**National Agricultural Research, Extension, Education, and Economics (NAREEE) Advisory Board**

# HIGHLIGHTS OF THE CITRUS DISEASE SUBCOMMITTEE MEETING

December 9-11, 2014
Citrus Research & Education Center, University of Florida
700 Experiment Station Road, Lake Alfred, FL

The Citrus Disease Subcommittee (CDS), a statutory subcommittee of the National Agricultural Research, Extension, Education, and Economics (NAREEE) Advisory Board met in public session on December 9-11, 2014, in Lake Alfred, Florida. The main goal of the meeting was to discuss the annual budget, agenda and funding priorities for the Citrus Disease Research and Extension Program (CDRE), part of the National Institute of Food and Agriculture's (NIFA's) Specialty Crop Research Initiative (SCRI). The meeting included a closed session, notes from which are only available to the NAREEE Advisory Board Office.

## SUMMARY OF PRESENTATIONS

CDS members heard presentations about current research efforts from representatives of the Citrus Research and Development Foundation, Inc. (CRDF), California Citrus Research Board (CRB), USDA Agricultural Research Service (ARS), and the Citrus Health Research Program (CHRP) of the USDA Animal and Plant Health Inspection Service (APHIS). Research portfolios cover improved vector (Asian Citrus Psyllid, ACP) control, reduced pathogen (bacterium *Candidatus Liberibacter asiaticus*, or *CLas*) inoculum, and reduced tree susceptibility and injury.

CRDF currently funds 91 projects of length 1-3 years specifically focused on Huanglongbing disease (HLB), out of a total of 107 projects in the Citrus Advanced Technology Program (CATP) research portfolio. However, 64 of those projects will expire by July 1, 2015. CRDF also has 36 active projects specific to HLB in the Commercial Product Delivery (CPD) portfolio out of a total of 40 projects, of which 25 will expire by July 1, 2015. Projects related to antimicrobial therapies are the top priority in the CPD. Other project topics include thermal therapy, tolerant rootstocks and psyllid shield (RNAi) work. It was noted that *CLas* chemical therapies are aimed at stabilizing or reversing the decline of chronically infected trees and are probably a short-term "band aid" solution, which could be replaced as more durable strategies are proven effective. It was also noted that more growers are experimenting thermal therapy, particularly to treat small trees, but it is still unclear how the treatment works. CRDF is conducting evaluations of commercially available tools, including field trials of integrated practices – determining the individual impact of each component of a strategy – and Advanced Citrus Production Systems, including consideration of growing under containment. CRDF is working with registrants, the Florida Department of Agriculture and Consumer Services (FDACS) and the EPA to consider expanded use of basal trunk insecticide applications, which in some cases can be more effective than foliar pesticides. It was noted that research is underway to investigate concerns over pollinator health with regard to insecticides, including honeybees. CRDF is planning commercial-scale field trial plantings of tolerant rootstocks in the spring of 2015.

The presentations emphasized differences in the citrus industry between Florida and California, with by far the most important difference being that in Florida, the disease is endemic, as nearly all trees are infected, and Florida need curative therapies. In California, the disease is eminent, but is still not present, so California's emphasis is on early detection and keeping the disease out.

Despite the psyllid being widespread throughout southern California and increasingly in the Central Valley, only one tree has tested positive for HLB infection to date. California has mandated that any tree found to be infected be removed, and has invested in education and outreach including in residential areas. Much of CRB's research with the pathogen, including pesticide evaluations, has to be conducted in a contained research facility. CRB programs are funded on an annual basis, with a current annual research budget of $5.5 million, but CRB has received special dispensation to commit funds to 5 projects in partnership with CRDF. On the topic of early detection, CRB is currently funding a project looking at the use of digital drop PCR to sample plants both within the contained research facility in California and in the field in Texas. Other project topics include biological control, natural predators of the psyllid, attractants / attract and kill / repellants, and the residual impact of pesticides in pollen and nectar. Many of the genetics projects funded by CRB are co-funded by CRDF and based in Florida. A high risk survey was implemented, contracting the Jet Propulsion Laboratory (JPL) to conduct flyovers in residential areas in the Los Angeles area, however this was not very successful. CRB is also preserving important commercial varieties in a cryogenic facility in Fort Collins, Colorado.

Another industry difference relates to product utilization; Florida is a predominantly juice industry, while the California industry relies heavily on table fruit exports, which makes non-residual pesticides very important.

ARS currently spends more than $14 million on citrus research as part of its base funding. Current epidemiological studies include risk based surveys for early detection and monitoring, predictive models, simulation models to test mitigation methods, canine detection, and models that support agency needs for surveying. ARS is conducting work on thermotherapy, and has demonstrated symptom remission in both the greenhouse and in the field for up to 3 years after treatment. Many researchers are working on biocontrol methods – the psyllid has several predators because of its different life cycle stages, providing opportunities for exploiting entomopathic fungi, predators such as ladybeetle and spiders, and parasitoids. ARS uses the Peco Farm facility in Fort Pierce, Florida, to test its citrus germplasm collection under high HLB pressure. The long term goal is to identify citrus relatives that are sexually compatible with citrus but immune to HLB. The USDA began using *Poncirus* as a parent 110 years ago for its cold-hardiness but more recent studies show that it and its hybrids have some HLB resistance. An ongoing survey in groves with multiple types of mainstream cultivars shows promise for identifying substantial resistance to HLB in conventional germplasm. Five new rootstocks showing tolerance to HLB were recently publically released, and four additional rootstocks are currently being evaluated. ARS is working to develop materials directly from citrus, but it was noted that regulation of any transgenic is an open question. ARS is also working on antimicrobial therapies, including classical antibiotics for trunk applications (currently registered bactericides, new compounds in evaluation, RNAi and other work) and different methods for application and delivery. A promising RNAi-based strategy is currently moving through the patent process.

The distinction between CHRP and the HLB Multi-Agency Coordination Group (MAC) was made as follows: CHRP's work is more of a regulatory nature, including inspections of packing houses,

citrus growers and nurseries, and development of diagnostic methods geared towards the regulatory program. MAC was initiated in December 2013 in response to a need for better coordination among federal agencies, to ensure that federal research did not unnecessarily overlap with industry efforts, and to more quickly provide practical tools for growers. MAC's $21 million appropriation must be obligated by September 30, 2015. There are two funding processes – direct funding and stakeholder suggestions. For the direct funding, proposals were developed by MAC for the most promising tools identified by members for large-scale field trials and projects have been approved. Cooperative agreements totaling $5 million have been signed: $1.5 million for scaling up production and release of biocontrols, $2.5 million for antimicrobials and $1 million for demonstration of inoculum removal groves in Florida. The stakeholder suggestion process used an online system for industry and researchers to submit project suggestions. Approximately 50 were received and evaluated on: timeline for impact, scalability, economic impact, end user involvement, adaptability across states, and for non-residential and non-commercial citrus. Approximately $8 million has been set aside so far for funding of these projects, with $8 million remaining for MAC to obligate. CHRP has approximately $13 million of funding, but is still operating under a continuing resolution that ends December 11.

The meeting included a tour of current research, laboratories and displays at the University of Florida's Citrus Research and Education Center.

## KEY ISSUES AND DISCUSSIONS

Recommendations for CDRE FY2015

As the main purpose of the meeting, CDS members spent significant time discussing the annual budget, agenda and funding priorities for the CDRE. It was agreed that the Requests for Applications (RFAs) for Fiscal Year (FY) 2014 were too broad in setting research priorities, which resulted in wide-ranging proposals without the desired depth on key topics. Therefore it was decided that a more focused set of priorities was needed for the next set of RFAs, and that CDS should provide four items that constitute the highest priorities for the industry as a whole.

With consideration of the funding decisions that have been made in FY2014, CDS members agreed on the following:

1) *Agenda*. CDRE funding in FY2015 should continue to focus on HLB.
2) *Budget*. All of the FY2015 budget of $25 million should be obligated during that year.
3) *Priorities*. The highest priorities for funding were listed for each state, and included: bactericide, fruit drop, early detection in host and vector, attract and kill / suppression, and resistant germplasm. Culturing (cultivating) of the *CLas* bacterium was also listed as a general priority, since the current inability to produce a lasting culture inhibits further work on screening and killing bacteria in the host plant.

   These topics were compiled into a single list and ranked in order of priority by each CDS member. By a majority vote, a motion was passed that the funding priorities for FY2015 are the following four items, in ranked order:
   1. Chemical and heat therapy systems to kill or suppress bacteria.
   2. Culturing (cultivating) the *CLas* bacterium.
   3. Early detection of the bacterium in host and vector.
   4. Resistant germplasm.

*Note:* it is acknowledged that while these four items are of highest priority for research funding, this list does not preclude proposals being funded on other topics (such as attract and kill / suppression) if they are of high quality.

It was noted that a website was established for scientists working on culturing the *CLas* bacterium to share their work, in an effort to avoid duplicative failures. It was suggested that this website be updated and made available to researchers submitting proposals on this topic to ensure that new, innovative ideas are proposed. It was also suggested that a prize could be offered, similar to the X Prize competition, for the first team who can demonstrate a successful culture. This prize could potentially be sponsored by the citrus industry or the new Foundation for Food and Agricultural Research created by the 2014 Farm Bill.

It was suggested that one way to ensure that cooperative research teams are formed to work on high priority topics is for industry members to recruit individual scientists to act as project leaders and coordinate proposals. However, because CDRE is a competitive grants program, any proposals submitted from such teams would still need to go through the formal review process and could not be guaranteed funding *a priori*. It was noted that the evaluation criteria for the relevancy component of the review process includes industry recruitment and support, so a research team assembled by industry members would be strongly considered.

Communication and Coordination Needs

Following the initial panel presentations, CDS members engaged in a question and answer session with the representatives from CRDF, CRB, CHRP and ARS. This discussion emphasized that research and development around citrus disease needs:

- Better coordination between all the different agencies and programs that provide funding for citrus disease research and development, including federal ( emphasis on MAC and NIFA, as well as CHRP and APHIS) and state governments, non-profit organizations and private industry; and
- Better communication between those funding sources, current research projects, and the citrus growers / industry, perhaps through a single senior stakeholder group ( like for example, the CDS).

Particular issues of concern raised during the discussion were:

- *Antimicrobial resistance.* It was noted that the Food and Drug Administration, Centers for Disease Control and other agencies are very sensitive to the issue of antibiotic resistance with respect to human health. It was also noted that the USDA has developed an action plan around the issue of antimicrobial resistance in agriculture. Notwithstanding that sensitivity, the Florida , citrus industry is heavily dependent on and in fact may not survive without registered bactericides to combat HLB in the short and midterm.
- *Genetic modification.* Concerns were raised about how current consumer perceptions of genetically modified organisms (GMOs) would affect the citrus market if a new GMO or transgenic citrus plant were developed to be resistant to HLB and provide an effective solution. Similarly, concerns were raised about the impact on the organic citrus industry if a GMO product (either a citrus plant or biocontrol method, e.g. a GMO psyllid) were to be mandated. It was noted that each regulatory agency has an operational definition of ‘genetically modified’ and ‘transgenic’, but those definitions may differ between agencies.

- *Funding coordination.* It was noted that research on citrus disease is funded by many different entities, at a federal, state and private level, each operating with a different timeline and agenda. It is difficult for scientists to keep track of the various funding opportunities and requirements, and for growers to identify where new developments are coming from. Despite the efforts of MAC, better coordination and communication is needed.

This issue was further emphasized later in the meeting, as CRDF's research portfolio will be greatly reduced after 2015 and MAC funding must be obligated by September 2015, raising questions about which group(s) will fund necessary and ongoing foundational research.

A suggestion was made that CDS expand its work to assume the role of lead coordinator of information about citrus disease research. For example, CDS could organize an annual meeting / forum for researchers on citrus disease to share their work with each other and with growers. It was also suggested that CDS contact CDRE project directors and invite them to present research progress at future CDS meetings, in order to gain more up-to-date information both for reporting back to the citrus industry and for CDS to make more strategic recommendations to the USDA.

General Recommendations

CDS members engaged in a discussion about more general aspects of citrus disease research, extension and education as per the committee's mandate. The following items were noted as topics for further discussion and making recommendations to the USDA, in addition to the significant coordination and communication issues described above:

- The exclusion of citrus disease researchers (which relative to other commodity crops is a small pool of scientists) from scientific merit review panels because of conflict of interest concerns may solve one problem ( conflict of interst) but create another ( not using the small pool of HLB informed scientists from participating in the merit reviews.
- If a CDS meeting includes a closed session, CDS members should be trusted with privileged information for the purposes of making necessary recommendations to the USDA. ( This is a specific suggestion in rection to the way the closed meeting information was shared.)
- Considerable expertise and funding lies within the private sector and some mechanism for accessing that information should be found; perhaps dovetailing to some private/public partnership or Foundation.
- RFAs should adhere to the priorities set by CDS and press releases about awards should include a statement to indicate stakeholder approval of those priorities; critical, as the "process" aleady creates the perception that the process and not the stakeholders drive the program.

**BOARD BUSINESS**

A working group was formed to write a report, including recommendations, based on the minutes of this meeting for forwarding to the Secretary of Agriculture.

**RESOLUTIONS AND RECOMMENDATIONS**

- CDS developed and approved an agenda, budget and list of four priorities to be provided to NIFA for the development of the CDRE RFA for FY2015.

- Future CDS meetings to discuss recommendations for the CDRE program should not be held without members having prior access to the details of new funding awards.
- CDS should meet twice per year in person and possibly more frequently via conference call.

**ACTION ITEMS**

- CDS will develop a report and recommendations based on the minutes of this meeting. This report will be reviewed by the NAREEE Advisory Board and, once approved, forwarded to the Secretary of Agriculture.
- NIFA will provide CDS with information about newly funded projects as soon as possible, including project director, other project personnel, abstract, budget, and contact details.
- Executive Director will schedule a conference call once the CDRE awards are announced.
- The next meeting of CDS will be scheduled for a week after the intended date for awarding the next cycle of grants, to be determined once the RFA is published.