Technical Transfer Teams Serving Commercial Beekeepers in Almonds

Project No.: POLL5-vanEngelsdorp

Project Leaders: Dr. Dennis vanEngelsdorp and Dr. Annette Meredith
Bee Informed Partnership, Inc.
Mailing Address: 4112 Plant Sciences Building, College Park, MD 20742
Phone: 301.404.3799
E-mail: dvane@umd.edu

Project Cooperators and Personnel:
Dr. Marla Spivak, University of Minnesota, Dr. Ramesh Sagili, Oregon State University, Dr. Elina L. Niño, University of California Davis, Dr. Meghan Milbrath, Michigan State University, Dr. Juliana Rangel, Texas A&M.

A. Summary

The Almond Board has supported the Bee Informed Partnership's Technical Transfer Teams (TTTs) since 2011. BIP's goal is to help beekeepers keep bees healthy by providing rapid, actionable data needed to ensure sufficient colonies are alive and able to provide almond pollination services. In 2019 the TTTs travelled over 100,000 miles across 17 states to service 108 beekeepers who collectively manage 23% of the colonies used by California almond growers. Over the winter 2018-2019, beekeepers participating in the Tech Team program reported losing 22.1% of their colonies, an ***11.5 point reduction*** from the 33.6% loss rates experienced by non-participating sideliner and commercial beekeepers. During 2019 TTT visits, field specialists completed colony health assessments and collected samples from over 9,000 colonies used to assess *Varroa* and other pest and disease analyses, and conducted 479 hygienic tests for queen breeding operations. BIP has also added 13 more commercial beekeepers to the Tech Team program, adding three in California, one in Texas and then expanding into three previously underrepresented states – Montana (2), Wisconsin (5) and New York (2).

To improve communication, BIP has revised the website as well as beekeeper health reports in order to improve their clarity, data relevance to the beekeeper's operation and ease of interpretation. BIP continues to enroll beekeepers of all operation size to participate in the Sentinel Apiary Program, which serves as an early warning system, alerting beekeepers to local and regional pest and disease issues. Beekeeper participation has increased from 70 participants in 2018 to 106 in 2019 and an additional 16 beekeepers have already joined the program for the upcoming 2020 beekeeping year.

B. Objectives

The objectives of this project are to:

1. Support BIP's TTT field specialists whose participants provide pollination services to California almond growers. These specialists focus on improving colony health prior to, during and after this critical pollination event.

2. Provide on-the-ground, rapid responses to bee incidents during or connected to almond pollination in order to help make fact-based risk assessments.

Project success is measured by the amount of services, samples and field/laboratory support we provide to beekeepers throughout the year. We also evaluate geographic coverage of TTTs, and are currently projecting further expansion into Montana, New York, South Dakota and Wisconsin. We have also worked to increase Sentinel Apiary program participation. This effort, combined with outreach through presentations at bee clubs and scientific conferences are an important measure of BIP's success at communicating current colony health information and offering educational resources to the general public, concerned citizens and policymakers. Beekeeper feedback is a critically important measure of BIP's success. We are consistently soliciting beekeeper opinion with regard to what is working and what should be changed, added or deleted from the list of services we offer. Ultimately, lower colony mortality and strong, healthy colonies are our greatest aim and measure of success.

C. Annual Results and Discussion

Funding from the Almond Board helps sustain, in part, all six Tech Team specialists across five regions whose participants migrate to pollinate almonds in California. By providing funding directly to BIP Inc., we are able to send funds directly to all teams that service commercial operations and improve the health of colonies during this critical pollination event. Commercial beekeepers face a growing set of challenges to keep honey bee colonies healthy. BIP TTTs serve commercial beekeepers much like crop protection agents serve commercial growers. Each team, trained extensively and consistently on our standard sampling and diagnostic protocols, acts independently to serve participating beekeepers in their specific regions. Regions vary considerably by management practices, migratory routes and main commodities. Nationwide, the TTTs service 108 beekeepers who collectively manage over 580,000 colonies (~21% of the managed colonies in the US). We estimate that 80% of these colonies are used for California almond pollination, representing ~23% of the colonies used by California almond growers. Over the winter 2018-2019, 40 beekeepers participating in the Tech Team program reported losing 22.1% of their colonies, an **11.5 point reduction** from the 33.6% loss rates of non-participating sideliners and commercial beekeepers.

Long term Tech Team monitoring has provided important insights into the drivers of losses to beekeepers who service almond producers. Our sampling has identified non-almond crop sprays in several pesticide kills while colonies were in almonds. Results have identified key colony measures that predict colony survival, allowing for regional specific treatment threshold levels to be adjusted.

2019 Tech Team Field Specialist Results – In 2019 BIP's Tech Teams travelled over 100,000 miles to serve 108 beekeepers from 17 states. Over the course of these visits field specialists conducted 10,672 colony inspections and collected ~9,000 samples processed for *Varroa* concentration, and 4,900 for *Nosema* loads. We also conducted 479 hygienic tests for commercial queen breeders. After confirming the precision of the field alcohol wash in comparison to *Varroa* load measurements, we have now shifted to in-field *Varroa* washes, enabling our teams to provide same day load data to beekeepers.

Field Trials – BIP participated in 7 formal field trials this year. These trials bring enormous value to the beekeeper and to industry. This is a valuable service provided by BIP to offer

unbiased results tested in a realistic field setting. This includes testing commercially registered honey bee health products, such miticides and probiotics, as well as innovative management approaches such as shed storage or chemical delivery approach methods.

Expanding BIP's geographic coverage – BIP has also expanded our services to beekeepers in states we have not previously covered. Beekeepers in Wisconsin, South Dakota and New York, many who move bees into almonds, have expressed interest in joining our teams. In 2019 BIP TTTs expanded into Montana, Wisconsin and New York. A new training initiative was launched to train additional seasonal TTT assistants that helped provide the flexible workforce needed to expand BIP's geographic reach. These highly trained individuals are valuable both as help for our TTTs during busy periods and as potential future commercial crew members/leaders.

Extending BIP's services – In response to beekeeper requests, we now provide Best Management Practice recommendations. This effort will grow as we discern regional best management practices from the data. We have also improved beekeeper reports to facilitate data interpretation, highlighting areas where beekeepers should take heed as well as issues that showed improvement, increasing the overall dialogue and information exchange between BIP and beekeepers.

Autopsy Committee – BIP has established an Autopsy Committee comprised of the country's top honey bee researchers to review and assess results from colonies experiencing a rapid decline. The Autopsy Committee is convened when BIP beekeeper members alert their TTT field specialist to an emergency so that scientists can provide feedback to the beekeeper based on the diagnostic results, accompanying management practices and colony history. In this way, BIP can provide feedback to the beekeeper to help discern what may have resulted in the observed outcome. The goal is to learn from negative experiences, avoid them in the future and use them as case studies for other beekeepers. The results from these autopsy studies can also better inform the industry and lead to improved practices prior to and during almond pollination.

Sentinel Apiary Program – Throughout the duration of this project BIP continues to promote the Sentinel Apiary program to beekeepers of all operational sizes across the country, which serves as an early warning system, alerting beekeepers to local and regional honey bee colony pest and disease issues. Data suggests this longitudinal sampling is the most effective way to identify factors that affect bee health. By having immediate, actionable data, beekeepers are better able to make an accurate assessment of what it happening and be proactive about management rather than reactive. In 2019 BIP increased Sentinel apiary program participation from 70 to 106.

D. Outreach Activities

1. Almond Board 2019 Annual Conference Poster Presentation "The Impacts of the BIP Tech Transfer Team"
2. California State Beekeepers' Association annual meeting – November 2019, Temecula, California, 200 participants, beekeeper audience

3. American Bee Federation 2020 Annual Conference – Healthy Hives 2020 Symposium, Mites: Does Size Matter? Dennis vanEngelsdorp, University of Maryland – January 2020, Schaumberg, Illinois, 800 participants, beekeeper audience
4. American Bee Federation 2020 Annual Conference – Presentation: BIP's Tech Team Recommendations: 5 Best and Worst Beekeeper Management Practices – January 2020, Schaumberg, Illinois, 800 participants, beekeeper audience
5. American Bee Federation 2020 Annual Conference – Panel Discussion: BIP's Role and Impact on Commercial Beekeeping: How and Why the Technical Transfer Team Program Works – January 2020, Schaumberg, Illinois, 800 participants, beekeeper audience
6. American Bee Federation 2020 Annual Conference – Workshop: BIP's Sentinel Apiary Program – January 2020, Schaumberg, Illinois, 800 participants, beekeeper audience
7. Apiary Inspectors of America 2020 Annual Conference – USDA APHIS National Honey Bee Survey/Bee Informed Partnership (BIP) update – Dennis vanEngelsdorp and Karen Rennich, University of Maryland Bee Lab and BIP
8. Apimondia 2019 International Conference/COLOSS Conference
9. Bee Clubs – Many state and regional bee clubs were visited by project leaders, field specialists and a number of other BIP employees during 2019

E. Materials and Methods:

The BIP TTTs currently consists of six field health professionals who work directly with each beekeeper to set up a sampling schedule that fits their operation's needs. This usually includes 3-4 sampling periods per year. For most migratory beekeepers, sampling will occur once in California during almond pollination (February) and in their summer and fall locations (May, September, and October). By sampling colonies over time, the team will gather more information about fluctuating disease levels and health, provide timely feedback on treatment efficacy, reduce use of unneeded treatments, and objectively evaluate efficacy of bee management practices.

Our TTTs record colony health information, management information, and sample for *Varroa*, *Nosema*, and viruses. Typically, eight colonies from each of five yards will be sampled, for a total of 48 colonies from each operation. They will sample more yards (rather than more colonies per yard) to increase the chances of detecting differences among yards within a beekeeping operation. The team will also offer any participating queen producers an option to test breeder colonies for disease levels and for hygienic behavior to help promote disease resistant genes throughout the nation. If viral or pesticide samples are requested, we also provide that sampling and analysis. During almond pollination and immediately after, we will provide rapid response to any honey bee health incidents from any of our participants (and others outside of our organization) and in the past have been able to identify non-almond crop sprays that were detrimental to the colonies in almond orchards.

Samples are processed using the existing BIP infrastructure. Due to in-field alcohol washes and a new data entry app that allows our team to enter colony health assessment data in the field, a report containing the colony information and disease levels is generated immediately and sent to the beekeeper. The data are stored anonymously in the BIP database where it joins a vast and growing archive of disease survey records. Beekeepers and researchers are

now able to access aggregate summaries of these records to give context to disease loads in specific seasons.

We will continue to work with and listen to the needs of the industry and to react in such a way that gives as many as possible the opportunity to be successful.

What we have achieved in the past and all our goals for the future are centered on making commercial beekeeping more sustainable. Using data driven management practices that are proven, practical and current, enables beekeepers to pivot quickly in this ever changing landscape. One of the largest components of our work is helping beekeepers get as many healthy and productive colonies to almonds.

BIP Inc., a nonprofit, has grown rapidly in its services available to beekeepers. The growth would not have been possible without the support of the California Almond Board. BIP now has a collective budget of over $1 million, with revenue coming from pay for services (30%), contract work (30%), grants (30%) and other revenue (10%). We continue to strive for self-sufficiency, but realize the cost of delivering services needed to beekeepers are prohibitively expensive without other lines of support.

F. Publications that emerged from this work

1. BIP sends out a quarterly electronic newsletter to all our commercial beekeepers detailing regional news, ongoing or past case studies and relevant research findings.
2. *Commercial Beekeeping: A Field Guide* – published 2019
3. *Diagnosis and Treatment of Common Honey Bee Diseases* manual – Published 2019
4. Please see the list of presentations listed in section D. above.