



Citrus Research and
Development Foundation, Inc.

QUARTERLY REPORT
TO THE
COMMERCIAL PRODUCT DELIVERY COMMITTEE

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TABLE OF CONTENTS

	Page
Overview	3
CPDC Tier One Project Reports	
A. Area-Wide Insect Management (Label Changes)	5
B. Antimicrobial Compounds	8
C. Naturally Occurring Microbes	10
D. Tolerant Rootstock Plantings	12
E. Plant Growth Regulator Interactions with HLB	15
F. Thermal Therapy	17
G. Genetic Technology (MCTF) – Deploying Canker Resistant Genes	19

Overview

At the September 24 CPDC Meeting, the Committee approved the following revised project list.

Tier 1: Active Projects

- Area-wide insect management (Insecticide label changes and CHMAs)
- Antibacterial compounds
- Naturally occurring microbes*
- Tolerant rootstock plantings
- Plant growth regulator interactions with HLB**
- Thermal therapy*
- Genetic technology (MCTF): Deploying Canker-Resistance Genes

Tier 2: Facilitate and Monitor Projects

- RNAi molecules
- Diaprepes pheromone

Tier 3: Information Projects

- CTV vector***
- Advanced Citrus Production Systems
- HLB Escapes
- nuPsyllid NIFA grant

* New addition to list ** Moved from Tier 3 list *** Moved from Tier 2 list

This Quarterly Report covers the CPDC Tier 1 projects for the period October through December 2013. For each of these projects, the report focuses on activity highlights of the past quarter, issues and gaps that have surfaced, and performance against milestones.

The established purpose of the reporting system is to provide the Committee with integrated information needed to inform planning, project prioritization and resource allocation decisions going forward.

In order to track changes in the roadmap charts over time, I have inserted the month of the projection inside the boxes.

As always, I welcome your feedback on the content, level of detail, and organization of the report. If there are items that you would like added to or deleted from the report, please let me know. Also let me know if there are items where you disagree, or have additional information or perspective. The goal is to make this a useful working document for Committee members.

Thanks and regards,

Jim Dukowitz, PhD
Commercial Product Manager

CPDC TIER ONE PROJECT REPORTS

A. Area Wide Insect Management (Label Changes)

Quarterly Activity Update

Over the past quarter, there have been further slippages in the label expansion roadmaps for clothianidin and thiamethoxam due to continued pressure from advocacy groups and an increasingly legal approach by EPA.

Imidacloprid

- With the Florida 24(c) Special Local Needs label expansion in place allowing a second imidacloprid application prior to November 1, efforts over the past quarter have been focused on Bayer providing updated nectar residue information that may support further changes in the timing requirements around bloom applications. We are currently waiting for Bayer to provide this updated information.

Thiamethoxam

- Syngenta continues to evaluate the results of GLP studies on non-target risks, particularly to pollinators, prior to proceeding with a request for label expansion and use changes. This data will be part of the review process by regulatory agencies. Dan Botts continues to work with Syngenta's regulatory and scientific review teams. Target date for submission will likely be tied to clothianidin actions.

Clothianidin

- Dan Botts confirmed with Valent that the projected date for an EPA PRIA decision on clothianidin will slip from December '13 to June '14.
- Dan Botts and team are continuing to work on the material to be compiled for the FIFRA Section 18 Emergency Use Exemption Process for clothianidin. The CRDF Board, upon recommendation of CPDC, authorized use of the Section 18 for clothianidin at the July 2013 Board meeting.
- At a November 20 meeting with EPA Office of Pesticide Programs (OPP), Dan Botts and team discussed the need for bearing label and tolerance to support 5-9 foot, 3-5 year old trees. EPA/OPP suggested a meeting of FDACs, Valent and citrus industry stakeholders with EPA prior to submission of Section 18, and reiterated the need for communication with and support from the beekeeping community. Dan Botts is trying to arrange a meeting in January with EPA for that purpose.
- Valent is in the final stages of reevaluating their residue data and indicated that they would be in a position to make a decision about moving forward early in 2014.

EPA Visit

- Dr. Steven Bradbury, Office Director, EPA/OPP visited the southern end of Florida citrus production area on December 10-11. The purpose of the visit was to meet with growers and researchers to more fully understand the impact of HLB/ACP management. His visit was in conjunction with the Ft. Lauderdale meeting of the Chemical Specialty Products Association. He is also interested in the status of on-going discussions between the citrus and beekeeper communities in Florida. He suggested any mitigation efforts developed at the local level would qualify as a managed program under the newly required pollinator protection label language.

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Beekeeper Citrus Grower Workshop Follow-Up

- On December 19 FDACS hosted a meeting at Lake Alfred to finalize recommendations developed at the September 18 Beekeeper-Citrus Grower Workshop. FDACS hopes to initiate implementation of the guidelines prior to the 2014 citrus bloom period.
- In preparation for this meeting, Dan Botts organized a meeting in Lake Alfred on October 24 to discuss the Pollinator Protection Program and development of the BMPs to implement the actions discussed at the September 18 meeting. The meeting also addressed the framework of the neonicotinoid soil application program to integrate into that larger effort.

Neonicotinoid Impact on U.S. Agriculture

- A Chicago firm is coordinating a January 23 meeting on the beneficial role of neonicotinoids to U.S. agriculture, and the associated implications of losing access to the products. This activity is a proactive step organized by the primary registrants of neonicotinoids. The meeting is one of several being set up at several locations around the country.. The Florida meeting will allow the registrants to understand the implications of neonicotinoid use loss for citrus and tomato industries. Representatives of both industries have been invited to participate. The nationwide information obtained will be compiled and published, providing documentation of the role of these materials in agriculture.

Key Issues

- **Registrant Risk-Reward.** The common issue for all registrants remains the perceived risk-reward associated with registrants moving forward with label expansions for neonicotinoids given the extremely small dataset that exists regarding pollinator impacts, the increased legal and political activity surrounding their use, and the increased call for additional information by EPA/FDACS.
- **Product Stewardship.** This includes following carefully the label instructions, and making every effort to observe the advisories on protecting bees.
- **Messaging.** It is essential that the Florida citrus industry develop the information and create clear, concise messages around the critical importance of using neonicotinoids to protect young trees against HLB, and that this can be done in ways that minimize risks to pollinators. These need to be delivered to government and other stakeholders, and to the general public.
- **Outreach.** Finally, there is an ongoing issue of outreach and constructive engagement with the beekeeper community to find common ground upon which to build.

Near-Term Priorities

Activity	Date
• Meeting on neonicotinoid impact on U.S. agriculture	Jan' 14
• EPA meeting on Section 18 for clothianidin	Jan/' 14
• FDACS implementation of guidelines from September beekeeper-citrus grower	1Q-14
• Stewardship program messages and rollout	1Q' 14
• Target date for thiamethoxam label expansion submission	2Q' 14
• Target date for PRIA decision on clothianidin	Jun' 14

Project Roadmap: Neonicotinoid Label Modification

What	Who	Start	End	4Q'12	1Q'13	2Q'13	3Q'13	4Q'13	1Q'14	2Q'14	3Q'14	4Q'14
Imidacloprid 24(c) approval	Bayer/ FDACS	Sep'12	Oct'12	S'12								
Thamethoxam label expansion submission	Syngenta	2Q'14	2Q'14	S'12	→	J'13	→	M'13	→	J'14		
Clothianidin Section 3 projected approval	EPA PRIA	Jun'14	Jun'14	S'12	→	J'13	→	M'13	→	J'14		
Clothianidin 24(c) projected approval	FDACS	Jul'14	Jul'14	S'12	→	J'13	→	M'13	→	J'14		
Clothianidin Section 18 submission	FDACS	1Q'14	1Q'14	▲				Jl'13	→	J'14		
Beekeeper-Grower Guidelines	FDACS	1Q'14	1Q'14							J'14		
EPA Notification of label changes (foliar)	FDACS	Sep'13	Sep'13									
Stewardship program and message development	Growers/ Registrants	Jun'13	1Q'14									

J = Jan M = Mar Jl = July S = Sept

B. Antibacterial Compounds

Quarterly Activity Update

- Over the past quarter progress has been made in implementing the antibacterial/antibiotic strategy that was reviewed and approved at the September '13 CPDC and subsequent CRDF Board meetings. This includes continued evaluation of candidate antimicrobial compounds, partnering discussions, and design and planning for field trials based on approvals at the December'13 CPDC and Board meetings.

Evaluation of Antimicrobial compounds.

- CRDF project management is continuing to work with partner companies to develop/identify candidate molecules/compounds for evaluation under our Research Service Agreements with the University of Florida (Triplett, Powell and Wang). A total of 44 different compounds provided by three suppliers were evaluated using the *L.crescens* assay in the October-December timeframe, bringing the total number of compounds evaluated to 278. Eight new samples were evaluated during October through December under the Wang Soil Based Antimicrobials RSA, bringing the total samples evaluated to 24. Dr. Powell continues his evaluation of 27 compounds using the graft-based assay.

Field Trials

- In parallel, work has continued on identifying and narrowing the list of candidate compounds that might be ready for Spring-14 field trials. Criteria for selection include efficacy in reducing *C. Las* titers, lack of phytotoxicity, and relative ease in obtaining regulatory approval for the compounds.
- At its December'13 meeting, CPDC approved funding for a field trial scenario that will evaluate up to 10 antimicrobial compounds for efficacy in reducing *C. Las* titers and improving tree vigor at three grower cooperator sites. The trials would be a one-year efficacy study, starting in the Spring'14. Measurements would include tree vigor, tree load, HLB visual symptoms and PCR sampling to measure *C. Las* titers, with a pre-tree evaluation, subsequent quarterly evaluations, and a final year end report.

Commercial Partnerships

- CRDF project management continues to work with several companies, two related to antibiotics, two related to new molecular entities, and a fifth company in the biopesticide space.
- For GRAS-like compounds, we are continuing to investigate and test “nano-emulsions” and other formulations through sponsored research at the UF Particle Engineering Research Center with intent to use toll manufacturing, as needed, to scale up candidates for field trials.

Key Issues and Gaps

- The greatest challenge is to balance multiple dimensions of risk inherent in developing a product that is safe, effective and can be registered for agricultural use through federal and state agencies in the shortest possible time.
- Another challenge is resources, and CRDF staff is securing additional staff support to oversee overall design of all field trials, as well as secure outside experts in addressing regulatory and

permitting requirements. We are also adding a trial administrator to handle the implementation details, including data collection and reporting, associated with each trial..

Near Term Priorities

Activity	Date
• Finalize compounds to be tested in spring	Jan'14
• Finalize trial design, schedules, budget	Jan'14
• Secure services of trial administrator/ IFAS researchers/crop consultant	Jan'14
• Secure regulatory consultant to obtain permits, as required, and guide regulatory strategy.	Jan'14
• Meet with EPA on regulatory issues and roadmap	Feb'14
• Arrange for compound provision from companies	1Q'14
• Finalize grower cooperator commitments and indemnity agreements	1Q'14
• Work out detailed operational schedules	1Q'14
• Begin trials	Spring'14

Project Roadmap: Antimicrobials

What	Who	Start	End	3Q'12	4Q'12	1Q'13	2Q'13	3Q'13	4Q'13	2014	2015	2016	2017+
InnoCentive challenge awards selected	Turpen	Aug	Aug'12	█									
Approve amended Powell research proposal (1 Yr)	UF/Powell	April'13	Apr'13	S'12	→	J'13	→	M'13					
Approve RSAs (Powell, Wang), RA (Powell)	CRDF/UF	Apr'13	Apr'13				█						
Approve RSA (Triplett)	CRDF/UF	Jul'13	Jul'13					█					
Source candidate compounds	CRDF	Jan'13	Ongoing		█								
Screen compounds with various assays	UF/TBD	Jul'13	Ongoing					█					
Grower-led field experiments	CPDC/ Growers	Spring'14	Ongoing							█			
Powell research in greenhouse/field (Y1)	UF	Apr'13	Apr'14				█						
Regulatory roadmap	CRDF	1Q 2014	Ongoing						█				
Secure commercial partners/ Develop toll mfg strategy	Companies	2013+	Ongoing					█					
Develop and optimize products	Companies	2014+	Ongoing							█			
Regulatory approvals (antibacterials)	Companies	2015+	Ongoing							█			
Regulatory approvals (antibiotics)	Companies	2017+	Ongoing										█
First commercial availability	Companies	2015+	Ongoing							█			

S = Sept, J = Jan, M = Mar

C. Naturally Occurring Microbes

Quarterly Activity Update

- The focus of activities during the October to December timeframe has been on planning for a Spring '14 field trial involving commercially available products containing naturally occurring microbes. The purpose is to provide a scientific basis for understanding whether and the extent to which the use of these products can be used as tools to control greening and other side effects such as fruit drop.
- A field trial scenario and associated budget was presented at the December '13 CPDC meeting, which was approved with modifications to the protocol and a "not to exceed" budget. The revised protocol and budget will be presented at the January '14 CPDC meeting.
- The impetus for the field trial has been widespread observation about the beneficial effects of using such microbes; and the fact that several companies are currently supplying their commercially available products to Florida citrus growers. Despite their widespread usage, there is generally a lack of supporting scientific evaluation as to their effectiveness.
- This field research will supplement research funded by CRDF into the impacts of beneficial bacteria in combating HLB. One such example is CATP #608 (Wang) which received enhanced funding to expand the scope of field tests, increase the number of beneficial microbes tested, and evaluate different approaches to enhance the survival of beneficial microbes in the soil.

Field Trial Scenario

- The purpose of the field trial scenario as presented is to provide side-by-side comparison of commercially available products as recommended by growers to measure impact on tree vigor and citrus greening. The trial is designed to be large enough to be statistically significant, and structured in a way to avoid the need for crop destruction or permitting. This is a three year study, with funding approval for year one.
- Four products were identified based on what growers indicated they are having success using, as well as delivery method, quantities and frequency. At the December '13 CPDC meeting, the committee accepted the four recommended products, and added a fifth product.
- The approach calls for five grower sites around the state, with four replications at each site. CPDC amended the protocol so that each product would be evaluated both with and without organic enzymes, as well as a control group.
- Maximum allowable dosage levels under label requirements will be delivered, with up to six applications per year (subject to label guidelines).
- Trees will be evaluated pre-treatment, then on a quarterly basis for fruit quality, yield, C. Las titers, and tree vigor, including canopy and root evaluations.
- Key stakeholders include grower cooperators, product manufacturers, IFAS, crop consultant, trial designer, and trial administrator.

Key Issues and Gaps

- Tree vigor studies generally take multiple years to show results. As a 3 year study, interim reports will be made, but final results will not be available in the near term.

- Because commercial products will be used within label, there should be no crop destruct or permitting issues associated with the trial.

Near Term Priorities

Activity	Date
• Present revised design and budget for field trials to CPDC	Jan'14
• Finalize protocol, products and site selection	Jan'14
• Arrange for product provision from manufacturers	1Q'14
• Finalize grower/cooperator agreements	1Q'14
• Secure services of trial administrator/ IFAS researchers/crop consultant	1Q'14
• Work out detailed operational schedules	1Q'14
• Begin trials	Spring'14

Project Roadmap: Naturally Occurring Microbes

What	Who	Start	End	Jul'13	Aug'13	Sep'13	Oct'13	Nov'13	Dec'13	1Q'14	2Q'14
CPDC approval of field trial template as project enhancement	CPDC/ CRDF BoD	Jul'13	Jul'13	■							
Develop candidate product list, experimental design and roadmap	CRDF staff/ consultant	Sep'13	Dec'13			■					
CPDC approval of field trial design with amendments and not to exceed budget	CPDC/ CRDF BoD	Dec'13	Dec'13						■		
CPDC approval of final budget with amended protocol	CRDFstaff/ trial admin	Jan'14	Jan'14							■	
Finalize details of trial design, schedules, roadmaps, line up stakeholders, secure product, etc.	CRDFstaff/ trial admin	1Q14	1Q14							■	
Launch trial	CRDF staff/ trial admin	Spring '14	Spring '14								■

D. Tolerant Rootstock Plantings

Quarterly Activity Update

- Interest continues in grower evaluation of candidate HLB tolerant rootstocks and CRDF is following several avenues to facilitate moving the project area along. During the October to December period, progress was made on several fronts: IFAS early release of promising candidate rootstocks; availability of liners of candidate rootstocks; and contracting for propagation of budded trees on candidate rootstocks. Also contracts were written to provide equipment for cold protection for the St. Helena rootstock trial, with delivery in 1Q'14.
- With promising outcome on releases of a number of tolerant rootstocks for grower evaluation, discussion continues on methods to overcome seed supply, how to manage early plantings to greatest benefit, and other related topics. CRDF's goal in this area is to remove obstacles to the use of this new tool against HLB.

Early Release of Promising Candidate Rootstocks

- During the quarter, UF, IFAS agreed to early release of promising candidate rootstocks for grower evaluation, and a clear pathway for grower planting of trees on these rootstocks is being developed. USDA, ARS has also been seeking institutional support. for early release of their promising rootstocks, and is still navigating through the issues.

Contract for Tree Propagation

- With CRDF funding approval at the August CRDF Board meeting, CRDF worked with UF, IFAS and citrus nurseries and, during the quarter, a contract was signed for propagation of budded trees on candidate rootstocks for planting in 2014.
- Because seed availability is an issue for some of the 30+ candidate rootstocks, CRDF has been in ongoing communication with state regulatory officials and with out-of-state micro-propagation companies who are considering scale-up to produce rootstock liner materials through micro-propagation. With success, trees generated from micro-propagated rootstock material could be planted in 2015.
- CRDF staff participated in the FDACS Citrus Budwood Advisory Committee meeting to discuss the micro-propagation permit, and address concerns by some parties with the importation of rootstock liners generated through micro-propagation by an out-of-state company, Agromillora.

Commercial Trial Scenarios

- Through CRDF's commitment of funding support and bringing together stakeholders, CRDF is on track in its planning for commercial-scale field trials using materials being grown from seed (2014 trial) as well as from micro-propagation (2015 trial). These field trials will be placed with growers in strategic sites across the state to represent variations in growing conditions and perhaps HLB pressure. Specific details of the plantings and determination of grower cooperators are being developed through a task force of citrus breeders, citrus growers and CRDF.

- In order to generate propagation requirements and establish CRDF budgets, assumptions were made regarding the size and scope of the Phase 1 (2014) and Phase 2 (2015) trials. These were reviewed at the December '13 CPDC meeting. Based on a block size of 12 rows by 12 trees, 6 genotypes with five replicates each, and three separate sites generates a propagation requirement for 12,960 trees for each of the Phase 1 and Phase 2 trials.

Data Collection and Analysis

- Data collection in existing and planned field trials of tolerant rootstock candidates will be crucial to understanding the benefit of these new rootstocks, and so CRDF has committed support for organized data collection. At present, the determination of how best to coordinate an evaluation team is underway.

Cold Protection Support of Existing Field Trials (St. Helena)

- The contract between CRDF and IFAS for funding of necessary equipment in support for cold protection of existing field trials of candidate HLB-tolerant rootstocks in St. Helena was signed in December, setting the stage for installation by contractor during 1Q'14.

Key Issues and Gaps

- Methods of overcoming seed supply
- Managing early plantings to greatest benefit
- Determination of grower cooperators
- Data collection and analysis in existing and planned field trials

Near Term Priorities

<u>Activity</u>	<u>Date</u>
• Agromillora import permit and scale up to produce liners	1Q2014
• Installation of cold protection equipment at St. Helena	1Q2014
• Plan for employment of data collection and management personnel	1Q014
• Commit tree propagation for Phase 2 field trials	June 2014

Project Roadmap: Tolerant Rootstock Plantings

What	Who	Start	End	4Q13	1Q14	2Q14	3Q14	4Q14	1Q15	2Q15	3Q15	4Q15	1Q16
Early release of candidate rootstocks	IFAS/ USDA	4Q2013	4Q2013	█									
Rootstock liners of candidate rootstock availability	4Q2013	4Q2013	4Q2013	█									
Contracting propagation of budded trees on candidate rootstocks	4Q2013	4Q2013	4Q2013	█									
Agromillora import permit and scale-up to produce liners	1H2014	1H2014	1H2014		█	█	█						
Cold protection for St. Helena rootstock trial	4Q2013	4Q2013	4Q2013	█									
Data collection/coordination of rootstock trials	1H2014	1H2014	1H2014		█	█	█						
1 st CRDF commercial trials	2H2014	2H2014	1H2015					█	█	█			
2 nd CRDF commercial trials	2H2015	2H2015	1H2016								█	█	█

E. Plant Growth Regulator Interactions with HLB and Fruit Drop

Quarterly Update Report

- In its August 2013 meeting, the CRDF Board approved, upon CPDC recommendation, enhanced project funding for a field trial that evaluates 2, 4-D and/or other PGRs for efficacy in reducing fruit drop among HLB affected trees.
- To determine the best course of action, CRDF staff organized a meeting in late October with recognized experts in plant growth regulators (PGRs) and fruit drop from IFAS and USDA. The purpose of the meeting was to discuss the issues associated with fruit drop and develop a recommended framework and roadmap for action. This was presented in December to CPDC and CRDF Board.
- In late October, CRDF COO Dr. Harold Browning, RMC chair Bobbie Barben, and CPDC chair Ben McLean travelled to Brazil to meet with key researchers and observe management and cultural practices to address HLB. The findings of this trip have been incorporated into CRDF's overall strategic approach to PGR/fruit drop.

Field Trials

- Two scenarios were presented with budget and approved by committee in December.
 - Scenario 1 was for a single, on-label application of 2,4-D before the end of December 2013 on Valencia oranges. This was in full compliance with label instructions, so there were no experimental use permit or crop destruct issues. The application occurred before end of year, and the next steps will involve periodic counting of fruit on and off the tree, as well as measurements of tree vigor.
 - The second approved trial scenario and budget involved a split application of 2,4-D on Hamlin oranges starting in the August' 14 and ending in the October' 14 timeframe. The trial will involve three applications at ¼, ¼, ½ maximum dosage and measure fruit drop vs control trees.
- Three additional trial scenarios were presented without budgets. The Committee requested they be presented with accompanying budgets at the January CPDC meeting.
 - Scenario 3 is for low rate application of 2,4-D to study the impacts on plant health and fruit quality. This would be a nine month study commencing Spring 2014 at four sites with focus on Hamlins.
 - Scenario 4 would be a large plot, one spray trial of 2,4-D and Gibberellic Acid in Fall' 14 to reduce pre-harvest drop, and measure impact on fruit quality.
 - Scenario 5 called for a replication of the Brazilian physiological treatment protocol used by Dr. Medina and his associates to manage HLB. This is subject to obtaining their protocol and access to their products. They have been contacted to determine their interest in cooperating with CRDF on this project.

Issues and Gaps

- Finalize field trial designs and budgets, line up stakeholders, sort out permitting requirements
- Bringing on additional resources to support field trial activity

Near Term Roadmap

<u>Activity</u>	<u>Date</u>
• Present field trial scenarios 3 and 4 with associated budgets to CPDC	Jan'14
• Clarify Brazilian interest in cooperating with CRDF on field trial scenario 5	Jan'14
• Finalize trial design, crop consultant, grower cooperators, data collectors and schedules (Scenario 3)	1Q'14
• Clarify requirements and secure permits for trials, as required. (Scenario 3)	1Q'14
• Arrange for product provision from companies (Scenario 3)	1Q'14
• Pre-harvest data collection (Scenario 1)	1Q'14
• Explore regulatory issues associated with label changes for 2,4-D and develop plan and roadmap	1Q'14
• Detailed planning for Scenarios 2 and 4	1Q'14
• Scenario 1 final report	2Q'14

Project Roadmap: PGRs, HLB and Fruit Drop

What	Who	Start	End	Oct'13	Nov'13	Dec'13	Jan'14	Feb'14	Mar'14	2Q'14	3Q'14	4Q'14
PGR Design Team meeting	CRDF/IFAS/USDA reps	Oct'13	Oct'13	█								
Approval of field trial scenario 1 & 2 with budgets	CPDC/ CRDF Board	Ded'13	Dec'13			█						
Approval of field trial scenarios 3&4 with budgets	CPDC/CRDF Board	Jan'14	Jan'14				█					
Clarify Brazilian interest in cooperation with CRDF for field trial	CPDC staff	1Q'14	1Q'14				█	█	█			
Finalize Scenario 3 field trial design, stakeholders, schedules	CPDC staff/ Design Team	1Q'14	1Q'14				█	█	█			
Arrange for product provision (Scenario 3)	CPDC staff/ companies	1Q'14	1Q'14				█	█	█			
Secure permits as required (Scenario 3)	CPDC staff	1Q'14	2Q'14				█	█	█	█		
Explore regulatory issues associated with 2,4-D label change	CPDC staff/ AMVAC/ CCQC/EPA	1Q'14	2Q'14				█	█	█	█		
Detailed field trial planning (Scenarios 2,4)	CPDC staff	1Q'14	2Q'14				█	█	█	█		
Scenario 1 Field Trial	Stakeholders	Dec'13	Apr'14			█	█	█	█	█		
Scenario 2 Field Trial	Stakeholders	Aug'14	Oct'14								█	█
Scenario 3 Field Trial	Stakeholders	Apr'14	Dec'14								█	█
Scenario 4 Field Trial	Stakeholders	Aug'14	Oct'14								█	█

F. Thermal Therapy

Quarterly Update Report

- Several CRDF-funded research projects have been enhanced during the 2H'13 to set the parameters for use of thermal therapy to lower C Las titers in infected field plant trees., e.g. how hot, what time of year.
- Grower innovators are adopting enclosures for larger and multiple tree treatments
- Private parties are identifying roles in scale-up
- Researchers are evaluating results and how extra heat can be applied artificially to shorten treatment times and perhaps develop a constant flow machine to deliver heat to trees.
- A summary presentation is being delivered at a state-wide citrus meeting in January'14.
- A field day to demonstrate thermal therapy is set for April 2014.

Issues and Gaps

- A key issue is how can CPDC best add value to this activity, given its strong momentum among growers.
- CPDC is playing the role of interface between research and grower adoption by listening to growers and the industry, finding out what is useful, and playing a facilitative role, including sharing of data, designs, etc. This is particularly important given the number of information requests coming from industry, and the large number of grower-driven initiatives such as building their own cages.
- Organizing a field day in April is a concrete action CPDC is taking to encourage demonstrations of projects.

Near Term Roadmap

- Organize a field day to demonstrate thermal therapy approaches April'14

Project Roadmap: Thermal Therapy

What	Who	Start	End	Aug'13	Sep'13	Oct'13	Nov'13	Dec'13	Jan'14	Feb'14	Mar'14	Apr'14
CRDF funded research enhancements	CRDF			■								
Statewide citrus meeting presentation	CRDF								■			
Field day to demonstrate thermal therapy	CRDF/ IFAS/ USDA				▲							■

G. Genetic Technology (MCTF)

Quarterly Activity Update

- Since beginning work in mid-July'13, Dr. Janice Zale has moved the activity forward on several fronts
- The first Steering Committee meeting was held on November 5 with participation by Drs.. Folta, Browning, Burns, Turpen, Dukowitz and Zale. The focus was on procedures, policies, and processes with emphasis on efficiency and accelerated time to commercial application.
- Dr. Zale is currently working on a small number of genes acquired through a “warm circle” of UF researchers. One such gene that had been shown to confer disease tolerance to canker in immature citrus was transformed into mature scions and rootstocks in the MCTF facility. She has proactively been in contact with several scientists to identify additional candidates.
- She is also looking for ways to streamline the current protocol developed by Dr. Leandro Pena and transferred to the facility.
- At the request of the Steering Committee, she is developing procedures for screening gene constructs.
- Dr. Zale has provided a budget submission to redirect funding to new plans, with savings from year one being directed to years two and three of the three year funding program by CRDF. The revised budget numbers are still under the original approved three year amount.

Issues and Gaps

- Dr. Zale has shown initiative in identifying issues, looking for ways to improve efficiencies, putting in place needed processes and procedures, and working with others in a cooperative and professional manner. The Steering Committee will work with her to provide needed support to Dr. Zale in performance of her duties.
- Finalize arrangements with Dr. Leandro Pena to provide valuable support in ensuring the facilities, tools, protocols and work plan are in place

Project Roadmap: Genetic Disease Resistance (Canker)

What	Who	Start	End	3Q'12 4Q'12 1Q'13 2Q'13 3Q13 4Q13 '14 '15 '16' 17 '18 '19 '20 '21'22
<u>MCTF Ramp</u>				
Interim MCTF Oversight	CREC	Sep'12	Jul'13	
Secure new MCTF Manager	CREC	Jul'13	Jul'13	
Establish Steering Comm	CREC/CRDF	Nov'13	Nov'13	
Establish resource requirements/budgets	MCTF/Steer Comm	Dec'13	Dec'13	
Ongoing operations	MCTF/Steer Comm	4Q'13	Ongoing	
<u>Commercialization</u>				
Mature tissue transformation into commercial cultivars	MCTF	4Q'13	Ongoing	
First raw materials with desired canker traits	MCTF	2017+	Ongoing	
Field evaluations/wide area testing	CRDF/Com Partners	2017+	Ongoing	
Regulatory studies, permits	CRDF/Com Partners	2014	Ongoing	
Achieve deregulation of first new line	CRDF/Com Partners	2021	Ongoing	
New cultivar budwood to nurseries	CRDF/Com Partners	2022	Ongoing	
Strategic partnerships	CRDF/Steer Comm	2014	Ongoing	