**Citrus Pest and Disease Prevention Committee (CPDPC)**
**Interim Science and Technology Subcommittee Meeting**

**Meeting Minutes**
**April 15, 2021**

There was a quorum of the Science Subcommittee and the following were in attendance:

**Science Committee Members Present:**

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| Dr. Ed Civerolo | Dr. Melinda Klein | Dr. Monique Rivera |
| Aaron Dillon | Kevin Olsen | Ram Uckoo |
| Dr. Subhas Hajeri | Dr. Etienne Rabe | |

**CDFA Staff:**

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| Karina Chu | Amelia Hicks | Keith Okasaki |
| Kiana Dao | Victoria Hornbaker | David Phong |
| Paul Figueroa | Anmol Joshi | Briana Russell |
| Alisha Garcia | Dr. Marina Kaiser | Jennifer Willems |
| David Gutierrez | Jana Miscevic | |

**Other Attendees:**

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| Bob Atkins | Jessica Leslie | Rachel Pitts |
| Teri Blaser | Jasmine Lopez | Sylvie Robillard |
| Jim Cranney | Dr. Weiqi Luo | Cressida Silvers |
| Holly Deniston-Sheets | Joey Mayorquin | Krista Smith |
| Rick Dunn | Dr. Neil McRoberts | Judy Zaninovich |
| Dr. Sara Garcia-Figuera | Sandra Olkowski | Sandra Zwaal |
| Jim Gorden | Margaret O'Neil | |
| Jonathan Kaplan | Drew Posny | |

All attendees participated via webinar.

**Opening Comments:**
Dr. Etienne Rabe called the meeting to order at 2:02 p.m. Dr. Rabe welcomed Dr. Subhas Hajeri as a new Science Subcommittee member. Dr. Rabe then outlined the agenda and topics of discussion in order of ethyl formate registration, moving Dr. Sarah Garcia-Figuera's presentation as part of the Data Analysis and Tactical Operation Center (DATOC) update to third on the agenda, the PowerPoint slides from the previous Science Subcommittee meeting, and then finally the remainder of the DATOC update.

**Ethyl Formate Registration**
Jim Cranney explained the registrant (Draslovtka), and consultants with help from California Citrus Quality Council, submitted the ethyl formate registration package to the United States (US) Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR). US EPA received the initial submission in June 2020 and in February 2021, issued a deficiency letter to the registrant requesting additional information including supplemental information regarding the manufacturing process, a Material Safety Data Sheet, and the synergist used in the production of ethyl formate. Specifically, US EPA requested confirmation that the synergist is inert and not an active ingredient in the final product. Ethyl formate is mixed with carbon dioxide ($CO_2$) which is a chemical of concern. EPA needed confirmation that the $CO_2$ in ethyl formate is not a contributor in the efficacy in killing Asian citrus

psyllid (ACP). US EPA also requested more information regarding what occurs when tarps are removed after fumigation and the effect on non-target organisms. The registrant plans to respond and submit the information to US EPA within the next two weeks.

In October 2020, the registration package was submitted to DPR and is currently under review. Until the registrant resolves the deficiencies identified by US EPA, DPR's evaluation of ethyl formate for ACP treatments is on hold. Mr. Cranny further explained that registering a chemical as a fumigant by DPR could potentially trigger a risk assessment which could prolong the registration process up to two years. Mr. Cranny explained that generally DPR has not been receptive to registering other soil fumigants because of concern over potential exposure to bystanders and workers. However, ethyl formate is a benign fumigant, unlike many other soil fumigants, and is readily absorbed when applied to citrus.

**Southern California HLB Program Discussion**
Dr. Rabe proposed to postpone discussion on the southern California Huanglongbing (HLB) program to allow CDFA staff to further update and reorganize the slide deck presented at prior Science Subcommittee meetings.

**DATOC Update**
Dr. Sara Garcia-Figuera shared her presentation entitled "A Social-Ecological Systems Perspective of Huanglongbing Management in California". The presentation summarized her research on the people and organizations that manage HLB and the ecological dynamics that impact how the disease spreads. Dr. Garcia-Figuera's research additionally focused on areawide management and coordinating citrus growers' participation in ACP treatment activities. Dr. Garcia-Figuera introduced three pillars to HLB management: the removal of infected trees, the use of certified plant material, and coordinated ACP insecticide treatments. The goals of her research were to determine which factors lead to participation and how the program can increase grower participation. Survey results demonstrated that growers would not participate in coordinated treatment if they thought their neighbors would not participate. Dr. Garcia-Figuera concluded this is a classic collective action problem and demonstrates strategic uncertainty. Dr. Garcia-Figuera described a collective action problem (or social dilemma) occurs when a group of people need to make costly, individual actions to achieve a goal for the benefit of the entire group. The result is that some may benefit from the actions of others without bearing the costs. If everyone solely depends on others' participation, the collective goal will not be achieved. This is a common problem for those managing forests, fisheries, and invasive species.

Dr. Garcia-Figuera explained that California's management of HLB aligns with economist Elinor Ostrom's eight common elements for successful action which include clearly defining boundaries, monitoring users by tracking participation levels, and utilizing defined structures with several levels (city, county, state, and federal). She further explained that grower participation in coordinated treatment increases when growers believe they are vulnerable to ACP, are informed, and participate in open communication with neighbors. Dr. Garcia-Figuera determined that participation has increased in pest control districts (PCDs) while declining in psyllid management areas (PMAs). She explained that PCDs implement a higher level of commitment, require mandatory treatments, or apply assessment fees from growers, resulting in steady increase in participation and treatment throughout the duration of the program. Comparatively, there has been a decline in participation in PMAs. Dr. Garcia-Figuera noticed a collective action theory trend in this case. On average, 25 growers participate in each PCD or PMA in California. PCDs and PMAs with relatively lower numbers of constituents, like those in California, have higher success rates based on smaller, focused social networks. Groups with more participants spanning over a larger geographical area tend to be less successful.

Another study conducted in collaboration with Dr. Tim Gottwald's group with Dr. Drew Posny and Dr. Weiqi Luo of the United States Department of Agriculture (USDA), Agricultural Research Service (ARS) used the agent-based model in three areas in Ventura County where both commercial citrus groves and residential citrus are present. The agent-based model simulation compared the impact of conducting no insecticide treatment, treatment within 21 days, and treatment within 60 days of an HLB detection. The simulation showed high efficacy of delaying HLB spread when treated within 21 days of a detection.

Dr. Garcia-Figuera concluded her presentation with five key points: 1) HLB management creates a collective action problem, 2) California's institutional approach is aligned with Ostrom's principals for success, 3) adopting HLB management practices is interdependent and will be impacted by perceived vulnerability to HLB, grove size, and intentions to stay informed and communicate with grower liaisons and neighbors, 4) PCDs have achieved higher participation than PMAs over time but the number of people in each PMA/PCD, the average size of citrus groves, and the heterogeneity in grove size may impact participation, and 5) the simulations prove that coordinated treatment within a 21-day window following an HLB detection can delay disease spread.

Dr. Rabe opened the discussion for comments and/or questions. Ram Uckoo inquired about predictions for the percentage of HLB infection based on Dr. Garcia's simulation in Ventura. Dr. Garcia-Figuera explained that she started the simulation assuming three percent of the citrus trees in the landscape were HLB positive trees, reflective of the current situation. The simulation ran for 20 years of ACP spread, and after five years, the disease spread incidence levels started to grow. After seven years in Ojai, HLB detections reached the maximum levels of incidence. Dr. Garcia-Figuera concluded that closely coordinated insecticide treatments seemed to significantly delay HLB spread. There were no further comments regarding Dr. Garcia-Figuera's presentation.

Holly Deniston-Sheets introduced the objective of quantifying the effectiveness of the current southern California residential program including risk-based survey, HLB positive tree removal, and mitigations to curb the threat of HLB to the California citrus industry. DATOC's original approach to the objective was to utilize the agent-based model to determine the effectiveness of each activity. The results indicated the current control program in southern California likely slows the spread of the disease, but it is difficult to quantify the financial benefits of the program. DATOC offered to employ a different, two-part approach beginning with action-benefit mapping followed by defining the parameters where the benefits exist. The action-benefit mapping includes identifying the actions that benefit the program and consider the economic consequences. Once the actions have been recognized, the subcommittee can identify the best- and worst-case scenarios to cease or continue the mapped actions. Dr. McRoberts added that the chart provided is merely a tool the subcommittee can use to determine action benefits. This approach should determine the connections between the actions and benefits which will give the program clarity. Action-benefit mapping also helps illuminate knowledge gaps for further research and would help CPDPC communicate the value of the program to state and federal legislatures.

Ms. Hornbaker inquired about comparing the strategies adopted and money invested in ACP and HLB programs in Florida, Texas, and California. Dr. McRoberts stated creating such a comparison would be difficult due to environmental and political factors. The climate and topography of the three states are vastly different with tropical, arid, flat, and mountainous regions. Ms. Hornbaker agreed and acknowledged that California has learned from the actions,

non-actions, and choices made in Florida and Texas. Ms. Deniston-Sheets added that the agent-based model explicitly accounts for climate and DATOC sets the parameters to include temperature differences on ACP biology with climate, daily data, flush, and local temperature.

Ms. Deniston-Sheets explained that DATOC did not use specific actions or benefits since the action-benefit approach is a tool the Science Subcommittee members could use to quantify the actions and benefits of program activities. A working group could be formed to evaluate each action, discuss the benefits, and request DATOC provide data to inform the Subcommittee of the benefits of each action. Dr. McRoberts suggested using the Delphi method for validation, which would account for the Subcommittee's consensus to determine for the optimal course of action. Dr. McRoberts illustrated this process by stating if an HLB positive tree was detected in Long Beach that expanded the quarantine boundary towards the ocean and away from commercial citrus, DATOC would recommend that CPDPD not delimit the find or remove the positive tree. Dr. McRoberts concluded that spending money and other resources on delimitation and tree removal would not be beneficial in this situation. Dr. McRoberts added if the program stops putting in reasonable effort, USDA may intervene with a statewide quarantine. Ms. Hornbaker confirmed CDFA understands prioritizing workload in a logical way.

**Other Items and Adjournment**

Dr. Rabe stated the current southern California HLB presentation slides should be reorganized, separating the science and financial topics. Also, the scientific approach should be validated before discussing the financial aspect of the program. Ms. Hornbaker added that the Subcommittee must acknowledge the federal and state regulations that guide ACP and HLB management. Mr. Olsen suggested the current slides be submitted to a panel of five or six reputable scientists or DATOC to quantify the effectiveness of the southern California HLB program.

**Closing**

Dr. Rabe adjourned the meeting at 2:32 p.m.