Citrus Research Board

May 25, 2016

Request for Proposals

for funding period October 1, 2016 – September 30, 2017

Specific instructions for preparing and submitting new proposal concepts, full proposals, continuing research proposals, and progress and final reports

2016 Calendar of Deadlines

- **May 17:** New Project Pre-Proposal Form Due
- **May 20:** Notify PIs of Request for Full Proposal
- **June 17:** Full Proposals for New Projects Due
- **July 20:** Continuing Project Proposals and Progress and Final Reports Due
- **August 11-12:** New Proposal Presentations, CRB Office Via Phone
- **August 15:** Notify PIs of Projects Recommended for Moving Forward
- **August 23-25:** Proposal Presentations to Full CRB Board for New and Continuing Projects
- **September 27:** Annual Meeting; Lindcove Conference Room; Final Board Decision for Proposed Projects
- **September 30:** Notify PIs of Award Decisions

Request for Proposals Fiscal Year 2016-2017

Introduction

The mission of the California Citrus Research (CRB) board is:

> *To ensure a sustainable California citrus industry for the benefit of growers by prioritizing, investing in and promoting sound science.*

Annually, the Board re-evaluates its research priorities for possible funding. Whereas the Board will consider all proposals submitted for the current fiscal year, the areas of greatest concern are surviving the threat of HLB and ACP and maintaining market accessibility. Collaborative team efforts are highly encouraged.

The board is soliciting both new and continuing proposals for funding consideration for the 2016-2017 Fiscal Year. Areas of particular industry needs are listed below. This document also includes guidelines for the submission of project proposals and the reporting of progress made during the tenure of CRB funding. The final decision on projects funded will occur at the CRB Annual Budget Meeting in September.

All necessary forms and supplemental documents should be downloaded from the CRB website: http://www.citrusresearch.org

NOTE: All forms have been revised for the 2016-2017 Fiscal Year.

Scope of Research

Research must be *outcome-based*; that is, the "need" or the end result is determined ahead of time, and research is developed in line with the desired outcomes. Projects are to result directly in a product, technology, solution or method that would benefit the citrus industry.

Therefore, each researcher who intends to apply for funding through the Citrus Research Board must be able to clearly articulate how his or her project will affect the production vitality and economic sustainability of the citrus industry. Further, researchers must explain how this information will be transferred to, or shared with growers. (NOTE: If your response is through UCCE, then you must have already made arrangements with a UCCE individual and must adequately describe your plan).

1. Research Categories

There are five research categories that align with the strategy determined by the board members. These include;

- 5100: Production Efficiency: Irrigation and fertigation management, mineral and chemical uptake, plant and canopy management, physiology, sensory studies (flavor and nutrition), regulatory compliance, labor saving devices, worker health and safety, economics.
- 5200: New Varieties Development: Breeding, selection and evaluation of new varieties.
- 5300: Insect-Vectored and Related Post-Harvest Diseases: HLB, CVC, CTV, leprosis, stubborn.
- 5400: Non-Insect Vectored and Related Post-Harvest Diseases: Septoria spot, viroids, Phytophthora root and brown rot, green and blue mold, storage decay, pre- and post-harvest controls.
- 5500: Pest Management: Regulatory pests such as Asian citrus psyllid, fruit flies, thrips, Fuller rose beetle; endemic pests such as scales, katydids, mites.

NOTE: Genomics projects should be submitted within the category that applies to the organism, i.e. if you intend to propose research on the ACP genome, you would submit your proposal under 5500, the Pest Management category.

Detailed information of each research category is provided below. **For new projects, multiple lab, multiple university, and industry collaboration is highly recommended if possible.**

5100: Production Efficiency

The goal of this category is to deliver timely and proven information on horticultural factors impacting fruit quality and production efficiency to California growers to keep them competitive in the domestic and international markets.

Researchable areas equally prioritized for 2016-2017 include:

- Conduct field trials to address rules and regulations regarding irrigation and leaching of nitrate in ground water and minimize nitrogen use in citrus orchards.
- Conduct field trials to maximize fertigation and water use efficiencies in citrus orchards:
    a) Confirm real crop usage or coefficients and how it fluctuates between soil types, geographical locations and citrus varietal types;
    b) Develop methodology or technology to study and improve water quality for irrigation.
- Develop and evaluate horticultural approaches to maximize fruit quality and yield especially in mandarin varieties.
- Conduct field trials in citrus orchards to evaluate:
    a) Improved and new equipment technologies for chemical application efficiency: e.g., low volume, electrostatic, atomized;
    b) Horticultural practices: e.g., canopy and weed management;
    c) Improve pesticide uptake, e.g., imidacloprid.
- Characterization of the citrus phytobiome:
    a) Cooperative project involving the inter-relations of the citrus phytobiome, mineral and water uptake, and fertigation regimes;
    b) Improvement of fruit quality and taste by the manipulation of the citrus phytobiome.
- Develop harvest mechanical technology and/or automated robots to reduce production cost and increase

productivity.

5200: New Variety Development
The goal of this category is to provide the California citrus industry open access to new varieties that will meet the ever-changing market demands, are resistant or tolerant to insect pests and diseases, and will improve production efficiency.

Researchable areas equally prioritized for 2016-2017 include:

- Develop marketplace intelligence to understand consumer preferences and better direct the breeding and evaluation program:
    a) Determine preferences of both domestic and export markets based on sensory (taste, appearance, feel, smell, etc.) and other factors, such as health benefits. Use this information to evaluate existing varieties and to identify genetic improvement needs within the breeding program;
    b) Develop quantitative methods to analyze flavor, and other sensory factors, that would promote the efficiency and speed of evaluating new varieties;
    c) Develop an understanding of the horticultural, handling, and genetic levers to influence flavor and other sensory characteristics.
- Develop tools that will address breeding issues using conventional, irradiation and molecular techniques:
    a) Target traits including: disease resistance/tolerance, especially to HLB; added flavor and health benefits; seedless fruit, especially Clementines and lemons; enhance lycopene expression both internally and in the rind, especially in Cara cara navel orange, and pink variegation in lemons;
    b) Develop or identify early maturing varieties especially Clementines and mandarins;
    c) Develop or identify late maturing varieties such as seedless grapefruit.
- Develop new ways to effectively evaluate varieties in multiple locations within California to determine production efficiency and market potential.
- Develop new citrus varieties and rootstocks.

5300: Insect-Vectored and Related Post-Harvest Diseases
The goal of this category is to provide California citrus growers timely and proven information on detection, eradication, control and management strategies and tools for diseases caused by insect-vectored plant pathogens in order to minimize crop damage and economic losses.

Researchable areas equally prioritized for 2016-2017 include:

- **Use of infrared radiation and other emerging new technologies to detect HLB-infected citrus fruits in pack lines during packing operations.**
- **What are the viable, cost-effective packinghouse options to remove ACP from fruit prior to transportation?**
- Identify solutions, tools and/or management strategies to minimize losses due to:
    a) Exotic pathosystems such as but not limited to: HLB/ACP; CVC/sharpshooters; Leprosis/flat mites;
    b) Endemic pathosystems such as but not limited to: CTV/aphids; stubborn/leafhoppers.
- Evaluate existing and newly developed tools to detect pathogens early in the epidemic and diagnose diseases before the development of visual symptoms:
    a) Cooperative project (working within USDA and CDFA regulations) to evaluate early detection technologies (EDT) in comparison to qPCR methods using field-collected samples;
    b) Expand volume of EDT data to increase ability to statistically analyze results;
    c) Establish consistency in EDT results across all diagnostic laboratories;

d) Use of canines to detect the HLB early infection (pre-qPCR positive);
e) Characterize the canine olfactory receptor system and how it relates to detecting unique scents emitted by HLB-affected trees.

- Determine the interaction of mixed infections (e.g., CTV, *Spiroplasma citri* and Liberibacter) and the effect on tree productivity, yield reduction, and the ability to detect individual pathogens.
- Investigate potential introduction of exotic insect-vectored or graft-transmissible pathogens that would threaten market access both domestically and internationally. Secure adequate data on pathogen and vector populations and spread to support industry positions dealing with trade activities and barriers.

5400: Non-vectored and Related Post-Harvest Diseases

The goal of this category is to provide California citrus growers timely and proven information on maintaining market accessibility of both foreign and domestic markets and proactively develop data and information to maximize food safety and minimize trade barriers to satisfy trading partners. Specific targets are non-vectored, graft-transmissible, and post-harvest pathogens of citrus.

Researchable areas equally prioritized for 2016-2017 include:

- Secure adequate data to support industry positions dealing with trade activities and barriers to the citrus export industry.
- Investigate the potential introduction of exotic non-vectored or graft-transmissible pathogens of citrus that would threaten market access both domestically and internationally.
- Develop data on food safety issues of citrus to mitigate regulatory action or to satisfy new regulations.
- Evaluate existing and newly developed chemistries to minimize pre- and post-harvest fruit deterioration.
- Develop new, nonchemical technologies to mitigate and/or minimize losses due to non-vectored or graft-transmissible pathogens, e.g., irradiation, variable radio frequency electromagnetic methods.
- Determine quantitative methods to analyze flavor and evaluate post-harvest treatments for their effects on flavor deterioration and storage life.

5500: Pest Management

The goal of this category is to provide California citrus growers timely and proven information on eradication, control and management strategies and tools against insect pests to minimize crop damage and economic losses and to maintain market accessibility of both foreign and domestic markets.

Researchable areas equally prioritized for 2016-2017 include:

- **How to exclude ACP physically from citrus groves by developing and testing screening in the field.**
- Develop integrated pest management and biological control strategies to combat ACP:
    a) Evaluate compounds for efficacy to control ACP (both conventional and organic) and toxicity to beneficial species such as parasitic wasps, lacewings, predatory beetles;
    b) Examine chemical modes of action to determine innovative treatment strategies and options to minimize development of resistance;
    c) Identify attractant compounds and develop lures or baits to improve trap design and develop bait and kill stations;
    d) Evaluate efficacy of California area wide pest management treatment programs and monitor treatment areas for possible resistance.
- Expand new pest management tools and application options to serve organic farming operations.
- Develop innovative, non-pesticide technologies to mitigate and/or minimize losses due to pests, e.g., ozone, irradiation, variable radio frequency electromagnetic methods.

- Identify new and improve currently developed control strategies, options and tools (including non-chemical strategies) for:
    a) Endemic pests including but not limited to thrips, scales, mites, earwigs, katydids;
    b) Exotic pests including but not limited to psyllids, brown citrus aphids;
    c) Regulatory pests including but not limited to Fuller rose beetle, fruit flies;
    d) Insect vectors of diseases.
- How to combat major insect pests, develop strategies and tools including biological control, baits and lures, improved trap design.

2. New Pre-Proposals

A project that has never been submitted to the CRB before can be considered in one of two ways; a scaled down project for the intent of developing a proof of concept or a well-defined, full scale project. The CRB may request that a project demonstrate the potential applicability of a concept before considering a more industrious project. The CRB process for new proposals includes:

- Completion of a pre-proposal form submitted by May 17, 2016.
- Pre-proposal forms will be reviewed by the Priority Screening Committee on May 20, 2016.
- If accepted, the researcher will be invited to submit a written full proposal, due June 17, 2016.

Submission Instructions:
Researchers should complete a Pre-proposal Form for each new project concept. Include basic information such as title, principal investigator (PI), co-PI, and collaborator contact information, and relevant dates. In addition, fill in the three boxes:

1. Purpose and Rationale: Provide a brief description of the project in layman's terms and background information to support the reason for conducting this research – what prompted your idea.
2. Objectives, Timelines and Milestones: Include a brief work plan including goals and objectives and a timeline for when each should be accomplished (bullet format is acceptable).
3. Expected Results and Practical Applications: Provide a brief description of how the industry will benefit from this research or what products the industry will receive in return.

Save your file using the following format:
Last name Preproposal 2016
If submitting more than one pre-proposal, use:
Last name Preproposal 2016 1 of 2

Pre-proposal forms must be submitted **electronically** to the Citrus Research Board (it is not necessary to submit a paper copy): research@citrusresearch.org

3. New Full Proposals

Researchers invited to submit a full proposal must complete the Project Plan-Research Proposal Form for each project according to the guidelines specified in Section 5 below. The CRB process for new proposals includes:

- New, full proposals will be reviewed by the Priority Screening Committee and by an Ad Hoc Scientific Review Panel.
- An oral presentation will be given by telephone and Web Ex to the Priority Screening Committee, August 11-12, 2016.
- Priority Screening Committee will review and evaluate proposals and presentations.
- If accepted, researchers will be invited to give an oral presentation in person to the full board and Research Committees during August 23-25, 2016.
- Proposal will be reviewed by the specific Research Committee, who will then make a recommendation to the full board for "yes/no" funding.
- The full board makes the final decision on funding at the annual budget meeting, September 27, 2016.

Submission Instructions:
Save your file using the following format:
Last name Newproposal 2016
If submitting more than one new proposal, use:
Last name Newproposal 2016 1 of 2

Forms must be submitted **electronically.** Please submit each as a separate email attachment directly to the Citrus Research Board at: research@citrusresearch.org

4. Continuing Projects

Regardless of the anticipated duration of the project, all researchers currently receiving CRB funding must re-apply each year. The Project Plan-Research Proposal Form must be completed for each project according to the guidelines specified in Section 5 below. In addition, a written progress report on the appropriate CRB form must accompany the project proposal.

Submission Instructions:
Save your Project Plan file and Progress Report using the following format:

Project Number Last name Proposal 2016
Project Number Last name Progress 2016PR

Proposals and Progress Reports must be submitted **electronically** as separate email attachments directly to the Citrus Research Board at: research@citrusresearch.org

Project Completion Report:
When your project is complete or when funding has been terminated, the research supported by the data must be summarized and submitted to the CRB using the Project Completion Report form available on the CRB web site or from the CRB office. In addition, an article should be written for publication in the *Citrograph* magazine.

5. Guidelines for Research Grant Proposals

1. The project proposal must:
    - Clearly state the anticipated duration of the project,
    - Identify the timelines and milestones for each short-term, medium-term, and long-term objective,
    - Identify the timeline expected for each finding, outcome or deliverable.

2. Every Grant Proposal must include the following *contact information for each principal investigator (PI), co-PI, collaborator, **and Financial and/or Contract Officer**:*
    - Location (physical address including Department),
    - Telephone number,
    - Email address, and
    - Mailing address if different from physical location.

3. For each collaborator identified, you must provide a letter from that person certifying that he or she has read the proposal, has been adequately briefed about the proposal, and can meet the milestones of this project. These letters must accompany the proposal when submitted.

4. ***Additional Amendment from the April 16, 2016 RFP:*** For the PI, Co-PIs and each collaborator identified, a brief CV should be submitted. CV should include: Name, affiliation, and relevant experience (employment, publications, etc.). These CVs must accompany the proposal when submitted.

5. Identify appropriate sources outside of this project that CRB staff may contact for additional information and/or an explanation of this type of research.

6. Project Impact Statement: **60 words maximum**. An impact statement:
    - Briefly states, in lay terms, the difference your research will make.
    - States accomplishments and creates strong support for your proposal.
    - Answers the questions... *"So what?*" and "*Who cares?*"
    - Conveys potential accomplishments in simple language that is free of technical jargon.

Formula to write an Impact Statement:

1. One statement to identify the Issue or problem.
2. Action statement. It describes how your work will help to solve a problem. Make sure you state why something is a problem, and then follow up with how your work will make a difference.
3. Impact - the benefits. "What is the payoff?" Not all impacts are quantitative; some are improvements in methods, avoiding trade barriers. Some examples are:
    - Nitrate is an essential nutrient for plant growth, but it can become a serious threat to heath or the environment if allowed to accumulate in animals or water systems. A new test kit will help producers manage nitrate concentrations, reduce costly nitrogen fertilizer applications and protect the environment from pollution.
    - We will develop formulations that are non-toxic to animals and to beneficial organisms such as lady beetles, parasitic wasps, and honey bees. Used as a fungicide, our product will reduce toxic effects and preserve biodiversity. Due to their complex, novel modes of action, use of XXX formulations in Integrated Pest Management programs can help limit development of resistance to synthetic fungicides.
    - Our lab has identified genes in one biological control agent – the bacterium *Pseudomonas fluorescens* – that are related to the organism's survival in soil and on plant surfaces. Our work could lead to the production of more effective biological control agents. *P. fluorescens* isolates protect a range of crop plants against diseases, including protection of wheat against take-all disease.

4. Executive Summary: **500 words maximum**. Provide a clear and concise executive summary of the project in layman's language. Include the following:
    - Overall goal and specific objectives of the project;
    - Summary of the work plan or methodology;
    - Expected outcomes and/or functional product or solution **using bullet point format**.

5. GANTT CHART of Progress: Complete the chart template as directed. The "Objectives" and tasks you intend to complete should be clearly and succinctly stated. You must associate milestones to each task. Milestone is used here to indicate the time necessary to complete or achieve success of a task. It is recommended that you do this accurately as this will be a major criterion used by the board when evaluating projects for continued funding.

7. Background Information/Relative Literature: This section should include some background information and a brief review of pertinent literature (about 200 words). What prompted you to propose this research?

8. Work Plan/Procedures: Elaborate on your stated objectives, tasks and milestones in the "Work Plans and Procedures" section. You must explain how they will be achieved, describe your experimental design, and if appropriate, list site locations for proposed trials.

9. Pertinent Questions: Provide answers to the following 3 questions:
    - Who will be the end user of the results of this project?
    - How will growers or others benefit from your results?
    - Will this research result in a product that will require commercialization or further development by another entity? If so, please describe.

NOTE: For projects involving basic or discovery research, include any potential issues concerning intellectual property rights and identify the steps needed for ultimate use by the grower (e.g., federal approval to test a genetically modified plant in the field for evaluation or the registration of a new chemical). Identify any potential involvement of University Cooperative Extension personnel and/or use of UCCE resources.

9. Budget Section: **The budget form has been revised!** Although the Grant Proposal form allows for investigators to include budget requests for up to three years, the principal investigator is still required to submit an annual Grant Proposal and fulfill the Progress Reporting milestones. Complete the budget form as specified:

    - For projects involving multiple researchers who will be receiving a sub-award, the PI must complete an Overall Project Budget Form for the entire project. In addition, each researcher who intends to receive a sub-award must complete a Sub-award Project Budget Form.
    - For continuing projects, complete the column for FY 2016-2017. Indicate whether you expect to have any carry-over funds from the previous funding year.
      NOTE: IN SEPTEMBER YOU WILL BE REQUIRED TO COMPLETE AND SUBMIT A "NO COST EXTENSION" FORM THAT ACCURATELY STATES THE ENDING BALANCE FOR YOUR PROJECT. THIS BALANCE WILL BE DEDUCTED FROM YOUR FY 2016-2017 AWARD.
    - **NEW!** Board and committee members prefer that PI's give their oral presentations in person rather than by telephone. To accommodate the additional expense, there is now a separate budget line for travel to CRB-related meetings.
    - The Lindcove Research and Extension Center (LREC) provides Land, Labor and Facilities (LLF) for projects approved by the UC Research Advisory Committee. On the 'LREC charges' budget line of the CRB proposal, the PI should estimate the expenses that the research project will occur at LREC, and if the project is approved, those charges will be directly billed on a monthly basis to the Citrus Research Board.
    - Under "Budget Justification", describe how funds will be used. You may want to include details such as; you expect to have delays in hiring a qualified post-doc, or a particular item within your budget is very costly.
    - Under "Other Funding Sources," identify the sources and amounts of all current and pending non-CRB sources of support for this project. Include in-kind contributions, and indicate whether other support funds are confirmed or pending. Describe how this funding may enhance and/or impact the timing of this project or if it could be used as matching funds for other funding sources.

6. Guidelines for Written Progress Reports

Complete the CRB Progress Report Form. Use the Times New Roman font in **12** point.

The report should document progress and accomplishments made during the current funding period (October 1 through September 30). Restate the project objectives and milestones as discussed in the original funded

proposal, and note and justify any revisions. Summarize the activities that were undertaken to accomplish each objective and explain why any planned activities or procedures were modified. Include comments on collaboration. Include data summaries and graphs as appropriate. Relate accomplishments to practical application in the industry.

All Progress Reports and all Grant Proposals for continuing projects must refer to the CRB- assigned project number in the space labeled Project No. (Example: 5500-029).

7. Guidelines for Oral Presentations

In August, Principal Investigators or representatives will give an oral presentation in person to the CRB Research Committees to explain research *plans* intended for the coming fiscal year. **Presentations must follow the "Presentation Template",** available on the CRB website. This presentation should **not** include progress made in the past year. It must accurately indicate the planned objectives and the time line necessary to complete each. Participation in the entire subject session is required; it provides an opportunity for collaboration among research groups and helps to prevent duplication of efforts.

In March, Principal Investigators (or representatives) will give an oral presentation in person to the CRB Research Committees to report *progress* on research to date. **Presentations must follow the "Presentation Template",** available on the CRB website. The presentation must accurately indicate the achievements and status of proposed milestones. Participation in the entire subject session is required; it provides an opportunity for collaboration among research groups and helps to prevent duplication of research efforts.

8. Expectations of Funded Project Leaders

It is expected that every funded Principal Investigator will:

- Give two oral presentations in person to the Research Committees. The first is in August to present intended research plans for the fiscal year. The second will be given in March to report research progress to date.

- Submit two written progress reports using the CRB Progress Report Form one in April and the second one along with your proposal for continuing research in July (see Guidelines for Progress Reports). This report is used by the CRB Research Committees and the Board to review the status of all projects.

- Submit two 500-word maximum progress reports that will be posted on the Florida Citrus Research and Development Foundation web site at http://www.citrusrdf.org. The purpose of these brief reports is to centralize a summary of all research supported by the California, Florida and Texas citrus industries at one website. You will be sent a reminder prior to the due date. These reports should be submitted to research@citrusresearch.org

- For each project, you must submit a full-length article every year written in "layman's language" for publication in the *Citrograph* magazine or as a Research Report in *Citrograph* online. **If you fail to meet this requirement, CRB funds may be withheld.**

- As part of its mission, California's Citrus Research Board sponsors informational meetings for members of our industry and the general public. As a benefit of attending these meetings, we offer California Department of Pesticide Regulation (DPR) approved Continuing Education (CE)

Units of value to certain licensed professionals working in our state. As a CRB funded researcher, you may be asked to make a presentation of your research at one or more of these meetings. To receive DPR approval of the CE units, we must describe how your presentation will discuss pest management or pesticide-related topics. Acceptable topics may also include pesticide Laws and Regulations. Upon award of your research contract, you will be asked to describe in 150 words or less in laymen's terms how your proposed research is directly relevant to pesticide laws and regulations, pesticides, or the management of one or more citrus pests. Note that these descriptions may be subject to revision prior to the date of your actual presentation.

- When you have completed your project, you must complete a "Project Completion Report Form" that can be found on the CRB web site: http://citrusresearch.org. A final article must be written for publication in the *Citrograph* magazine.

- Sign a contract of funding acceptance and abide by all terms, including all bullets above.