box, and the grower is harvesting 6.25 p.s. per box, the grower would be willing to pay up to \$8.62 per box to pick and roadside gleaned fruit (Calculation: \$1.50/p.s. x 6.25 p.s./box – 75 cents/box). Clearly an \$8.62 cost threshold exceeds any current hand-harvesting cost. Thus, only in very unusual situations would a grower not insist on gleaning.

On the other hand, if fruit prices were 60 cents/p.s. and the block was yielding 5.9 p.s. per box, a 75-cent hauling charge would leave the grower with only \$2.79 to pick and roadside a box of gleaned fruit. Under these circumstances, if a harvesting company was to charge \$2.80 or more per box to pick and roadside, the grower should not glean unless he or she is willing to accept the economic loss.

The cost of gleaning will vary directly with the recovery percentage of the mechanical harvesting system. That is, the more effective the harvesting machine (i.e. higher fruit recovery percentage), the higher the cost to glean the remaining fruit. To understand this cost relationship, one must realize two things. First, a worker’s productivity will decline as the total volume of available fruit declines. Second, the piece rate to glean fruit will be adjusted to the hourly earnings expectation of a typical worker.

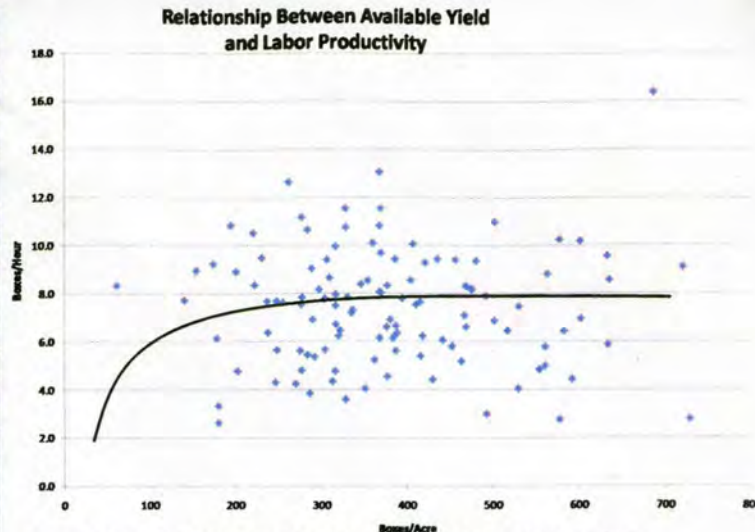


Figure 1. Data from 2008 showing average worker productivity by crew from individual citrus blocks of varying yield levels. Source: Roka, 2010



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In blocks of oranges that yield between 400 and 500 boxes, labor productivity of hand harvesters averages between eight and 10 boxes per hour. If a mechanical harvesting system recovers 90 percent of the crop, only 40 to 50 boxes per acre are available for gleaning. Figure 1 (inset, top photo) illustrates the relationship between the productivity of hand-harvesters (vertical axis) and the number of boxes available to be harvested (horizontal axis). These data were collected during the 2008 harvest season and combine blocks that were completely hand-picked with those blocks that were gleaned after mechanical harvesting occurred. What is interesting to note is that worker productivity remains fairly high even as available yield declines to less than 200 boxes per acre. As available yield falls below 200 boxes per acre, worker productivity drops off dramatically. Analysis of these data indicate that average productivity falls to five boxes per hour as total available fruit declines to less than 50 boxes per acre.

Experienced citrus harvesters know their individual productivity. Thus, when presented with a piece rate, they can quickly calculate their hourly or daily earnings. Typically these workers start the day with specific income expectations in mind. If harvesting conditions prevent them from performing at their usual productivity levels, they will argue for an increase in the per box piece rate in order to meet their income targets. At the very least, workers have to be paid the federal minimum wage, which currently is \$7.25 per hour. (Note: Employers have to abide by the higher of federal and state minimum wage levels. Currently, the Florida state minimum wage is slightly less than the federal rate.) If average productivity to glean fruit is five boxes per hour, the gleaning piece rate has to at least be \$1.45 per box just to cover the minimum wage threshold. Rates for roadsiding gleaned fruit would be adjusted upward as well.

Improving fruit recovery of mechanical harvesting systems is an important goal toward achieving lower harvesting costs. Table 1 (page 14) provides an example with current representative cost numbers to illustrate how unit harvesting costs can be reduced when the machine recovery percentage improves from 85 percent to 95 percent. The cost of harvesting is the weighted average of both machine and gleaning costs. Even

Bringing Strategic Recommendations to the Grassroots Level

By Ken Keck

Recent major reports have provided long-term strategic recommendations for the Florida citrus industry. In March, the National Academies released the "Strategic Planning for the Florida Citrus Industry: Addressing Citrus Greening Disease." Citrus economists from the United States and Brazil issued the "Future of the Global Orange Juice Industry" in April. These reports provide important guidelines for our industry's future, and they also focus on the immediate needs of the Florida citrus grower.

As production costs and risks continue to escalate in the face of weak market demand, we are seeking to expedite actionable solutions.

In the short term, we recognize that our industry must identify ways to reduce production risks and mitigate cost escalation. This could mean creating low-volume pesticide sprays to control psyllid movement and disease spread, improving mechanical harvesting applications and uncovering more efficient production methods.

Long-term research is necessary to control and solve greening. The industry must allocate limited resources to research efforts that offer the highest possible return while continuing to seek additional dollars from state and federal policymakers.

We can take heart in the National Academies' report conclusion which states, "However deficient is our current arsenal for fighting HLB, the potential for progress against this disease remains distinctly hopeful."

After reviewing available information to date, and referencing similar actions and results for Pierce's Disease in the grape industry in California, industry leaders believe that with continued diligence and hard work, growers may be able to slow the spread of greening in three years with better psyllid management programs. We might also expect to have a disease-resistance or tolerance in our groves in seven to 10 years through accelerated plant breeding already under way.

While we all deal with production challenges, we need to continue to boost demand for our products. Generic marketing programs have demonstrated a positive return on grower investment and FDOC will continue to implement fully integrated marketing programs to drive consumer purchase and consumption of Florida citrus.

As citizens of a global economy, we also need to look beyond our borders. The economists' workshop recommended supporting Brazilian efforts to create additional generic advertising campaigns, first in Europe and later in developing markets.

Supporting a healthy European market for orange juice benefits Florida citrus growers by growing the worldwide market for orange juice, thereby preserving profits for both juice processors and orange growers.

On behalf of the Florida Citrus Commission and the dedicated professionals I work with every day, we pledge our support to continue to work collaboratively with the entire industry in these areas, as well as others, to help ensure the economic well-being of the Florida citrus grower and the future sustainability of the Florida citrus industry.

Links to reports:

The "Strategic Planning for the Florida Citrus Industry: Addressing Citrus Greening Disease" report and summary can be viewed at www.nationalacademies.org.

The "Future of the Global Orange Juice Industry" consensus report and additional reports can be viewed at www.fdocgrower.com/emr/powerpoint.php.

The mission of the Florida Department of Citrus is to grow the market for the Florida citrus industry to enhance the economic well-being of the Florida citrus grower, citrus industry and the state of Florida.

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For more information, visit www.FDOCGrower.com



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Table 1. Comparison of harvesting costs as mechanical harvesting recovery percentage increases from 85% to 95%

Recovery % of mechanical system	Block Yield: 500 boxes/acre	Costs	
85%	Mechanical cost:	85% @ \$1.20/box	\$510/acre
	Gleaning cost:	15% @ \$3.00/box	\$225/acre
	Total cost:		\$735/acre
	Unit cost:		\$1.47/box
95%	Mechanical cost:	95% @ \$1.20/box	\$570/acre
	Gleaning cost:	5% @ \$4.00/box	\$100/acre
	Total cost:		\$670/acre
	Unit cost:		\$1.34/box

a machine's recovery would certainly move the mechanical harvesting program in that direction. Whether mechanical harvesting could ever completely eliminate gleaning depends on the delivered-in price of fruit. If fruit prices remain high, it is likely that gleaning will, and should, occur.

though gleaning costs increase from \$3 to \$4 per box as the recovery percentage increases, overall unit harvest cost decreases by 13 cents per box.

It would be unrealistic to expect mechanical harvesting to ever approach the nearly 100 percent fruit recovery achievable by a hand-harvesting crew. What is important, however, is that mechanical harvesting systems achieve a lower unit cost of harvesting. Improving

When making a decision to glean or not to glean, a grower needs to be aware of the dynamic relationship between the piece rate for hand-harvesting and the available fruit to be gleaned, as well as the cost ceiling above which it would not be in a grower's economic interests to glean.

For questions or comments about citrus mechanical harvesting, please visit the UF/IFAS citrus mechanical harvesting Web site at <http://citrusMH.ifas.ufl.edu>. On the Web site you will find the entire IFAS faculty actively engaged in the mechanical harvesting program. Feel free to contact anyone.

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WHAT'S SHAKIN'

Paper on abscission available on Web site

The "Abscission White Paper" is available for reading at the Citrus Mechanical Harvesting & Abscission Program Web site (<http://citrusMH.ifas.ufl.edu>).

The paper was written as part of the CMNP (abscission) submission package to the USEPA. The paper provides the reader with an in-depth description of citrus mechanical harvesting and how abscission will affect harvesting efficiency.

The Citrus MH Web site has a library of more than 340 publications available for viewing or printing. Recently added to the library were 11 new publications on machine enhancements and tree health.

Also available at the Web site are all of the presentations that were made at our April 21 field day and workshop at the SWFREC in Immokalee titled "Overcoming Obstacles and Making the Transition."



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