

# IFAS Citrus Initiative

## Mechanical Harvesting and Abscission

### Progress Report

**Program:** Economic Studies

**Investigator:** Fritz Roka

A southwest Florida grower advisory committee rated Economic studies a “medium” priority.

**Why work is important:** Economic studies attempt to address questions related to machine and worker productivity, crop yields, harvesting costs, and valuing the costs and benefits of incorporating abscission as part of the overall harvesting system.

#### **Objectives:**

Three field studies were planned for the 2011-12 season:

1. (S1) Distribute and analyze a grower survey to determine the threshold cost savings before which they will adopt MH despite lingering concerns with tree health.
  - *Status:* A draft of a grower survey was completed and a preliminary list of grower contacts was organized. Discussions with various growers, however, convinced UF/IFAS researchers that the premise of the study had changed. HLB and limiting the amount of additional stress to trees was, and remains, an overriding concern to growers. Therefore, until growers can restore their trees to a suitable horticultural health, no amount of tree damage from mechanical harvesting will be tolerated.
2. (S2) Determine to what extent grove conditions and operator speeds influence fruit recovery percentages of the self-propelled equipment.
  - *Status:* This study did not take place during the 2011-12 season. Preliminary work had been done during the 2010-11 season at the CCLP Summerland Grove near Immokalee and during the late-season trial at Lykes Ft Basinger Grove.
3. (S3) Work with Oxbo and BEI to modify existing “over-the-row” equipment for citrus mechanical harvesting.
  - *Status:* A December meeting was arranged by Dr. Ehsani with two large growers and representatives of BEI to discuss how the BEI blueberry harvester could be modified to harvest young and/or small citrus trees. A BEI proposal, which asked for grower financial contributions, was rejected by the growers. BEI made no other attempts to pursue harvesting interest. Another effort was made in conjunction with Oxbo Corp. Oxbo engineers attempted to harvest young (4-yrs, ~4 ft high) trees with an olive harvester. The trial block was managed by CPI near SWFREC. After 15 minutes of operation and significant damage to 3 out of 4 trees, the trial

was stopped. While there was some discussion of modifying the harvesting head, Oxbo did not pursue any more work on its olive harvester.

Note: \$30,000 of the allocated \$41,733 was returned in large part because a graduate student designated for (S1) was not funded and the OE-materials budgeted for study (S2) were not incurred since the study did not move forward.

#### **Research Gaps:**

- 10 ac/yr CMNP constraint limiting the sufficient collection of data to confirm existing economic models as to the value of CMNP to mechanical harvesting systems.

#### **Employees supported with CI funds:**

- Barbara Hyman, .33 FTE of TEAMS position. Ms Hyman serves as the coordinator of the citrus MH education and outreach program. She works to collect and analyze economic data relevant to citrus mechanical harvesting.

#### **Accomplishments in July 2011 - June 2011:**

##### Publications during 2011-12:

1. Published refereed articles:
  - \*Leonard, K, L House, and F Roka. 2012. Adoption of Mechanical Harvesting for Sweet Orange Trees in Florida: Addressing Grower Concerns on Long-Term Impacts. *International Food and Agribusiness Management Review*. 15(2): May 2012. \* denotes graduate student.
2. Manuscripts prepared for refereed journals:
  - Ebel, RC, KT Morgan, FM Roka, and P Newman. Abscission Agent Application and Mechanical Harvester Settings on Harvest of Late Season 'Valencia'. Submitted to *HortScience*. April 2011.
  - Shamshiri, R., R. Ehsani, J.M. Mari, and F. Roka. Determining machine efficiency parameters for a citrus canopy shaker using yield monitor data. Submitted to ASABE (manuscript # PM-09008-2011. 2011. Nov 2011 revise and resubmit.
  - Roka, F.M. Gleaner productivity, implied piece rates, and implications for citrus mechanical harvesting. Submitted as refereed paper to the *Proceedings of the Florida State Hort Society*. June 2012.

##### Proposals submitted related to citrus mechanical harvesting:

3. Roka, FM, R. Ehsani, D. King, and G. Stich. 2011. Removing Debris from Mechanical Harvesting Systems. Submitted to the Florida Dept. of Agriculture and Consumer Services as part of the USDA 2011 Specialty Crop Block Grant, April 2011. 2-year. Request: \$381,600.  
**Rejected.**
4. Burks, T., W. Castle ..... FM Roka. An Integrated Approach to Citrus Management in the Presence of Various Economic and Biological Challenges

Facing the US Citrus Industry. Submitted to the USDA SCRI 2012. 5-yr. Request: ~\$10M.

**Pending.**

Graduate students with a citrus mechanical harvesting topic,

Completed:

3. Jacob Searcy, Ph.D. Co-Chair. Food & Resource Economics, Aug 2011.  
Dissertation title: Industry-Wide Adoption Of Mechanical Harvesters By The Florida Citrus Industry: Coordination Issues And Economic Trade-Offs.
4. Farangis, Khosro Anjom, M.S. Member. Agricultural & Biological Engineering (Dr. Ehsani, chair), Dec 2011. Thesis title: An Automated Tine Control System For Tractor Drawn Canopy Shakers.

In- progress:

2. Aldosary, Naji Mordi, Ph.D. Member. Agricultural & Biological Engineering (Dr. Burks, chair), est: May 2013.

Other activities/accomplishments:

6. Collected fruit count data at the Lykes Ft. Basinger grove from Sep 10-17. These data were presented at the Nov FDOC Harvest Council meeting and attempted to estimate yield effects from 2011 late season harvest trial.
7. Participated and assisted Dr. Bob Ebel in organizing the 2012 late season harvest trial at Lykes Bros. Harvest dates: May 1, May 15, May 29, and Jun 12. This is a significant trial that will, hopefully be repeated for the next several years to collect data on how next year's crop will be affected by mechanical harvesting with and without CMNP.
8. Updated an ongoing yield study in Southwest Florida by collecting yield data from from selected commercial blocks. Data being currently analyzed to provide a representative tree age-yield plot for Hamlin and Valencia sweet oranges on Swingle and Carrizo rootstocks. With 2010-11 data, the study can track average commercial yields blocks for trees up to 25 years old.
9. Collected pick and roadside rates 2010-2011 season.
10. Traveled to Tulare, CA, (Feb 12-15, 2012) to observe Oxbo vacuum assist harvester working in a Naval orange orchard outside of Deland, CA. Unfortunately, rainy weather prevented the equipment from operating during the 3-day visit. The visit was timed to attend the World Ag Expo in Tulare, CA. Met with several MH vendors, including Coe and Oxbo.

