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## Featured Article

# PCAs, Conflicts of Interest, and Pesticide Use in California Agriculture

By: Jay A. Rosenheim, Ph.D., Department of Entomology and Nematology, University of California, Davis; and Michael Culshaw-Maurer, Ph.D., Transit Information Department, St. Paul, MN

Dear Reader,

The study published here was originally commissioned as part of discussions in the SPM Workgroup, which recognized that PCAs are an important component of pest management decisions in California. The results reflect the work of professional license holders who are practicing IPM in the field every day across California, and highlight the importance of bringing both data and new insights to the conversation. Articles in upcoming CAPCA Adviser issues will detail adoption of IPM using a USDA National Agriculture Statistics Service data set and the results of a recent CDFA-funded project assessing SPM practices used by PCAs in several California cropping systems. Taken together, the current and upcoming articles will build a data set documenting that implementation of SPM is already well underway across the state. For those who participated in the study described in this article and the upcoming articles, we appreciate your professional engagement to document the impacts of your work through data.

**Jim Farrar**, *Director, UC IPM and*  
**Kevi Mace**, *Supervisor, Office of Pesticide Consultation and Analysis, CA Dept. of Food and Agriculture*

### Introduction

Nearly 50 years ago entomologist Robert van den Bosch's book *The Pesticide Conspiracy* was published. In it, van den Bosch argued that sales commissions earned by PCAs who are employees of agricultural chemical distributors ("sales PCAs") promote overuse of pesticides in California agriculture. Sales commissions were proposed to create a conflict of interest, in which the potential for financial gains by sales PCAs would take precedence over the best interests of their client farmers. This "conflict of interest hypothesis" has been repeated for so long that it has become conventional wisdom in many quarters and has shaped policy documents at state, national, and international levels.

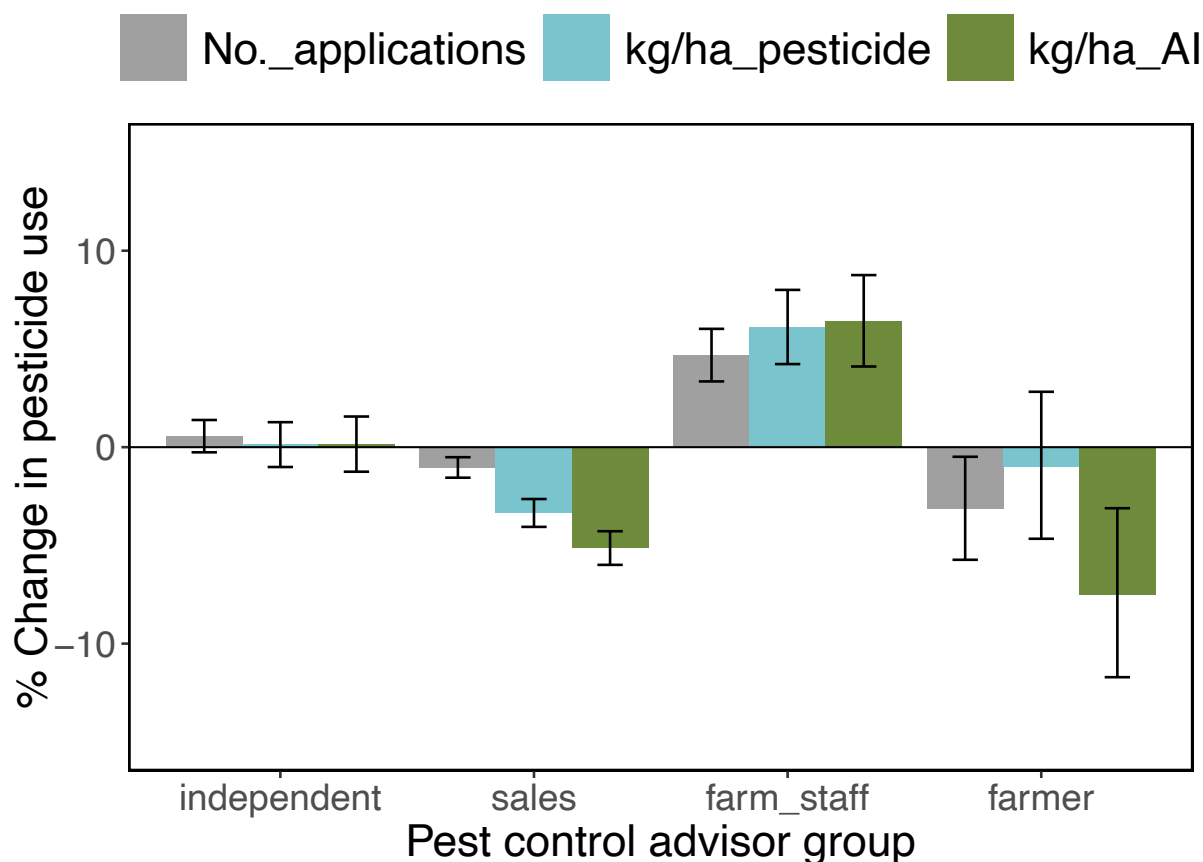
But is there any evidence that the conflict of interest hypothesis is true? For many years, efforts to examine how PCAs influence pesticide use by their farmer clients have been hamstrung by the absence of large-scale data. Early studies relied on questionnaires directed to relatively small numbers of farmers. One influential early study conducted by agricultural economist D. C. Hall and published in 1977 compared pesticide use by farmers advised by sales PCAs with farmers advised by "independent PCAs," who charge their client farmers a flat per-acre fee for their scouting services but who do not receive sales commissions. Hall suggested that California cotton and citrus farmers advised by sales PCAs spent approximately twice as much on pesticides as farmers advised by independent PCAs. He noted, however, that this difference appeared to be decreasing over the 4-year period analyzed (1970-1973). Since that time, two additional questionnaire-based studies of pesticide use by California farmers published by S. Brodt and colleagues in 2005 and 2007 found no

difference between farmers advised by sales PCAs versus independent PCAs. Thus, altogether, published research has generated very little support for the conflict of interest hypothesis.

### Building a dataset

More recently, changes in data collection practices by the State of California have created an opportunity to address the conflict of interest hypothesis with statewide data. Starting in 2011, County Agricultural Commissioner offices across the state started to use the *CalAgPermits* system to record information describing pest management practices for farmers applying for pesticide use permits. Included in this information were the identities and employers of the PCAs working at each farm. We used *CalAgPermits* data to identify, statewide, farmers being advised by four groups of PCAs: sales PCAs, independent PCAs, in-house

PCAs (full-time staff hired by the farmer), and farmer PCAs (farmers who obtain licenses to act as their own PCAs). The *CalAgPermits* data, when combined with the statewide pesticide use data compiled in the Pesticide Use Reporting (PUR) system, allowed us to build a dataset for pesticide use across all outdoor California commercial agriculture, 2011-2020; the final dataset included over 1.4 million observations, where a single observation included total year-long pesticide use on a particular crop (e.g., almonds, cotton, or raisin grapes) grown in a given field by a given farmer in a given year. Our analysis controlled statistically for other factors that could influence pesticide use, including the county, the year, the size of the field, the size of the farming operation, and whether the field was being managed conventionally or organically. Pesticide use was measured in three different ways: (i) the total number of pesticides applied; (ii) the total weight of



**FIG. 1.** Total pesticide use (including pesticides targeting insects and mites; plant pathogens; and weeds) by California farmers 2011-2020 who use different groups of PCAs. Shown is the percent change in pesticide use compared to the state-wide average. Shown are means and the associated 95% confidence intervals, which provide a measure of the precision of the estimated means.

formulated pesticides applied per unit area of the crop field (kilograms per hectare); and (iii) the total weight of the pesticide active ingredient applied per unit area of the crop field.

### Analysis results

We found no support for the hypothesis that conflicts of interest lead to elevated use of pesticides by farmers advised by sales PCAs (**Figure 1**). In particular, farmers advised by sales PCAs used slightly less total pesticides than farmers advised by independent PCAs. Although the observed differences were quite small in magnitude (1-5%), these differences are the opposite of what is expected under the conflict of interest hypothesis. This is true regardless of which measure of pesticide use we use (application number, weight of formulated pesticide, weight of active ingredient). Instead, we found that farmers advised by in-house PCAs use slightly more pesticides overall; more detailed analyses showed that in-house PCAs use more pesticides to control groups of pests that are capable of damaging outbreaks (insects and mites; plant pathogens) but not to control non-outbreak pests (weeds).

### General discussion

Our analysis suggests that farmers advised by sales PCAs are not using more pesticides than are farmers advised by independent PCAs. The idea that sales commissions create conflicts of interest that lead farmers to overuse pesticides appears to be an example of a “conventional wisdom” that has been enshrined largely in the absence of supporting evidence.

We emphasize that although the dataset we assembled gave us a powerful look at pesticide use practices of California farmers, these data cannot tell us which pesticide use program performs best in terms of producing a high quality, high yield crop and top returns for each dollar spent on pest management. The *CalAgPermits* and *PUR* databases are not linked to data on pest management costs or harvest quality or quantity. Thus, we make no judgements regarding whether one group of PCAs provides better pest management services for their client farmers than another. In particular, we do not know if the modestly elevated use of pesticides by in-house PCAs against potentially outbreaking pests results in improved control and better overall outcomes for their farmer employers.

### Why don't sales commissions lead to elevated pesticide use?

Discussions with PCAs and agricultural chemical retailers revealed three factors that may weaken or break the expected linkage between sales commissions and pesticide use. The first concerns the details of the sales commission itself. Sales PCAs do receive a supplement to their base salary from sales commissions, but these commissions are based not on gross sales receipts, but rather on the profit generated by a sale. A near-universal observation shared with us is that profit margins associated with pesticide sales are quite narrow, weakening any financial incentive to sell more pesticides.

The second reason that sales commissions do not appear to translate to heavier use of pesticides concerns the nature of the relationship between PCAs and their client farmers. PCAs establish long-term relationships with their client farmers that are based on trust. PCAs are acutely aware of the costs incurred by their clients as they farm their crops, and PCAs must strive to achieve high quality outcomes with cost efficiency. PCAs who fail to achieve this will lose clients and incur the reputational damage that will prevent them from gaining new clients. Thus, PCAs operate in a highly competitive environment. PCAs reach financial success not by attempting to inflate sales to a particular farmer client, but rather by providing high quality, cost-efficient service to farmers, building a reputation of success, and then leveraging that reputation to recruit more clients. Total sales commissions rise by increasing the number of clients rather than elevating the amount sold to a particular client.

Finally, although commissions might motivate sales PCAs to recommend a particular pesticide application, the farmer may choose not to accept the PCA's advice. Although some farmers accept virtually all PCA recommendations, others balance the judgement of the PCA against their own appraisal and may choose to decline making a particular recommended pesticide application. The *PUR* data that we analyzed reflect the actual pesticides used rather than the original recommendations made by PCAs, which may or may not have been followed by the farmer.

Whatever the reason, it seems that commissions received by sales PCAs are not leading to heavier use of pesticides by their client farmers. Robert van den Bosch's conflict of interest hypothesis, which seems so intuitive to so many observers, does not appear to explain pesticide use by today's California farmers. ■