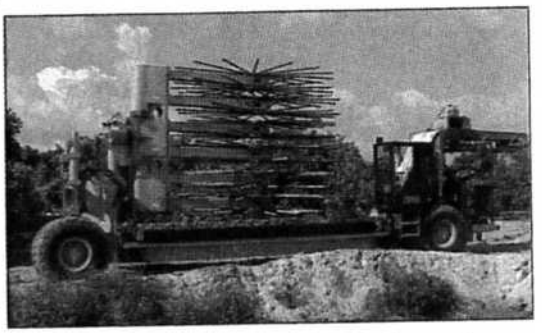
Outlook on Citrus Mechanical Harvesters

By Fritz Roka

Since the early 1960s, the Florida citrus industry has been exploring the possibilities of mechanical harvesting systems. The Florida Dept. of Citrus (FDOC) redoubled this effort in 1994 by commissioning the Citrus Harvesting Research Advisory Council and hiring Galen Brown, Ph.D., as its program administrator. Since 1994, the FDOC has committed $8.3 million of grower taxes into the research and development of citrus mechanical harvesting systems.



The OXBO machine demonstrates the Continuous Canopy Shake and Catch system(CCSC).

The Coe-Collier machine demonstrates the Trunk Shake and Catch system (TSC).

Mechanical harvesting systems should reduce the demand for seasonal migrant workers, but the benchmarks of a successful system will be lower unit harvesting costs and higher on- tree grower revenues. Florida citrus faces stiff competition from low-cost producers, namely Sao Paulo, Brazil. Picking and roadsiding costs are the areas that represent the biggest potential for cost reduction through mechanical systems. Ron Muraro, agricultural economist at the Citrus Research and Education Center in Lake Alfred, has documented pick and roadsiding costs in Florida and Sao Paulo to be $1.60 and $0.50 per box, respectively. Achieving at least a 50 percent reduction in unit harvesting costs is the long-term goal of Florida's mechanical harvesting program.

In the past two years, two systems have made notable strides toward commercial viability: the trunk, shake and catch system (TSC) and the continuous canopy shake & catch system (CCSC). A TSC system includes three machines: a shaker, a receiver, and a field truck. A shaker and receiver set position at each tree, where trunks are shaken for between 5 and 10 seconds to remove fruit. The receiver conveys fruit in a trailing bin, which holds between 70 and 90 boxes. A field truck (goat) off-loads the fruit to a bulk trailer. Trees need to have adequate clear trunk and skirt heights to allow shaker and receiver units to position underneath the canopy.

One CCSC set involves a minimum of four machines two harvesting units and two field trucks. Working in parallel, a CCSC system travels 1 to 2 mph along each side of the tree row. Shaker heads rotate through the tree canopy to remove mature fruit. Trees have to be skirted to allow fruit collection underneath the tree canopy.

On properly prepared trees, the TSC and CCSC systems can recover 90 percent of the available fruit.

The costs of adopting a mechanical system will be financed by lower unit-harvesting prices. Lower harvesting costs will increase a grower's net on-tree revenue. However, the lower harvest price must compensate a grower for grove preparation expenses required by the mechanical system, value of non-harvested fruit, and any tree damage that reduces lifetime tree yields. On the harvesting side, a lower price must be sufficient to offset equipment ownership costs, increased fuel and maintenance costs, and equipment operator training costs. In addition, the equipment owner must receive a reasonable return (profit) from their capital investment.

Lower unit-harvesting prices will be achieved through higher labor productivity rates. Data collected during the 2000-01 season indicate that the TSC system improved labor productivity to 50 boxes per hour, a five-fold increase over average hand-harvesting crews. The CCSC system increased labor productivity by more than 70 boxes per hour. If a harvester is paid $0.70 per box and by hand can pick 10 boxes per hour, a five-fold increase in his productivity would drop the effective pick rate to $0.14 per box without changing his hourly earnings. The switch to a mechanical system would save $0.56 per box on just the picking costs. Further, roadsiding costs should drop as well, since fewer people would be involved in a mechanical harvesting operation. Again, it is important to emphasize that these savings must be sufficient to finance the adoption costs listed above for both growers and equipment owners.

During 2000-01, nearly 10,000 acres were harvested with a mechanical system. The FDOC set a goal to mechanically harvest 100,000 acres, or at least 20 percent of the orange grove acreage, by 2004. Significant progress has already been made, particularly in the area of machine design.

If mechanical harvesting systems are to become a permanent part of Florida's citrus landscape, it will require the collective efforts of equipment manufactures, harvesters, grove owners and processors. *CVM*

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