

Citrus Harvesting

The Big Change In Progress

Harvesting methods may be totally different in 10 years.

By Ernie Neff

Mechanical harvesting machines will be gathering most of Florida's processed oranges and grapefruit in 10 years, Galen Brown believes. There are at least three reasons why the Florida Department of Citrus' harvesting program administrator thinks mechanical harvesting's time is near:



Brown

1) Florida growers must reduce harvesting costs in order to be cost-competitive in an increasingly global marketplace. With harvesting costs equaling production costs for some growers, harvesting is a prime place to tighten the belt, and mechanization will cut costs.

2) Brown believes the seasonal labor supply required to harvest citrus will dwindle to a fraction of its current size. If he's right, there won't be enough people to hand harvest all of Florida's citrus crop at any price.

3) Several commercial and experimental machines appear capable of harvesting citrus substantially faster than it can be harvested by hand. And Brown believes the machines will soon be more cost-effective than hand labor.

Brown is not alone in his vision for mechanical harvesting. Some large growers have been using mechanical harvesters experimentally for several years. In the August issue of *Citrus Industry Magazine*, Barron Collier Co. Agribusiness Manager Everett Loukonen said, "One of the greatest changes in this industry – and we'll be in the forefront of it – will be mechanical harvesting."

FROM 0 TO 7,000 ACRES IN 5 YEARS

Several companies that make agricultural machinery have begun jockeying to capitalize on the coming mechanical harvesting boom. Just five years ago, there were no mechanical citrus harvesters in the state. Last season, approximately 4,000 acres of Florida groves were harvested by several different machines. This season (1998-99), Brown expects 20-25 machines owned by five companies to be harvesting as much as 7,000 acres, either commercially or experimentally.

Jim Griffiths, a member of the Citrus Harvesting Research Advisory Council which directs Brown's efforts, is surprised at how quickly mechanical harvesting technology has progressed. "We are moving much farther along in terms of the ability to remove unloosened fruit from the tree than I ever expected by this time," he said.

Griffiths said several different machines are capable of removing close to 90 percent of the fruit on the trees they harvest "and that's probably close enough" to make them commercially acceptable.

The 83-year-old grower, researcher and industry observer doesn't think a severe labor shortage is as imminent as Brown does. "Labor has gotten scarce on a number of occasions, and always they find some way to get more," Griffiths said. "Galen undoubtedly believes the labor crunch will be a reality far sooner than I do."

But Griffiths does think that scores of thousands of acres of processed Florida citrus will be harvested mechanically 10 years from now.

Let's take a look at the three factors that Brown believes are driving mechanical harvesting to an industry-wide reality – harvesting costs, labor availability and the development of effective harvesting machines:

COSTS

Cost cutting has become a way of life for most growers since prices for processed citrus declined in the early 1990s and stayed depressed. So far, virtually all cost-cutting has been in the production end as growers scrambled to minimize fertilizer, chemicals and other inputs. There simply wasn't any place to trim the labor-intensive harvesting budget.

By the 1997-98 season, the average cost of harvesting a field box of oranges

for processing had climbed to about \$1.55, according to Brown. That included the cost of picking the fruit and placing it in a bulk highway truck.

Growers who have watched fruit prices and production costs decline are often appalled at their inability to curtail harvesting costs. Brown thinks mechanical harvesting will give them the chance to reduce those costs substantially.

"Up to this point, I don't think those growers (using mechanical harvesters) have saved anything," Brown said. But he said those who've been experimenting with the machines are paying for development costs now and making the grove changes – such as tree skirting for trunk shakers – that will facilitate mechanical harvesting. Those who are preparing now will be able to move to mechanical harvesting more quickly and inexpensively in the future, he said.

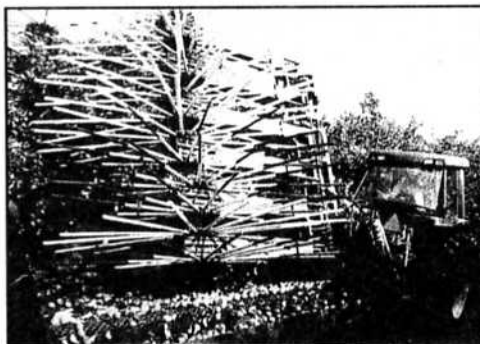
He thinks handsome dividends will be paid to those using mechanical harvesting. "Some envisioned mechanical harvesting technologies may cut harvesting costs by 25-75 percent," he wrote in a recent report. Such savings would go a long way toward keeping a Florida grower cost-competitive.

LABOR

Several harvesting contractors told Brown they had trouble finding enough workers to pick late-season Valencia this past spring. "Our labor supply this year at the end of Valencia season was definitely short... The labor supply dropped to nearly zero." He said some contractors had to pay pickers \$1.50 to \$2 per box, compared to the usual going rate of 75 cents a box.

Brown thinks such spot shortages of picking labor will become more permanent shortages in the near future. This excerpt from a recent report he wrote explains why:

"An estimated 43,700 workers were needed at the peak of the harvesting season (in 1993). The workers were largely single young Mexican males who migrate each year. Surveys reveal that over 50 percent of these individuals are undocumented workers (illegally employed). The 1996 Illegal Immigration Reform and Immigrant Responsibility Act increased the enforcement efforts to prevent employment of illegal workers and the penalties on employers. There will be a continual decrease in this traditional labor supply. This may force the adoption of harvesting systems requiring only 5,000 workers to harvest processing oranges by the



The AMI canopy shaker covered 700 trees in an hour.

year 2003. About 25 percent of the total citrus production still must be hand-harvested by 10,000 workers for the fresh market."

If that scenario pans out, mechanical harvesting will, indeed, be a necessity.

THE MACHINES

Ever since the new Department of Citrus Harvesting Program began operating in 1995, it has been funding development of a number of promising mechanical harvesters. Additionally, Brown and his advisory council have been keeping tabs on other machines not funded by the department.

The machines the program has put the most emphasis on in recent years can potentially harvest fruit cost effectively without the use of fruit-loosening abscission chemicals. The department put its emphasis on such machines because the commercial use of an effective abscission chemical is years away at the earliest (see the section on abscission chemicals later).

The program will spend approximately \$1 million on harvesting-related programs in the 1998-99 season. Approximately 60 percent will go for mechanical harvesting development and 40 percent for abscission chemical research.

Following is a quick update on the machines that the program thinks have advanced the farthest or hold the most promise for the future. Those receiving development funding from the Department of Citrus have more written about them — mainly because Brown has more information about them.

Trunk Shakers

Trunk shake-and-catch systems seem to have been developed farther than



Coe trunk shaker



Mongoose

other systems and offer some of the best prospects for immediate use. Trunk shakers attach to the tree trunk and shake the fruit off, and the accompanying catch systems collect the fruit before it hits the ground. Thousands of acres of Florida citrus have been harvested by trunk shakers in recent years, versus only a few acres by other methods.

Trunk shakers appear to have only one serious shortcoming — late Valencia oranges give them fits. After rolling through the early- and mid-season orange crops, trunk shakers face a crop of Valencias; or, rather, two crops of Valencias. There are the mature, orange Valencias that are ready for picking this

season; and there are the smaller, green Valencias that recently appeared and need a year to grow.

The trunk shakers generally do OK early in the Valencia season. But Brown said once the new Valencias reach half-an-inch or three-quarter-inch in diameter, "trunk shaking will remove enough (new fruit) that the yield next year will decrease." As the new fruit gets larger, even more is shaken off.

Consequently, trunk shakers usually stop harvesting Valencias after about the first week in May, and hand harvesters finish picking the Valencia crop.

Here's Brown's take on the various companies that are using or developing trunk shakers in Florida groves:

Compton Enterprises

"Compton is the fastest trunk shake-and-catch system at this moment," Brown declared. "During demonstrations that were not time-studied, they were running at 180 trees per hour." He said any machine that can harvest as much as 90 trees per hour is "very efficient" by current standards.

Crop removal ranged from 87 percent to 97 percent, depending on grove condition and preparation. Harvest recovery ranged from 158 to 398 field boxes an hour. The system requires three workers — two harvester operators and one grove truck operator.

The California company has announced it will have two machines operating commercially in Florida in the current season.

Brown said a grower could do better financially to buy and operate a Compton machine that averaged 120 trees an hour than to hire a contract harvester. "If a grower purchases and operates that system, it would save 50 percent," he said.

So why hasn't any grower or harvesting contractor purchased the system? Brown explained that in addition to taking on the labor-related liabilities inherent in harvesting, a grower would have to capitalize the purchase of a machine. The grower would also have to have his or her trees skirted and possibly move the microsprinkler irrigation system to accommodate a trunk shaker.

"They are promising; they can do the job," Brown said. "It's a very smooth running system. I see no reason it will not be successful." The Department of Citrus program has previously funded development of the Compton system, but won't this year since the company is doing commercial harvesting.

Coe Orchard Equipment

Coe, also a California firm, is conducting some harvesting in Barron Collier Co.'s southwest Florida groves. Brown said the company, which doesn't receive Department of Citrus funding, has announced plans to have five trunk

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shake-and-catch systems in Florida this season.

Brown said it appears that Coe's equipment can remove fruit as fast as the Compton system. However, he said its fruit handling system, which gets the fruit into a truck, was too slow last season "and it held up its harvesting." He said Lyman Coe, the company president, said he'd solve the fruit handling problem this season.

Fruit Harvesters International (FHI)

This company, based in Alva in Florida's Gulf region, has by far the most experience of any mechanical harvester in the Sunshine State. It has been operating commercially for several seasons. Brown said FHI will likely harvest approximately 4,000 acres this season with up to 10 trunk shake-and-catch systems.

FHI's machines aren't funded by the Department of Citrus program, and Brown doesn't have any information about FHI's productivity. A March 1996 *Citrus Industry Magazine* article reported the company was harvesting an average of 65 trees per hour and consistently removing 95 percent of the fruit.

Other Systems

Trunk shake-and-catch systems may have the lead in the citrus harvesting race, but they're not the only game in Florida. Following is a look at some other systems that Brown thinks offer promise. Among other advantages, they appear to be able to harvest Valencias throughout the season without removing a significant amount of new fruit.

Mongoose

The Mongoose, developed by J&G Harvesting of Arcadia, has four rectangular grids, each containing foliar-penetrating rods, that sequentially shake fruit from parts of four trees. The prototype went into operation this February in groves owned by several large Florida growers.

Mongoose's greatest advantage, Brown said, is that it has the most flexibility of any known citrus harvesting system. It can harvest unskirted trees up to 40 feet tall of any age, spacing or trunk size.

However, "the harvester didn't operate fast enough this year (1997-98) to become economically feasible," Brown said. The problem was that it took too long - 15 seconds - to reposition the grids each time on the four trees.

"They're trying to simplify the arm and the control" to make it faster, Brown said.

Additionally, the Mongoose's fruit collecting systems weren't large enough to catch all the fruit that was removed. Brown said the collecting system sometimes missed as much as 50 percent of

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