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The Impact of Mechanical Citrus Harvester Adoption on Florida Orange Juice Growers

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Selected Poster prepared for presentation at the Agricultural & Applied Economics Association's
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INTRODUCTION

- Over 10 Billion oranges are hand picked each season in Florida
 - (120 mil boxes * 90 lbs * 1.5 pieces per lb)
- Brazil has a harvest cost advantage
- MH could lower harvest costs and keep Florida citrus competitive in world markets
- But MH adoption may require changes to industry operations
- What operational changes may be required for successful MH adoption?
- What economic trade-offs do growers and processors face with adoption?
- With potential savings of (\$.50 * 120 mil) why has the industry not fully adopted MH?

OBJECTIVES

- Model economic consequences of adoption on the industry, growers, and processors
- Simulate the industry and its incentive structure
- Estimate changes in revenues, costs, and operational trade-offs
- Suggest scenarios that could lead to Pareto improvements

METHODS

Biological Model

$$PSPA_{via} = PPT_{via} \times (1 - DROP_{vit}) \times (FTWT_{vit} / 90lbs) \times DEN_{via} \times PS_{vit}$$

Estimated 75 functions for pound solid production per acre (PSPA) as a function of pieces per tree (PPT), drop, fruit weight (FTWT), tree density (DEN), and pound solids per box (PS), specific to variety(v), age(a), region(i) over time (t). (Fig. 1)

Linear Programming Model

Maximize industry returns subject to a large sets of physical capacity constraints

- CIPM1 simulates 2006-07 weekly processing volumes with 5% MH
- CIPM4 simulates the maximum 2006-07 processing volume during a single week with 95% MH

RESULTS

- MH allows for collection of more pound solids and more biologically optimal harvest (Fig. 2)
- All monetary gains accrue to growers awhile processors face higher costs (Table 1)

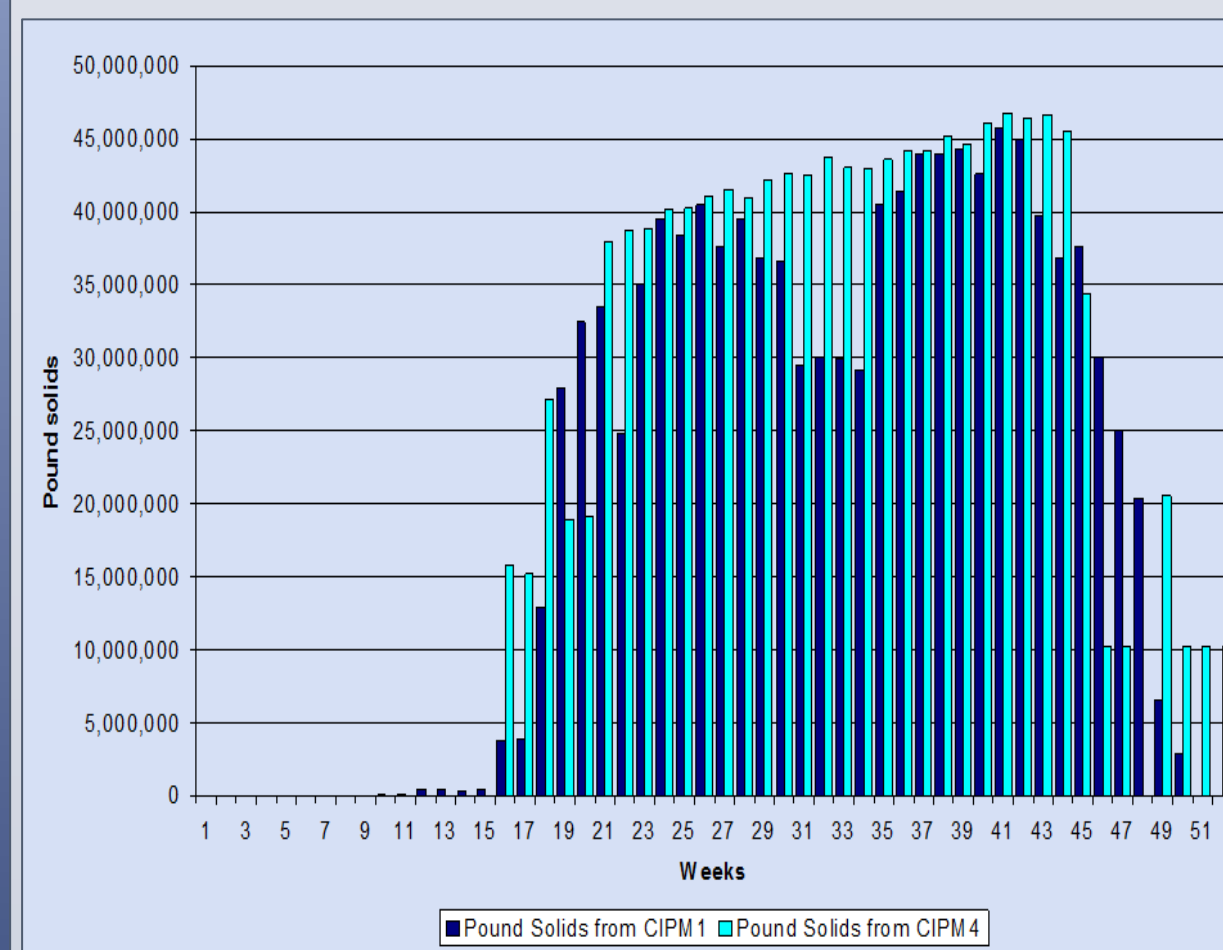


Fig. 2 - CIPM1 and CIPM4 weekly total pound solid production.

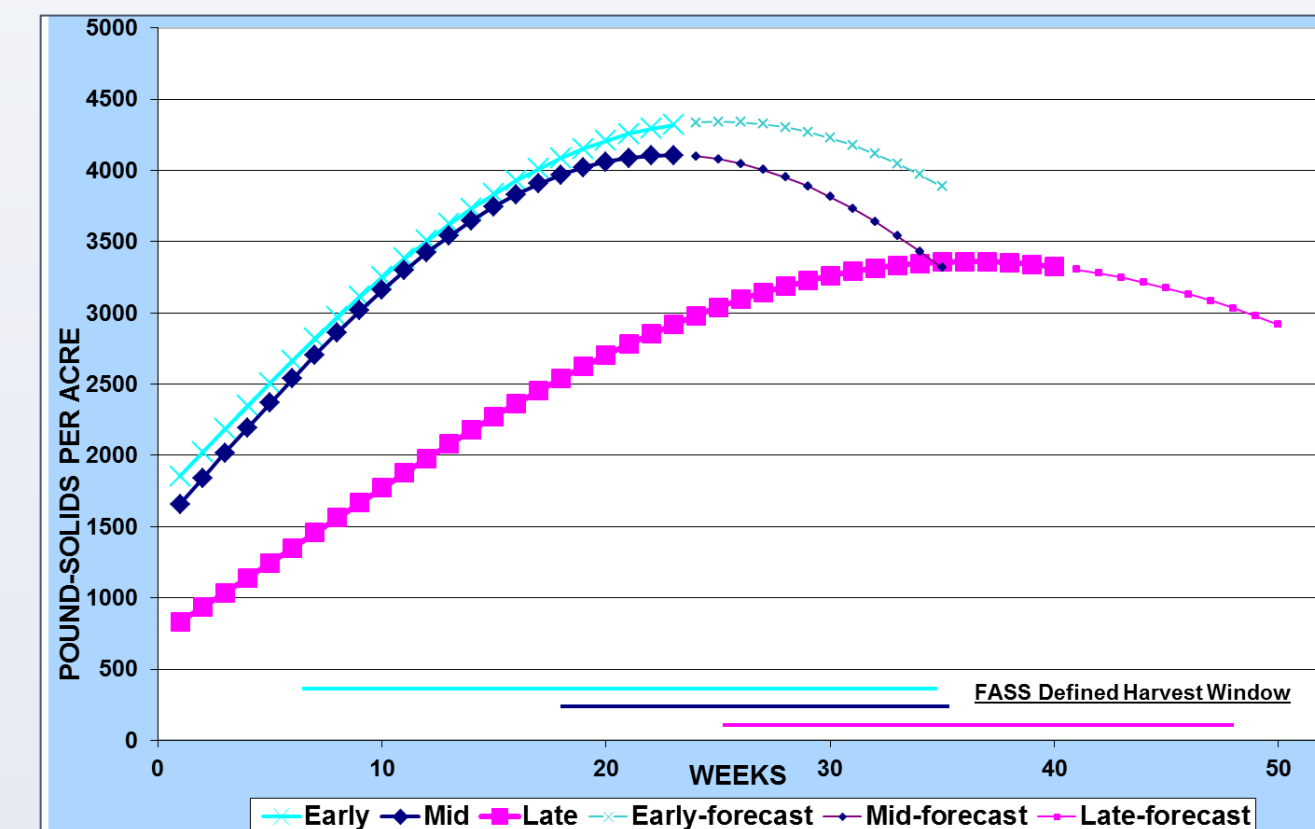


Fig. 1 - PSPA for Early, Mid, and Late Varieties, 14 to 23 year old trees in central region

- Increase of \$204 million (\$440 /acre)
- \$227gain to growers
- \$23 loss to processors
- 11% increase in PS from harvesting more acreage
- Need 172 sets of harvesters
- \$1.2 million in returns per harvester

Tab 1 -Simulation results (millions)

Model	CIPM1	CIPM4
Total returns	\$1,778	\$1,981
Grower returns	\$1,338	\$1,565
Processor returns	\$439	\$416
Total boxes	166	186
Boxes of NFC	86.9	93.0
Boxes of FCOJ	79.1	93.1
Total pound solids	1,111	1,233
Pound solids NFC	574	606
Pound solids FCOJ	537	627

CONCLUSIONS

- Results show the potential for Pareto improvements from MH adoption
- Grower would need to subsidize the processor to make both parties better off
 - Potential marketing mechanisms or MH processing fee
 - Contracting changes
 - Third-party negotiator: Cali. Tomato Growers Association
- A “systems approach” is necessary, adoption is not just a farm management decision

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