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FE982

What Is the Economic Benefit of a Citrus Health Management Area (CHMA)? A Case Study[1]

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Introduction

A "Citrus Health Management Area" (CHMA) is a voluntary, area-wide pest-management approach to control the Asian citrus psyllid (ACP), which is the insect vector of huanglongbing (HLB; citrus greening). Each CHMA, constitutes a group of growers who work cooperatively to coordinate insecticide application timing and mode of action to control the spread of ACP across neighboring commercial citrus groves. The idea behind this cooperative effort is that it provides a larger and more lasting effect relative to individual (uncoordinated) farm sprays because it minimizes the movement of psyllids between groves (Bassanezzi et al. 2013). The effort is also aimed at maximizing the time before additional sprays are required, therefore reducing the risk of ACP developing pesticide resistance.

CHMAs can be characterized according to the following criteria: ACP average counts, number of annual coordinated sprays in a year, leadership, participation of growers in the area, and communication among participants. The latter three refer to the degree to which the CHMA leader and the growers are committed to coordinating efforts. Table 1 shows four categories of CHMAs established by the UF/IFAS Extension program based on the criteria above.

HLB has a negative impact on yield, fruit size and quality, tree mortality, and cost of production. Hodges et al. (2014) found HLB caused a cumulative loss of more than $2.9 billion in grower revenues between 2006/2007 and 2013/2014. The purpose of this article is to examine whether blocks in different CHMA categories attain different levels of yield and provide a differential economic benefit to growers. The answer should be relevant to both individual growers and the citrus industry as a whole.

1. This document is FE982, one of a series of the Food and Resource Economics Department, UF/IFAS Extension. Original publication date February 2016. Reviewed February 2019. Visit the EDIS website at https://edis.ifas.ufl.edu for the currently supported version of this publication.

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Reviewed: 04/2022

Data

A company that owns blocks in two different categorized CHMAs provided the data for the present analysis. Therefore, a key feature of this dataset is that all blocks are managed under the same practices (i.e., number of sprays, nutritional programs, and fertilizer applications) and have similar characteristics in terms of production region, tree age, tree density, and reset plantings.

The data consist of yields for two sets of Valencia orange blocks over four different crop years: 2001/2002; 2008/2009; 2012/2013, and 2013/2014. The first set includes 6 blocks comprising 221 acres, located in a "moderate" class CHMA. The second set includes 5 blocks with a total of 161 acres, located in a "best" class CHMA.

Analysis

We analyzed the data to obtain two measures of change in yield. First, the change in yield per acre over time, which encompasses the overall incidence that weather, pests, and disease had on that crop year's yield. Second, the differential yield attained in blocks located in the best class CHMA over those located in the moderate class CHMA by year.

To examine the data, we used regression analysis. A summary of the results is shown in Table 2. All variables in that table are statistically significant, except for variables (2) and (5), which refer to year 2008/09. This means that from a statistical point of view, their magnitude is not different from zero. Such results are not surprising. The effects and rate of infection of HLB were not as widespread in 2008/2009 as they have been in more recent years. In addition, CHMAs were merely starting to be organized at that time.

Variable (1) in Table 2 denotes that the average yield for all blocks across the two CHMAs (best and moderate) in 2001/2002 was 364 boxes per acre. It is worth noting that since there are characteristics for which we do not have data and that may not be identical across blocks (such as soil quality and PH), we conducted a test to establish whether there was a statistically significant difference in the mean of the two CHMAs in 2001/2002. We found there was not.

As denoted by variables (3) and (4) in Table 2, the average yield in the moderate class CHMA decreased by 105 boxes per acre in 2012/2013, and by 184 boxes per acre in 2013/2014. It can thus be argued that the main contributor to the significant yield decrease in years 2012/2013 and 2013/2014 was HLB, which can cause fruit drop and smaller fruit size.

Another key result from this analysis is the magnitude and significance of variables (6) and (7) in Table 2. The former variable denotes that the average yield in 2012/2013 was 83 boxes per acre higher in blocks located in a best class CHMA compared to those located in a moderate class CHMA. Similarly, variable (7) denotes that the average yield in 2013/2014 was 145 boxes per acre higher in blocks located in a best class CHMA compared to those located in a moderate class CHMA.

Conclusions

In our analysis of the case-study data on yields of Valencia oranges from blocks located in two different categories of CHMAs, we found that the number of boxes per acre decreased significantly during 2012/2013 and 2013/2014. Since there were no extreme weather events such as hurricanes or freezes during those years, we argue that those variables capture mainly the increasing negative impact of HLB on yields. We also found that yields of blocks located in a best class CHMA were significantly higher compared to those located in a moderate class CHMA. Moreover, such partial offsetting effect of the best class CHMAs against the negative impact of HLB on yields is increasing over time. These findings provide evidence on the effectiveness of best class CHMAs as a way to deal with HLB.

To obtain a measure of the differential economic benefit of best over moderate class CHMAs, we multiply the differential annual yield obtained above by the corresponding price per box. For example, combining 83 (145) boxes per acre with the annual average on-tree price per box for processed Valencias in 2012/2013 (2013/2014) equals $8.60 ($8.40) (USDA/NASS 2015). The estimated differential gross economic benefit per acre is $714 ($1,218) for 2012/13 (2013/14). Thus, our analysis provides evidence that CHMAs can enhance an individual grower's profitability at a time when margins are becoming increasingly narrow.

References

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Table 1. Cirus Health Management Area (CHMA) categories, UF/IFAS Extension

Category	Best	Good	Moderate	Poor
ACP average counts	0 to 2	3 to 5	6 to 9	10+
Number of sprays/year	5+	5	4	2
Leadership	Strong	Strong	Sporadic	None
Participation	Majority of growers	Most growers	Some growers	Very few growers
Communication	Constant	Once per month	Quarterly	None

Table 2. Changes in yield per acre by year for CHMA best and moderate categories.

Variable Number	Variable Name	Boxes per acre	Significance Level
(1)	2001/02 average yield in both CHMAs	364	***
(2)	2008/09 change in yield from average in moderate class CHMA	–47	NS
(3)	2012/13 change in yield from average in moderate class CHMA	–105	***
(4)	2013/14 change in yield from average in moderate class CHMA	–184	***
(5)	2008/09 yield difference for best vs moderate class CHMA	17	NS
(6)	2012/13 yield difference for best vs moderate class CHMA	83	**
(7)	2013/14 yield difference for best vs moderate class CHMA	145	***

NS denotes no statistical significance (i.e., statistically not different from zero).
** denotes significance at the 5% level
*** denotes significance at the 1% level