The economic impact of a more sustainable citrus industry in California

Valeria Lavagi[a], Deborah Pagliaccia[a], Luis Navarro[b], Jonathan Kaplan[c], Georgios Vidalakis[a]

[a]Department of Microbiology and Plant Pathology, University of California – Riverside

[b]Instituto Valenciano de Investigaciones Agrarias, Retired

[c]Department of Economics, California State University – Sacramento

Citrus Clonal Protection Program ... starting citrus correctly

A. The economic impact of citrus clean plant units and the Citrus Clonal Protection Program in California

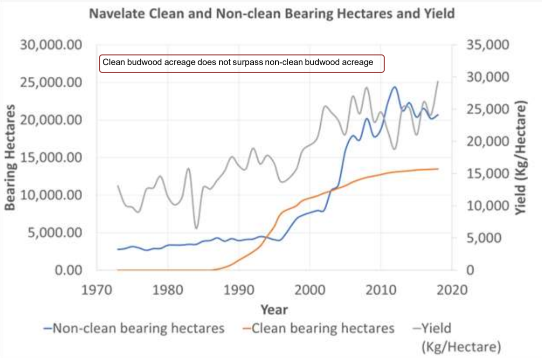
A. Introduction

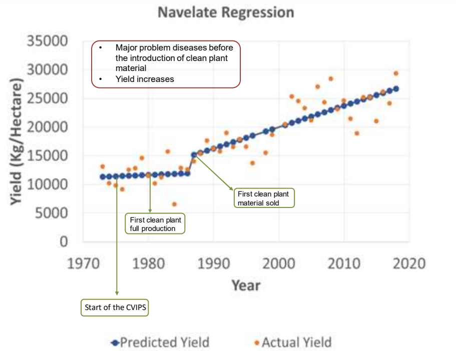
- The citrus industry is continually threatened by the presence of diseases.
- In California citrus represents one of the most economically valuable fruit crops contributing to the development of the State's agriculture.
- The Citrus Clonal Protection Program (CCPP) produces and distributes clean citrus. propagative plant material ensuring a safe mechanism for the introduction into California of citrus varieties, preventing the spread of plant diseases throughout the state.

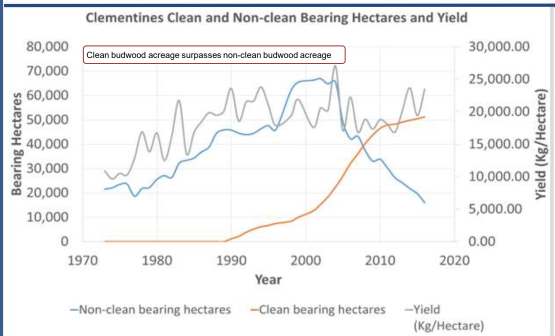
A. Method

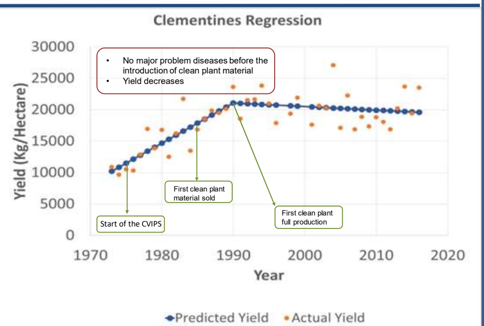
- Since California has no nursery tree propagation data, a counterfactual scenario was created.
- Spanish nurseries citrus production data was used.
- Regression analyses were performed to investigate the impact of the citrus clean plant units on the yield in Spain (clean plant material produced by the Citrus Variety Improvement Program in Spain (CVIPS)

A. Results









A. Next steps

- Survey to California nurseries to understand how many nursery trees are produced for the known amount of sold CCPP-produced budwood
- Apply the Spanish paths to California situation

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

B. An economic analysis of the benefits of Bokashi and biochar as a substitute for commercial fertilizer

Figure 1. Citrus waste.

B. Introduction

- Problems:
  - Agriculture in California contributes to carbon emissions that exacerbate climate change that affects availability of natural resources such as water;
  - California agriculture is a linear economy and needs to transition to circular economy and reuse agricultural waste;
  - Presence of unused citrus waste (for Bokashi) and almond waste (for Biochar).
- Research has already shown that Bokashi and Biochar have beneficial effects on plants growth (Figure 2).
- Aim of the research: Conduct a cost-benefit analysis to determine the economic feasibility of using biochar and Bokashi in agriculture and the monetary benefits that are accrued from this use.

B. Method

- Analysis is based on the experimental results, the data gathered from the literature and agricultural production supply retailers.
- Treatments included: soil amendments 10% biochar, 10% bokashi, 10%+10% bokashi and untreated control.
- Cost savings for water, fertilizer and carbon sequestration for the three treatments were measured.

Figure 2. Growth differences with (starting from left): 10% biochar only, 6.25% Bokashi, 12.5% Bokashi and 25% Bokashi (+ 10% biochar each).

B. Preliminary Results

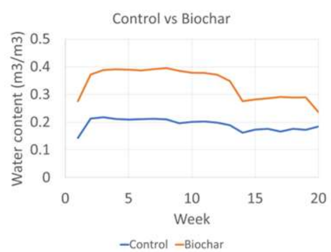


Figure 3. Differences in plants' water content between using commercial fertilizer and biochar.

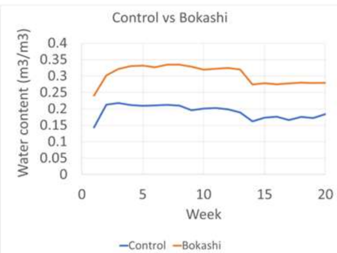


Figure 4. Differences in plants' water content between using commercial fertilizer and Bokashi.

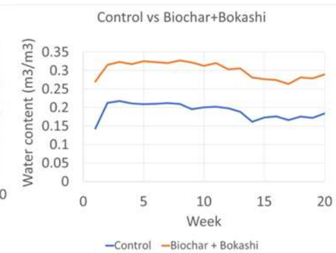


Figure 5. Differences in plants' water content between using commercial fertilizer and a mix of biochar and Bokashi.

	Water cost savings	Fertilizer cost savings	Carbon benefits
Biochar	$24.64/acre/day	$18.69/acre/day	$0.13/acre/day
Bokashi	$21.12/acre/day	$18.69/acre/day	$0.08/acre/day
Biochar + Bokashi	$20.9/acre/day	$78.51/acre/day	$0.1/acre/day

B. Next steps

Determine which one between biochar, bokashi and the mix of the two is the best ultimate strategy

ucanr.edu