



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**A Stochastic Economic Model to Assess the Effectiveness of Different Management Strategies to
Mitigate the Damage Caused by the Citrus Greening**

Samuel D. Zapata

Assistant Professor and Extension Economist, Department of Agricultural Economics, Texas A&M AgriLife Extension Service, Texas A&M University, Weslaco, TX. samuel.zapata@ag.tamu.edu

Felipe Peguero

Extension Associate, Department of Agricultural Economics, Texas A&M AgriLife Extension Service, Texas A&M University, Weslaco, TX. Felipe.Peguero@ag.tamu.edu

Mamoudou Sétamou

Professor, Department of Agriculture, Agribusiness, and Environmental Sciences, Texas A&M University - Kingsville, Weslaco, TX. amoudou.Setamou@tamuk.edu

Olufemi J. Alabi

Assistant Professor and Extension Specialist, Department of Plant Pathology and Microbiology, Texas A&M AgriLife Extension Service, Texas A&M University, Weslaco, TX. alabi@tamu.edu

***Selected Poster prepared for presentation at the 2018 Agricultural & Applied Economics Association
Annual Meeting, Washington, D.C., August 5-August 7***

Copyright 2018 by Samuel D. Zapata, Felipe Peguero, Mamoudou Sétamou, and Olufemi J. Alabi. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.



Economic Feasibility of Management Strategies to Control the Citrus Greening in Texas

Samuel D. Zapata¹, Felipe Peguero¹, Mamoudou Sétamou², and Olufemi J. Alabi¹

¹Texas A&M AgriLife Extension, ²Texas A&M University-Kingsville Citrus Center



Introduction

- Citrus greening or Huanglongbing (HLB) is currently the most devastating disease of citrus worldwide. Numerous control and management strategies have been proposed and implemented to date. However, none has been found to be effective.
- The first case in Texas was detected in 2012. Since then HLB has spread rapidly through the entire production region (Fig. 1) [1].
- It is imperative to evaluate the economic feasibility of new control and management strategies to guarantee their broad adoption by growers in Texas.

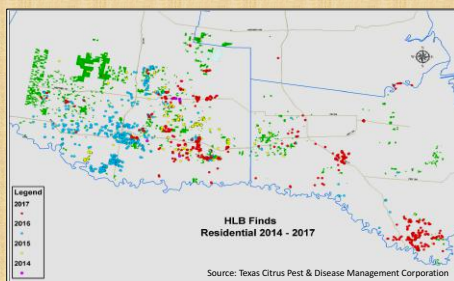


Figure 1: Spread of HLB in South Texas (Backyard trees only)

Objectives

The main objective of this study is to develop an interactive stochastic model to:

- Understand how HLB outbreaks affect citrus growers' profits.
- Evaluate the cost-effectiveness of different management strategies.

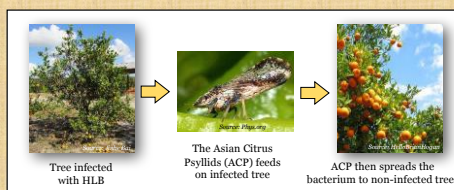


Figure 2. Citrus Greening Spread by ACP

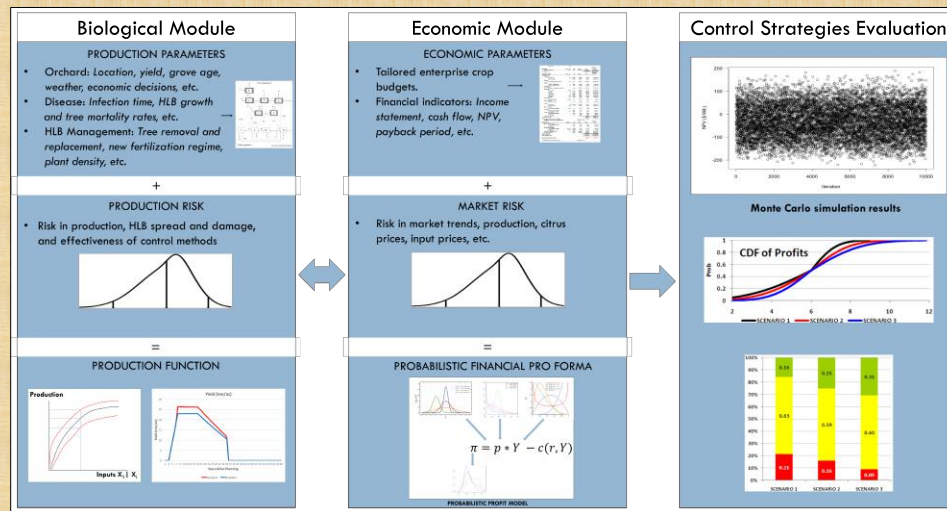


Figure 5. Stochastic Economic Model

Citrus Greening

- HLB is an incurable bacterial disease. The bacteria is spread by the Asian Citrus Psyllid (ACP) (Fig. 2).
- It has become endemic in Florida and Texas while California is at the early stage of the disease epidemics.
- HLB significantly reduces fruit yield quality and increases production costs (Fig. 3 & 4).
- Since its first detection in Florida in 2005, HLB has destroyed millions of trees, resulting in losses of about \$7.8 billion in revenue, over 160,000 citrus acres and nearly 7,500 jobs [2].



Figure 3. HLB affected Citrus Fruit

Stochastic Model

- The model describes the complex intertemporal relationships between HLB spread, implementation of disease control methods and subsequent effects on growers' profits (Fig. 5).
- The model simulates the spread of HLB and the effectiveness of proposed HLB/ACP management practices under different production scenarios (*Biological Module*).
- A series of economic and financial indicators are calculated for each control strategy evaluated (*Economic Module*).
- Advanced Monte Carlo simulation techniques are used to incorporate the intrinsic production and market risks into the analysis.
- Simulation results are used to calculate stochastic production levels, receipts, costs, cash flows, break-even levels, and other financial indicators.
- Interactive and probabilistic financial *pro forma* is developed to evaluate and compare different HLB/ACP control alternatives.

Data

- The stochastic model is estimated using a combination of production data, market information, and experimental trial results.
 - Texas HLB Surveys, 2007–2016
 - HLB Experiment trials
 - Extension citrus crop budgets
 - Citrus market projections
 - Scientific and technical reports



Figure 4. HLB Impacts on Citrus Production

Future Work & Implications

- Validate the *Biological Module* and incorporate management production cost into the *Economic Module*.
- Provide a platform to timely and efficiently evaluate the economic viability of current and novel HLB/ACP management strategies.
- Estimate the actual and potential economic impacts of HLB in Texas.
- Develop better educational and disease management programs.

References

- [1] Texas Citrus Pest & Disease Management Corporation. 2017.
- [2] Singerman, A. and P. Useche. 2016. Impact of Citrus Greening on Citrus Operations in Florida. UF/IFAS Extension.

We are grateful to the Texas Citrus Pest & Disease Management Corporation for their support

For more information contact
Dr. Samuel Zapata: samuel.zapata@ag.tamu.edu