Citrus health management areas vs. individual sprays

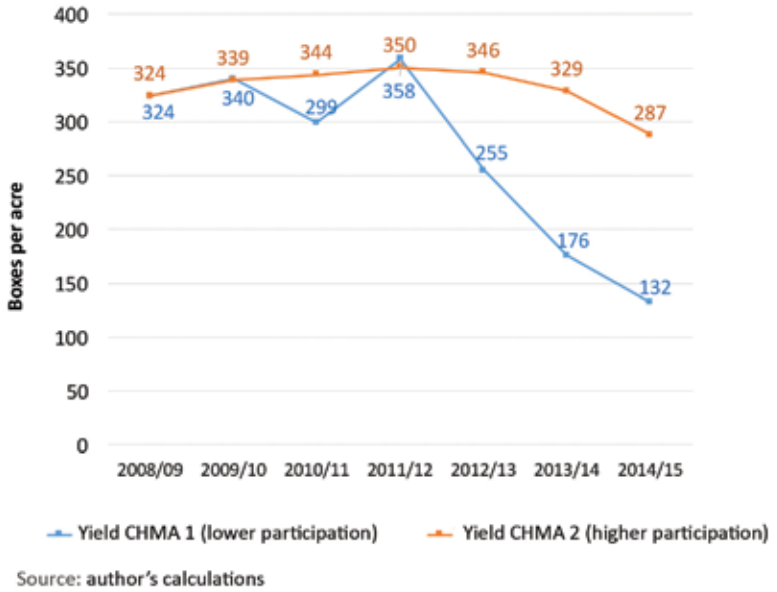
CHMAs have proven to be an effective strategy for psyllid control, so why isn't there more grower participation?

By Ariel Singerman and Pilar Useche

It has long been recognized that mobile pests with the ability to move between farms compromise the effectiveness of individual (uncoordinated) sprays. This is because neighboring growers share the pest and, therefore, crop damage is dependent not upon the individual farm pest population but on the regional total pest population. Mobile pests can then be viewed as common property because individual farms' actions have little effect on the density of the pest due to reinfestation from adjacent properties.

Area-wide pest management is based on the premise of addressing the entire pest population in a region. It provides a more lasting effect than individual farm sprays and reduces the risk of pesticide-resistance development. From an economic standpoint, growers should coordinate pest management practices whenever the benefit of doing so is greater than its cost. It is important to emphasize that for an area-wide pest management to be effective for an individual grower, a majority of neighboring growers need to participate in the coordination effort.

Figure 1. Average of Valencia Orange Yields per Acre by CHMA



Source: author's calculations

CASE STUDY RESULTS

Case-study data provided by a grower owning two sets of Valencia blocks in two different citrus health management areas (CHMAs) was analyzed to establish whether there was any significant difference in the level of

yield and profitability attained in each of the two CHMAs. The first set of data includes six blocks comprising 221 acres located in CHMA 1. The second set includes five blocks with a total of 161 acres located in CHMA 2. All blocks were managed under the same practices and had similar characteristics in terms of production region, tree age, tree density and reset plantings.

Figure 1 (page 14) shows the average yield per acre in each of the two CHMAs. As illustrated in Figure 1, yields have been decreasing since 2011–12. Given there were no hurricanes or significant freezes during those years, the decrease in yield can be mainly attributed to the increasing negative impact of HLB on yields. Figure 1 illustrates that from 2012–13 to 2014–15, yield in blocks located in CHMA 2 — where coordinated sprays occurred with higher levels of grower participation than in CHMA 1 — were significantly higher compared to those in CHMA 1[1]. The partial offsetting effect of CHMA 2 against the negative impact of HLB on yields has been increasing over time. These findings provide evidence of the effectiveness of well-performing CHMAs as a way to deal with HLB.

CHMA PARTICIPATION

At the end of 2015, the number of CHMAs statewide was 55, but it is estimated that only 19 were actively coordinating sprays. But, even for the active CHMAs, there is no data available on the overall level of participation. Therefore, we conducted a survey/choice experiment during the Florida Citrus Growers Institute in April 2016. A total of 123 growers representing 153,278 acres participated in the survey, representing approximately one third of the total citrus acreage in Florida.

When asked about whether they participate in CHMAs, 37 percent of the growers stated they do not

[1] Based on regression analysis (not shown here), differential yields were statistically significant.

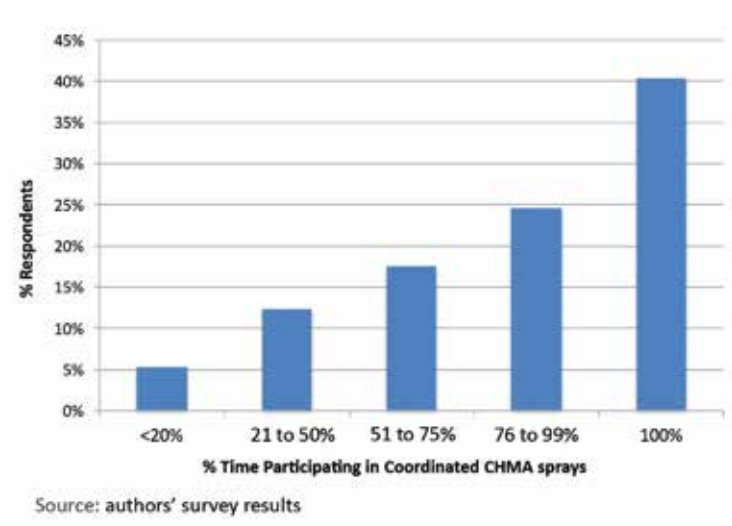
currently participate while 63 percent stated they do. However, only 40 percent of CHMA participants stated they participated in coordinated sprays 100 percent of the time (see Figure 2). Thus, the majority of CHMA participants (60 percent) participate less frequently. Hence, the data shows a large proportion of growers do not participate in CHMAs, and that the majority of those who participate do it in a limited fashion.

The finding on limited participation in CHMAs seems counterintuitive given the significance of the results on differential yields (and associated revenue) between the two CHMAs presented above. Therefore, the question becomes: What can explain the reluctance of many growers to participate in CHMAs despite the evidence of it being efficient? To address this question, more data was collected.

Asked to rate their reasons for not participating in coordinated sprays, 57 percent of non-CHMA participants stated their top reason is that other growers do not participate. Their responses indicate that their belief about the reluctance of others to participate makes them not participate in CHMAs. The second top reason for not participating was "I prefer to spray on my own timing," with 50 percent of the non-CHMA participants agreeing with this statement. This result denotes the growers' own reluctance to coordinate efforts. In addition, "too much effort to coordinate" was the reason receiving the third-largest percentage of "agree" responses (19 percent) from non-CHMA participants (see Figure 3).

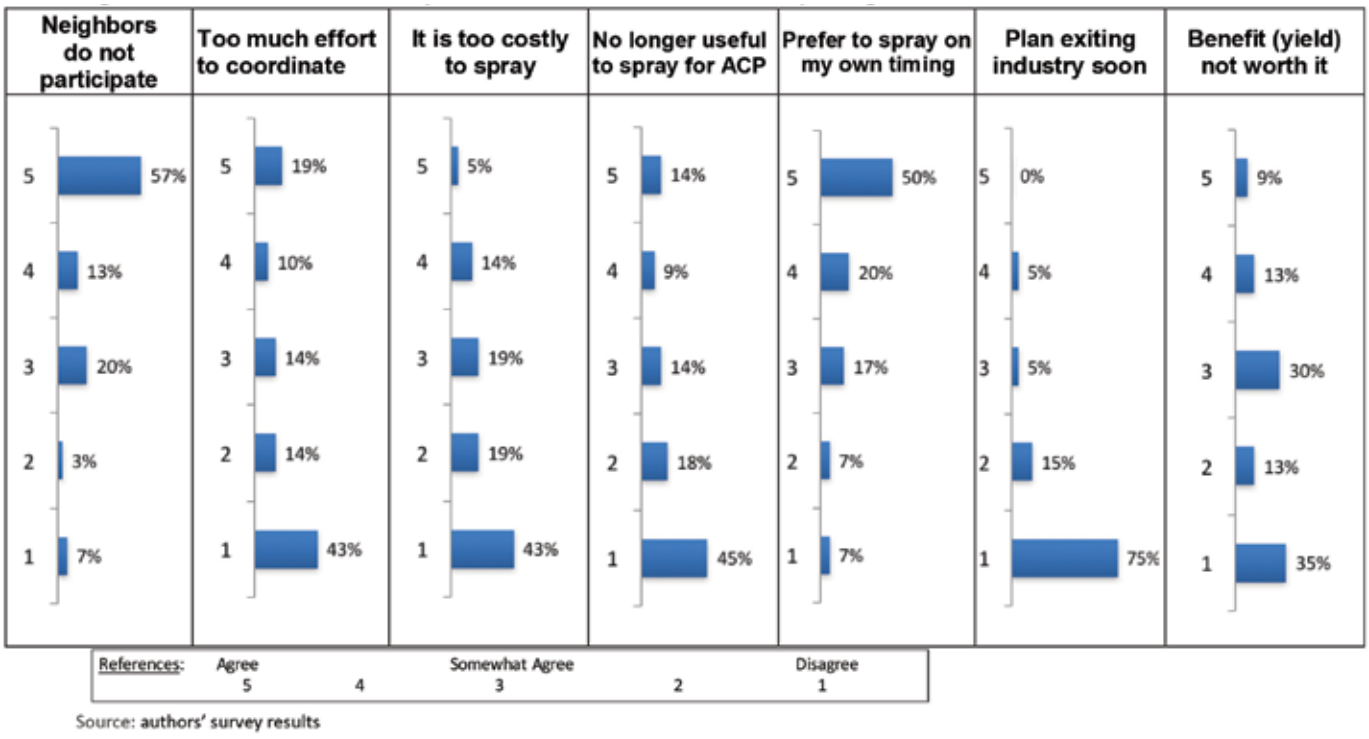
According to CHMA participants, neighbors not participating in CHMA sprays is the top obstacle to increase CHMA effectiveness (see Figure 4). Other than their agreement on neighbors' participation, CHMA

Figure 2. Level of CHMA Participation



Source: authors' survey results

Figure 3. Non-CHMA Participants: Reasons for Not Participating in CHMAs[2]



Source: authors' survey results

[2] The order of the statements in this figure reflects the way in which they were presented in the survey.

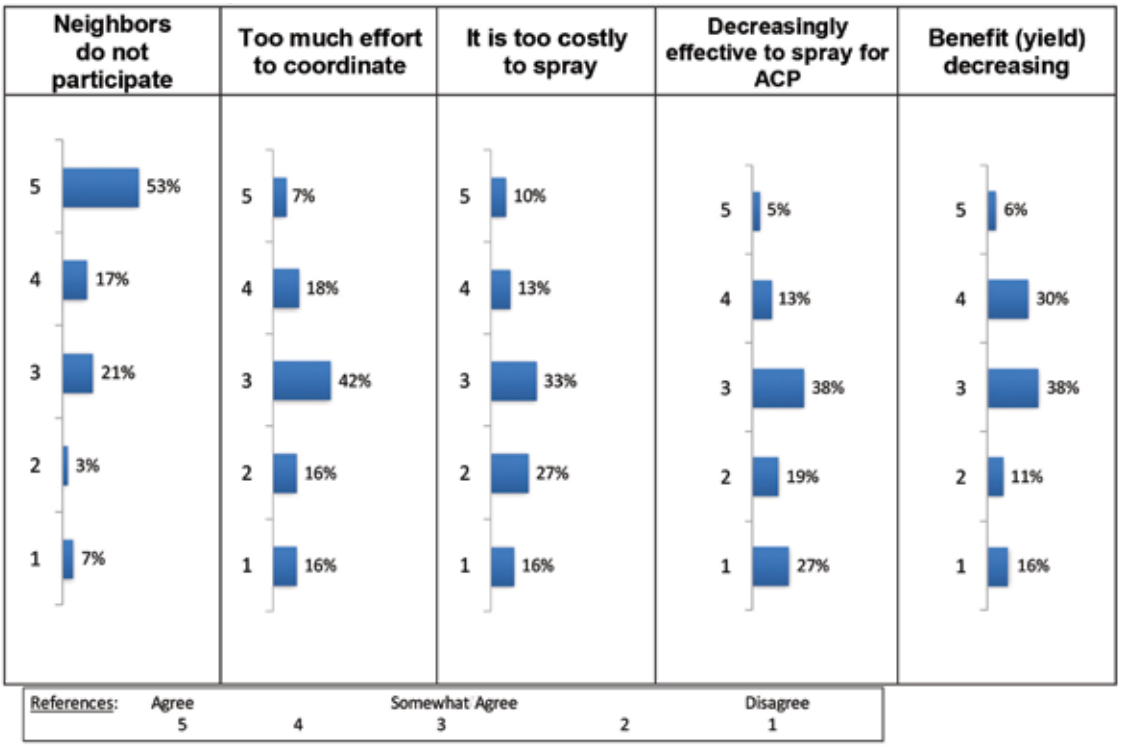
participants and non-participants' diverge in their opinions on whether it is too much effort to coordinate, if it is too costly to spray, the usefulness of spraying and the benefit of CHMAs. These responses suggest that the uncertainty regarding the actions and beliefs of others with respect to participation is a key consideration in growers' pest control decision-making. As Stephen Morris and Hyun Song Shin (2002) put it, "The idea is that even a small seed of doubt concerning the ability of the players to close ranks to achieve the good outcome will start to undermine the resolve of an individual player to stick to the cooperative strategy, and opt out."

In a choice experiment, growers had to choose between two alternatives for three different hypothetical situations. In the first part, growers had to choose between two options in 10 different scenarios. Option A consisted of a certain payout in excess of expenses, which started at $150 in scenario 1 and increased by $150 in each scenario, thus reaching $1,500 by scenario 10. Option B consisted of the chance of obtaining $1,500 with 67 percent chance with an expected payout of $1,000 (=$1,500 x 67 percent). Thus, we call this first hypothetical situation a lottery.

Growers also were asked to choose between two options in two other hypothetical situations. Option A was identical as that described above, but option B resembled a CHMA decision. Thus, in the second hypothetical situation, option B offered a payout of $1,500 if at least one-third of the growers in a CHMA coordinated sprays, and zero otherwise. In this way, growers had to make a choice between a certain payout (option A) and a payout dependent upon their beliefs regarding their neighbors' behavior (option B).

In the third hypothetical situation, option A was identical to that in both previous situations while option B offered a payout of $1,500 if at least two-thirds of the growers in a CHMA coordinated sprays, and zero otherwise.

Figure 4. CHMA Participants: Obstacles to Increase CHMA Effectiveness[2]



Source: authors' survey results

[2] The order of the statements in this figure reflects the way in which they were presented in the survey.

To understand whether the number of growers in a CHMA had any effect on the choices, there were three different versions for situations two and three that denoted different group sizes — namely a CHMA with 15, 30 and 45 growers, respectively.

Table 1 (page 19) shows the average number of times growers chose option B for each of the three hypothetical situations described above. The average number of times growers chose option B in the first situation (or lottery) was 4.60. Interestingly, for all group sizes, the number of times they chose option B in the one-third coordination situation was higher than for the lottery. This result denotes that growers, on average, perceive such coordination requirement to be less risky than the lottery. However, the average number of B choices in the situation requiring two-thirds of growers to coordinate is lower than for the lottery for all group sizes. Moreover, the average number of B choices decreases as the group size increases. Thus, coordination among two-thirds of growers is perceived to be riskier than the lottery, and such risk is also perceived to be higher if there are more growers to coordinate with.

The cost of coordinating insecticide sprays encompasses more than just the application cost; it also includes the uncertainty growers face regarding their neighbors' behavior.

SUMMARY

Despite finding evidence on the efficiency of well-performing CHMAs to deal with HLB, participation varies significantly. Results of the survey and choice experiment provide a better understanding of why growers choose to behave in such a way when it comes to coordinating insecticide sprays.

The cost of coordinating insecticide sprays encompasses more than just the application cost; it also includes the uncertainty growers face regarding their neighbors' behavior. Coordination among a higher percentage and larger number of growers increases the perceived risk. In addition, the majority of growers believe their neighbors do not participate in CHMAs, so they do not participate themselves. Therefore, to avoid the risk of relying on others, many growers prefer self-reliance in spraying.

The results help explain why participation in CHMAs and,

therefore, their success is not as widespread across Florida as one would expect. However, given that there is currently no cure for HLB, and that CHMAs with higher levels of participation were found to be efficient, efforts should be made at the state level not only to prevent the cooperation achieved in some areas from vanishing, but also to increase coordination to threshold levels that make cooperation efficient against HLB across all citrus-growing regions in Florida.

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Table 1. Average Number of B Choices in Hypothetical Situations for Different Group Sizes of CHMAs

Number of growers in CHMA	Lottery Game	Coordination among one-third of growers	Coordination among two-thirds of growers
15	4.60	5.34	4.19
30		4.88	3.72
45		5.42	3.58