Mechanical harvesting

– the processors' perspective

By Timothy Spann

(AUTHOR'S NOTE: This article is the third in a three-part series examining mechanical harvesting and its impacts on the citrus industry from the perspective of the major stakeholders.)

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The acreage of commercial citrus in Florida is at its lowest level (576,577 acres) since acreage censuses began in 1966, and FCOJ is trading near its lowest price in three years. These trends in the industry coupled with ever-increasing production costs due to major inputs like pest control and labor are continuing to enhance interest in mechanical harvesting of processing oranges. Previous *Citrus Industry* articles this year have presented the pros and cons of mechanical harvesting from the nurseryman, grower and harvester perspectives. This article discusses the pros and cons from the perspective of the processor.

Processors are focused on one goal – consistently producing the highest quality, safest product at the lowest cost. Working toward that goal requires that processors keep all costs in check, and without a doubt, fruit procurement costs are one of the greatest inputs for processors. That is one reason why processors have been strong supporters of the development and implementation of mechanical harvesting technology – the promise for it to directly impact production costs is a major driving force. However, there are many concerns on the processing end of the equation that arise with the use of mechanical harvesting.

DEBRIS

A primary concern to processors at this time is the amount of debris (twigs, leaves and large stems) that is captured by mechanical harvesters and makes its way to the plant. Data collected by IFAS researchers during the 2007-08 harvest season indicate that mechanically harvested loads of fruit can have two to three times the amount of debris found in hand harvested loads. This debris represents a real cost to the processors because it must be removed prior to processing.

Leaves and twigs have always been present in loads and the equipment necessary to remove them is in every processing plant, but the volume of material removed and handled is much greater with mechanical harvesting. In addition to these types of debris, mechanical harvesting has introduced a new category – large branches (> 0.5 inches in diameter). These large branches may be old wood hung up in the canopy from previous hedging or dead branches that are removed by the vigorous canopy shaking needed to harvest the fruit. Regardless of their source, these branches are problematic because processing plants don't have equipment capable of removing them, so it requires increased manual labor to remove these large stems. Removal of these large stems is critical because they are large enough to damage equipment, leading to increased maintenance costs and costly down-time if lines or even whole plants have to be shut down.

While on the surface debris may appear to be just a processor issue, it should be of concern to everyone, particularly the harvester-haulers. IFAS data indicate that mechanically harvested loads may contain up to or even more than the equivalent of two boxes of fruit in debris (180 lbs). That's less fruit being transported in each load, which directly increases hauling costs/unit of fruit. Over the course of a harvest season, two boxes of debris in every load is nearly equivalent to 900 loads of debris hauled, based on the 2007-08 harvest. A focused engineering effort to eliminate this debris on the harvester in the field is needed to help all stakeholders.

ABSCISSION

The registration and eventual use of the abscission compound CMNP is also of some concern for processors. On one hand, data indicate that the use of CMNP, which selectively loosens mature fruit, will allow for less aggressive canopy shaking to remove the fruit, thus reducing the amount of debris in loads to amounts equivalent to or less than hand harvesting. Even in cases where more aggressive shaking is needed, less debris adheres to CMNP-treated fruit and ends up at the processor. However, on the other hand, questions remain about the integrity of fruit treated with CMNP. The appearance of a ring on the stylar end of fruit treated with CMNP under some conditions leads to concerns about premature fruit breakdown. Will fruit treated with CMNP hold up as well in trailers, or will processing of this fruit need to be expedited? Research is planned to address these questions.

Another aspect of CMNP use that remains to be answered is the presence of the compound or its metabolites in the peel and peel oil. The testing being conducted for product registration purposes indicates that CMNP is metabolized in the fruit into harmless compounds. However, much of the cattle feed produced from the peels is sold to the European Union, which has strict maximum residue limits (MRLs) for any contaminants. Peel oils are also known to retain applied chemicals at detectable levels even when they may become undetectable in other parts of the fruit. Current regulations indicate that if an MRL is not established for a compound, then its MRL is zero; therefore, harmless or not, CMNP and its metabolites must be fully researched. These are critical questions that must be answered so that valuable byproducts of our industry are not jeopardized.

PULL-BEHIND HARVESTER

Also along the lines of product safety, there is concern about fruit harvested using the Oxbo 3210 pull-behind harvester. This machine shakes the fruit from the tree and drops it to the ground to be picked up by a hand crew or pick up machine. When fruit comes into contact with the ground, there is always concern about contamination by potentially hazardous pathogens. Outbreaks of food borne illness have had severe negative impacts for other crops (e.g. tomatoes and spinach) even when the crop was later proven not to be the source of the outbreak. Previous outbreaks of salmonellosis linked to consumption of Florida orange juice have led to legislation mandating the pasteurization of citrus juice. The pasteurization protocol has been designed assuming all fruit is harvested by hand. It is important to note that IFAS researchers have not found any indication that fruit in contact with the ground (as occurs with some mechanical harvesting systems) is consistently and significantly higher in microbial surface contamination than hand harvested fruit. However, fruit coming into contact with the ground, without adequate grove preparation, is still a risky practice and only one incident may have devastating consequences for our industry.

THE VALUE OF MECHANICAL HARVESTING

Despite these serious concerns, processors do see a lot of value to the industry in moving to more mechanical harvesting. The primary benefit will be a reduction in the overall length of the harvest season because fruit can be harvested more quickly. Thus, the very early and very late fruit that is not of the highest quality could be harvested closer to its peak maturity. This would increase the overall quality of the end product. However, due to plant and storage capacity issues, not all processors will be able to shorten their harvest season equally, given current crop production and capacities.

Another benefit of the speed with which fruit can be mechanically harvested is at the beginning of each week during the season. Fruit harvest can be timed to provide fruit to the plants as they begin operating, rather than being harvested on Friday or Saturday and sitting in the grove or on the lot until Monday morning. Mechanical harvesting also has the potential to be done 24 hours a day, which would maximize machine efficiency, while maintaining a steady flow of fruit to the plant, reducing the time fruit sits on the lot. An added benefit of this would be more evenly distributed truck traffic on the roads throughout the day. Fewer trucks entering and leaving the plants during the day when most people are on the roads would help to reduce traffic congestion and make processors, and our industry as a whole, better neighbors.

Despite the long-range benefits of faster harvesting, this aspect of mechanical harvesting currently makes scheduling and load allocation difficult and machines may not be utilized as efficiently as they could be. Each processor currently works around this issue in its own way with its growers. As time goes by and mechanical harvesting is more widely adapted, this issue will work itself out, but in the interim, it is a concern because everyone wants to see these expensive machines utilized as efficiently as possible.

To the processors, mechanical harvesting of Florida citrus will increase the value of our product by reducing variability due to labor uncertainties and allowing fruit to be harvested closer to its peak of maturity. Each of the stakeholders involved see mechanical harvesting from a different perspective, but share the common goal of producing the highest quality product possible. There will certainly be growing pains along the way as this new technology continues to develop and is adopted. But in the end, mechanical harvesting will be an integral part of the 21st century Florida citrus industry.