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

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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

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)

METHODS

- Biological Model

\[
PS\text{PA}_{\text{crop}} = PPT_{\text{crop}} \times (1-DROP_{\text{crop}}) \times (FTW\text{T}_{\text{crop}}/90) \times DEN_{\text{crop}} \times PS_{\text{crop}}
\]

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

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

REFERENCES


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