

**CALIFORNIA AVOCADO COMMISSION
PRODUCTION RESEARCH COMMITTEE
MEETING MINUTES**

August 22, 2011

A meeting of the Production Research Committee (PRC) of the California Avocado Commission (CAC) was held on Monday, August 22, 2011 in the CAC board room in Irvine, California, with the following people present:

MEMBERS PRESENT:

Shane Tucker, Chair
John Burr
Reuben Hofshi (12.20pm)
John Lamb
Tom Royden

GUESTS PRESENT:

Charley Wolk
Jim Davis CAS

CAC STAFF PRESENT:

Jonathan Dixon
Ken Melban

MEMBERS ABSENT:

Louis Santiago

ITEM #1 CALL TO ORDER

Roll Call/Establish Quorum- Item 1.A.

Shane Tucker, PRC Chairman, called the meeting to order at 11:20 a.m. with a quorum present.

ITEM#2 APPROVAL OF MINUTES

Production Research Committee Meeting Minutes were tabled for the June 15, 2011 meeting.

Attachment A to these minutes.

As the minutes had not been distributed to the committee members before the meeting Chairman Tucker proposed to delay the approval of the minutes until later in the meeting. The minutes were not approved as the meeting went over time and will be considered for approval at the next PRC meeting.

ITEM #3 DISCUSSION ITEMS

Chairman Tucker began by introducing the purpose of the meeting in that ahead of the CAC Budget process he would like the PRC to review the proposed existing projects and to consider what a budget placeholder number would be recommended to the CAC Board. Following the discussion on the existing projects there would be discussion on the draft Outreach Strategic Technical requirements followed by a discussion on the budget process.

A. Consider Recommendation to CAC Board Regarding 2011/2012 Continuing Research Projects

Chairman Tucker asked for comment on the existing projects. The PRC members were generally in favor of the projects with positive discussion focused on the injection of pesticides and determinates of avocado flavor. There was some discussion about the increased cost of the scion breeding program and the need for a review of the activity within the program.

J Burr moved a motion that a recommendation to the CAC Board: "**Existing projects be approved as requested by the researcher**". The motion was seconded by J Lamb and passed unanimously by the PRC members present.

B. CAC Research Outreach Programs

J Dixon tabled the Draft Strategic Technical Requirements sent to the PRC members along with written comments by R Hofshi as the starting point of a discussion.

Attachments B and C to these minutes.

Chairman Tucker then asked for comments.

The following comments about the draft Strategic Technical Requirements were made.

The discussion was wide ranging and considered many different aspects of outreach. Chairman Tucker asked the committee members what degree of priority they would put on different initiatives.

The following is a summary of the discussion and attempts to cover the salient points raised.

Item 6. A. All access to knowledge

This Strategic Technical requirement is also composed of Research reports, Database of knowledge and Easy location of knowledge.

The discussion covered the following points:

The California avocado industry has growers with different needs ranging from those new to avocados and farming to highly experienced and technically savvy growers. Therefore outreach activity should be developed that recognizes different needs and puts the information into the best context for the different subsets of growers. With a different needs base, activity could encompass projects such as a school for new growers perhaps twice a year as an education tool. This suggests that there could be a need to understand and evaluate how to change grower behavior/attitude and to determine what is the best method to communicate what knowledge is available.

As part of the outreach effort there will need to be identification of the target audience of the information, perhaps through a grove ID system, so that the greatest impact for the activity could be made. If growers who are early adopters and early innovators of knowledge could be identified then outreach could be targeted to different grower groups.

A component of outreach would then be a continual process of renewal of information and notification of where to go for the knowledge. In the process there would be opportunity for getting new knowledge to growers in using different learning methods from delivery to set up with how to learn.

The outcome of the system for growers would be practical tools that California avocado growers could use to improve decision making where they would be forewarned by systems monitoring potential problems. Examples of tools could include using phenology models to tune into the trees for best management and a grower manual/handbook complete update.

All access to knowledge was given high priority but the physical location of the knowledge was not thought important with the information capable of being kept in an electronic format and would therefore be maintained anywhere and accessed from anywhere.

Item 6. B. No barrier to participate

It was agreed that presenting outreach activity, including written material, in English and Spanish would be a good idea to reach all participants in the California avocado industry. Overall the components of the strategic requirement No barrier to participate was given a mid to low priority as interested industry participants would attend meetings even if there was a small inconvenience in meeting times and places.

Item 6. C. Increase in knowledge

There was discussion was on the meaning of concepts as opposed to topics and there appeared to be general agreement with the Strategic technical requirements proposed. An example of a concept is applying fertilizer at a specific time to when flower buds were initiated, an example of a topic is pests and diseases.

Item 6. D. Utilize new knowledge

In the discussion on this technical initiative there was support for using demonstration groves to illustrate avocado growing techniques. The discussion also centered on the best location for demonstration groves whether they should be on commercial orchards or in dedicated research plots within the University system. Ideas were mooted to see if it would be possible to lease groves from growers who are letting blocks go due to high water costs etc. It was recognized that for the best success contracts will be needed with growers to ensure that demonstration groves are run as directed. The possibility of using consultancy services as a way to manage demonstration groves was considered.

From the demonstration groves, research and other outreach activity the development of growing guides were considered a good idea.

Item 6. E. Innovation culture and Item 7. Information systems

The proposed Strategic Initiative Innovation Culture and Information System were proposals that were focused on industry or grove activities rather than principals to work with. A number of ideas were suggested, some of which were new and others that had been used in the past but were no longer undertaken. R Hofshi presented a case for an Annual Research meeting composed of talks and posters by researchers. As this had been tried in previous years and had stopped C Wolk suggested a re-examination of the format to improve attendance. Further considerations were for such a meeting could proceedings be published and it could be a combined CAS & CAC effort.

The idea of expert forums either online or in person were discussed. Grower discussion groups were examined and consideration that these may not suit larger growers who may prefer demonstration blocks or more intimate discussion with researchers. There was discussion on continuing to use University of California extension advisors.

The discussion concluded with consideration of the importance of providing California avocado growers with information and the information be presented to help growers make decisions rather than necessarily giving advice.

There was general support in the discussion for Information systems.

C. CAC Research Budget

Owing to a lack of time this item was not discussed.

ITEM #4 PUBLIC COMMENT

There was no public comment as comments had been made by the guests present during the meeting.

ADJOURN MEETING

Chairman Tucker adjourned the PRC meeting at 2:30 p.m.

Respectfully submitted,

Jonathan Dixon, Research Program Director

Attachment A

**CALIFORNIA AVOCADO COMMISSION
PRODUCTION RESEARCH COMMITTEE
MEETING MINUTES**

June 15, 2011

A meeting of the Production Research Committee (PRC) of the California Avocado Commission (CAC) was held on Wednesday, June 15, 2011 in the CAC board room in Irvine, California, with the following people present:

MEMBERS PRESENT:

Shane Tucker, Chair
John Burr
Reuben Hofshi
John Lamb
Tom Royden
Louis Santiago

GUESTS PRESENT:

Charley Wolk
Bob Schaar

CAC STAFF PRESENT:

Jonathan Dixon
Ken Melban
Tom Bellamore

MEMBERS ABSENT:

ITEM #1 CALL TO ORDER

Roll Call/Establish Quorum- Item 1.A.

Shane Tucker, PRC Chairman, called the meeting to order at 10:05 a.m. with a quorum present.

ITEM#2 APPROVAL OF MINUTES

Production Research Committee Meeting Minutes were tabled for the May 18, 2011 meeting.

Motion to approve the minutes as read as proposed was moved by John Lamb seconded by Reuben Hofshi. Minutes were approved unanimously.

Reuben Hofshi initiated a discussion on the need for the CAC Website access to be limited to some of the information through the use of a password. Discussion centered on the sensitive nature of some information, researcher security and password access is common for other avocado industry websites around the world. Comment was made that a short term solution it would be simpler to not put sensitive research on the website. A comment was also made that a web password may only be a false sense of security as it is often not difficult to get a password.

ITEM #3 REVIEW AND PRIORITIZATION OF INITIATIVES AND CONCEPT PROPOSALS

Chairman Tucker began by outlining the process, that the PRC would review proposals and take recommendations to the CAC Board and meet with researchers.

There was discussion on fitting continuing research projects into the process. There was no major objection to continuing projects needing to submit a concept proposal but there was a desire to see researchers are notified as soon as possible of the change.

Chairman Tucker then set up a discussion on strategies and requirements and tabled draft Strategic Technical Requirements, Attachment A in this document. During the discussion some of the Strategic Technical Requirements were edited by the committee and the modified list was agreed to be used for consideration in the next California Avocado Commission Board meeting. The modified Strategic Technical Requirements were presented to the California Avocado Commission Board Meeting on June 16 as Exhibit H and after discussion were approved by the CAC Board.

The following comments about the concept proposals were made. The proposals should have a broad reach of disciplines, e.g. could include entomologists and economists. Encourage interdisciplinary systems in the RfP. Would like to see consortium type approaches.

Further discussion centered around possible Technical Initiatives.

ITEM #4 PUBLIC COMMENT

There was no public comment as comments had been made by the guests present during the meeting.

ADJOURN MEETING

Chairman Tucker adjourned the PRC meeting at 2:00 p.m.

Respectfully submitted,

Jonathan Dixon, Research Program Director

Attachment A

Draft Concept of California Avocado Industry Pest Management - May 2011

Authors: Jonathan Dixon and John Burr

Essentially there are two types of insect pests of avocados in California

A. Potential Pests - these are insects that could become a pest if introduced into California and they become established in commercial avocado groves

Phytosanitary Protection Process for Imported Fruit into California

1. Survey Pests in Country Exporting Fruit to California and Search for Natural Predators

Deliverable: A list of avocado pests and their natural enemies from importing countries

Outcome: Scientific publications in peer reviewed journals to provide APHIS with credible documentation for presence of pests

Activity: *Entomologists conduct a program of surveys for insects and their natural enemies*

2. Risk Analysis of Pests in Country Exporting Fruit to California

Deliverable: An analysis of the economic damage for each pest where possible based off actual economic damage where the pest is present and potential harm to the California avocado industry

Outcome: Risk assessments to potential damage to the California avocado industry for each pest identified. Scientific publications in peer reviewed journals to provide governmental agencies with credible documentation for risk assessment

Activity: *Risk analysis study of potential pests and their economic importance to avocado production in California*

3. Independent Grove Certification Process for Pests on Harvested Fruit in Country Exporting Fruit to California

Deliverable: Protocols for auditing harvested avocado fruit for pests in countries exporting avocados to California

Outcome: A set of standards for auditing avocado orchards for pests in countries exporting avocados to California

Activity: *Entomologists supervise protocols and train independent auditors as fruit inspectors in exporting country to monitor certified groves and inspect roadside fruit at harvest*

4. Pre-US Shipment Inspection Process for Fruit Exported to the US

Deliverable: Protocols for auditing harvested avocado fruit in packing houses for pests in countries exporting avocados to California

Outcome: A set of standards for auditing avocado packers for pests in countries exporting avocados to California

Activity: *Independent auditors trained by Entomologists and operating under their protocols inspect fruit prior to shipment*

5. Arrival Inspection of imported fruit for Pests at California Ports (Los Angeles)

Note: Should be all US ports as the fruit can be trans-shipped across the US back to California

Note: Use the same standards and protocols going to be used as in the importing country

6. Fruit transported in enclosed containers

Note: Security seals would be needed on the containers and means to inspect the seals as valid

7. Certification process for California Packers or Distribution Center

Deliverable: Protocols for handling imported avocado fruit to minimize risk of escape of potential pests

Outcome: Fruit is handled and monitored in enclosed rooms in appropriate conditions to prevent insects escaping

Activity: *Entomologists develop protocols for fruit storage and handling*

8. California within Packer facility or Distribution Center Inspections

Deliverable: Protocols for independent auditing imported avocado fruit in California packing houses for potential pests from countries exporting avocados to California

Outcome: A set of standards for auditing California avocado packers for potential pests from countries exporting avocados to California. Fruit isolated at packer until insect identification

Activity: *Entomologists develop protocols for inspection of fruit. Entomologists train independent auditors or inspectors for packer facilities. Unidentified insects are sent to Entomologists for taxonomic identification and DNA testing.*

9. California peripheral Packer facility or Distribution Center Inspections

Deliverable: Protocols and tools for independent sampling of fruit, potential host plants and avocado trees within escape distances from the packhouse

Outcome: Independent audit via trapping, inspection and monitoring of potential pests from countries importing avocado fruit to California

Activity: Entomologists develop protocols and tools for detecting potential insect pests. Entomologists train independent auditors or inspectors for packer facilities. Unidentified insects are sent to Entomologists for taxonomic identification and DNA testing.

10. Mitigation of pest at Packer or Distribution Center if potential pest insect is found

Deliverable: Protocols and treatment tools for exterminating potential pest

Outcome: Treatment of potential pest to remove risk of escape by isolation, transport to low risk of infestation customers or fumigation

Activity: Entomologists to develop protocols and tools for eliminating potential pests on imported fruit

11. If pest escapes, quarantine and mitigation in areas where avocados and host plants are present

Deliverable: Protocols for sampling and treatments where an exotic pest has been determined to have escaped and has potential to become established

Outcome: Science based response protocols for eliminating or managing the exotic pest

Activity: Entomologists prepare contingency plans for a pest incursion and treatment options for the exotic pest preferably by release of natural enemies. Entomologists to develop rearing methods for potential pests natural enemies and protocols for release.

B. Established pests - these are insects that cause economic damage directly to the fruit or to the productive capacity of the trees.

Phytosanitary Management Process for California Avocado Groves

1. Survey for avocado pests in California and associated natural predators

Deliverable: A list of avocado pests and their natural enemies within California

Outcome: Scientific publications in peer reviewed journals to provide APHIS with credible documentation on presence of pests

Activity: Entomologists conduct a program of surveys for insects and their natural enemies within California avocado groves

2. Economic damage analysis of California pests

Deliverable: An analysis of the economic damage for each pest

Outcome: The annual cost to the California avocado industry for each established pest. Scientific publications in peer reviewed journals

Activity: Studies of established insect pests in California, thresholds for economic damage and value of control options in California

3. Grove monitoring of established pests in California avocado groves

Deliverable: Protocols and tools for monitoring California avocado trees and fruit for established pests

Outcome: Sampling methods, real-time population monitoring of avocado pests within California, control treatments applied according to documented need.

Activity: *Entomologists conduct a program to refine and develop protocols and tools to sample and identify California avocado pests. Establish a system to inform California avocado growers of pest population changes to identify periods when economic damage can be controlled*

4. Best practice management of established avocado pests in California avocado groves

Deliverable: Protocols for chemical usage and biological control to avoid resistance to control methods.

Outcome: Control options (chemical tools) are maintained for a long time. Economic damage from established pests is reduced. Control of California avocado pests can be demonstrated to be sustainable.

Activity: *Entomologists conduct a program for best practice in pest management through use of chemicals, application methods and natural enemies. Entomologists investigate new chemistry for pest control and where appropriate work to continuously register new products with enhanced sustainability attributes.*

Draft Concept of California Avocado Industry Growing Systems - May 2011

Author: Jonathan Dixon

Three key issues for California avocado growers:

A. Increase income

1. Grow more fruit

Deliverable: Methods focused on improved tree nutrition, canopy health and root health that allow individual avocado trees to set and hold to the maximum of the trees yield potential each year.

Outcome: Avocado trees with high yields of fruit

Activity: *Agronomists, Plant Physiologists and Plant Pathologists investigate increasing yields through the use of nutrition, an understanding of phenology, high root and canopy health*

2. Produce fruit more consistently

Deliverable: Methods where high yields of fruit on avocado trees are maintained from year to year

Outcome: Avocado trees where high yields vary by less than 10% per year

Activity: Agronomists and Plant Physiologists investigate consistent fruit set using an understanding of tree physiology, hormonal and molecular control of flowering and fruit set, pollination and fertilization. To evaluate tree structure and density for productivity and consistency of production.

3. Produce bigger fruit

Deliverable: Methods where the fruit size obtained at harvest meets grower expectations

Outcome: Avocado trees producing fruit of a desired fruit size profile

Activity: Agronomists, Plant Physiologists and Plant Pathologists conduct studies to increase fruit size through an understanding of nutrition, hormonal and molecular control and root health

4. Profitable growing systems

Deliverable: Methods of fruit production that are the most productive and cost efficient

Outcome: Profitability of producing avocados in California increases

Activity: Agronomists and Plant Physiologists conduct studies to obtain high yields per acre while inputs are managed for most efficient use

B. Decrease the cost of growing

1. Maintain smaller trees

Deliverable: Methods that allow tree size to be decreased without affecting tree yields

Outcome: Avocado trees readily maintained at a height that can be harvested at low cost but maintain high yields

Activity: Agronomists and Plant Physiologists conduct studies on pruning strategies, tree structure and plant growth regulators

2. Use less water

Deliverable: Improved application and scheduling of water on California avocado groves for maximum efficiency of use

Outcome: Increased profitability of water use on California avocado groves

Activity: Agronomists and Soil Scientists to conduct studies of California avocado water use, application methods and water scheduling in relation to tree productivity

3. Use salty water

Deliverable: Allow California avocado growers to utilize low quality water for high yields

Outcome: Avocado trees in California using saline water without decreases in yield

Activity: Agronomists and Soil Scientists to conduct studies investigating the effect of salinity on fruit production, and ways to mitigate the impacts through cultural or water treatment methodologies.

C. Expand the growing regions in California - the opening up of non-traditional growing areas for avocados in California brings the opportunity to expand the acreage of avocados where the input costs of production are inherently lower

1. Identifying potential growing regions

Deliverable: An assessment of the suitability of growing avocados in different regions/districts of California

Outcome: Risk assessment of growing avocados in non-traditional regions of California

Activity: Agronomists and Agricultural Economists conduct studies to evaluate the risks and potential profitability of growing avocados, including cultivar requirements, in non-traditional regions of California.

Draft Concept of California Avocado Industry Harvest Strategy - May 2011

Author: Jonathan Dixon

There are three key issues for California avocado growers:

A. Understanding the consequences of current harvest strategy - at present California avocado growers harvest decisions are mostly based on their assessment of market prices and not tree health or consequences to future yields. Therefore an understanding of the risk they are taking on future production should also be an important consideration in the harvest strategy each year.

1. Physiological consequences to the trees of late harvest

Deliverable: Information on the effect on tree phenology, hormones and molecular control mechanisms from late harvesting of the fruit

Outcome: A greater understanding of the effect late harvesting fruit has on the productive potential of avocado trees

Activity: Plant physiologists to conduct studies examining the effect on the physiology and phenology of California avocado tree fruit production using different harvest times through the California avocado season

2. Fruit drop versus increase in income

Deliverable: A model that shows that relationship between fruit drop from holding fruit longer on trees and expected increase in income

Outcome: A risk management tool that allows a California avocado grower to conduct a sensitivity analysis on holding fruit on the tree versus an increase in income

Activity: *Agricultural economists conduct a study of fruit drop and fruit prices under different market scenarios*

3. Impact on fruit quality of late harvest

Deliverable: Protocols for handling late harvest fruit in the market and an understanding of the ripening characteristics

Outcome: Consistent quality of California fruit for the entire harvest season

Activity: *Postharvest physiologists to examine the changes in ripening characteristics of late harvested California avocado to define a harvest window where quality is the best*

B. Relating harvest strategy to phenology - developing an the skills to understand tree condition and the crop to maturity and harvest season

1. Impact of early harvest on fruit set

Deliverable: The relationship between timing of harvest and fruit set in the year of harvest and future fruit set

Outcome: An understanding of the impact on fruit set of different timing of harvest

Activity: *Plant physiologists to investigate the effect of timing of harvest on fruit set and consistency of yields*

2. Harvest timing in relation to tree growth cycles

Deliverable: The impact of different harvest timings on changing the timing of phenological events in the tree growth cycle

Outcome: An understanding of the changing timing of cultural management activities needed to maintain consistent and high yields when changing the time of harvest

Activity: *Plant physiologists to evaluate the effect of harvesting timings on tree growth cycles and future yields*

C. Alternative harvest strategies - what other methods could California avocado growers use for harvesting their fruit?

1. Select harvesting

Deliverable: The response of the tree in fruit sizing and productivity when different select harvesting strategies are used

Outcome: An understanding of the effect on fruit size and productivity of the trees when using multiple select harvests

Activity: Agronomists, Plant physiologists examine select harvest of different fruit sizes or volumes of fruit removal on fruit sizing and yields

2. Single harvest

Deliverable: The effect on yields, fruit size and consistency of yield when a harvest strategy of a single strip pick is used

Outcome: An understanding of what is needed to produce fruit of a specific fruit size profile

Activity: Agronomists, Plant physiologists investigate how fruit could be produced to meet a targeted fruit size profile and achieve a maturity target

Draft Concept of California Avocado Industry Evaluation and Development of New Germplasm Strategy - May 2011

Author: Jonathan Dixon

A. Produce new avocado scions or rootstocks with desired characteristics to increase grower income or reduce cost of production - seeking to use a blend of traditional methods and new technology to increase the speed at which new germplasm becomes available to California avocado growers

1. To breed, evaluate and release new rootstocks

Deliverable: New avocado rootstocks with the characteristics of pest and disease resistance or tolerance, salinity tolerance and reduced tree size while maintaining consistently high yields

Outcome: Increased income and reduced costs of production for California avocado growers

Activity: Plant breeders conduct a program of developing new avocado rootstocks ideally suited to California conditions

2. To breed, evaluate and release new fruiting cultivars or enhanced standard cultivars

Deliverable: New avocado fruiting cultivars with consistent high yields, early or late maturity fruit, ideal eating characteristics, pest resistance and ideal tree structure

Outcome: Increased income and reduced costs of production for California avocado growers

Activity: Plant breeders conduct a program of developing new avocado fruiting cultivars ideally suited to California conditions

B. To evaluate imported germplasm with characteristics desired by the California avocado industry - to take the best new germplasm from around the world and assess its suitability for California avocado growers

1. To evaluate new avocado rootstocks and fruiting cultivars imported into California

Deliverable: The suitability of rootstocks or fruiting scions for California growing conditions

Outcome: Increased income and lowered costs of production for California avocado growers

Activity: *Plant physiologists conduct a program of evaluating imported avocado rootstocks and fruiting cultivars for suitability under California growing conditions*

Draft Concept of California Avocado Industry Expectations of Quality Strategy - May 2011

Author: Jonathan Dixon

A. Guarantee of use to consumers

1. Consistent ripening throughout the harvest season

Deliverable: An understanding of the ripening characteristics at different fruit maturities

Outcome: Tools for predicting the ripening characteristics of California avocados at a range of maturities

Activity: *Postharvest physiologists to determine the variability in ripening of California avocado fruit at different maturities and growing districts*

2. Freedom from defects

Deliverable: The causes of fruit defects and possible control methods for California avocados

Outcome: Avocados harvested from California avocado groves are free from defects

Activity: *Plant physiologists, Plant pathologists and Entomologists examine the causes of fruit defects and investigate control methods to reduce fruit defects*

B. Consistent eating experience

1. Harvest window for best eating quality

Deliverable: Information on the characteristics of the fruit that mark the decline in fruit quality as the fruit become increasingly mature

Outcome: The ideal harvest period for California in different growing districts

Activity: *Postharvest physiologists to analyze the components of fruit maturity and their relationship to fruit quality*

2. Consistent taste characteristics

Deliverable: Information on the components of avocado flavor

Outcome: Avocado fruit that are reliable in having ideal taste characteristics

Activity: Postharvest physiologists to investigate the flavor characteristics of avocado fruit and changes to flavor at different fruit maturities from different growing districts

3. Inventory management according to market conditions

Deliverable: An understanding of the effect on fruit storability and quality to consumers and customers when fruit need to be held in storage due to slow fruit sales

Outcome: Risk management tools for the varying storage times of fruit when market conditions have slow inventory movement

Activity: Postharvest physiologists to characterize the effect of increased storage times during different parts of the harvest season on fruit quality

Attachment B

Draft Strategic Technical Requirements **6. Requirements for Effective Grower Education**

A. All access to knowledge

1. Research reports

Deliverable: All research agreements require comprehensive reports in formats that allow publication using up-to-date technology.

Outcome: All research funded by the California Avocado Commission is available to California avocado growers.

2. Database of knowledge

Deliverable: A repository of avocado knowledge that has an easy to use search feature which also is continually updated with new information from around the world.

Outcome: All information available on avocados is collated into a single database.

3. Easy location

Deliverable: A repository of avocado knowledge that is maintained in an avocado centric location.

Outcome: All information is available in an easily accessed location.

B. No barrier to participate

1. Learning in Spanish

Deliverable: Outreach materials and presentations have English to Spanish or Spanish to English translations.

Outcome: Outreach activity can be presented in English and Spanish.

2. Grower friendly locations and times

Deliverable: A selection of location options to conduct outreach and other associated grower education activities that are close to the main growing regions. Where there is sufficient interest outreach activities outside of normal work hours offered.

Outcome: Outreach activity is in locations within reasonable driving distance and at times that do not conflict with other grower activities

3. Multiple participation times

Deliverable: A system where interest in outreach activity can be registered and the activity can be matched to the availability of participants.

Outcome: Outreach activity can be repeated for different groups of growers.

C. Increase in knowledge - this is regardless of educational background

1. Summarize and explain concepts

Deliverable: Identification of key concepts for successful avocado production and presentation of key concepts in easy-to-understand new non-scientific formats.

Outcome: Key concepts are described in a way easily understood by California avocado growers.

2. Depth and detail of topics

Deliverable: Individual subjects related to growing avocados are described in increasing detail from basic summaries to technical treatises allowing California avocado growers to select the depth of knowledge they wish to access.

Outcome: Detailed information is available on key topics.

3. Short pathway from research to grower for both domestic and international science

Deliverable: A system where new information is formatted and published to the database of knowledge.

Outcome: New knowledge is available to California avocado growers promptly.

D. Utilize new knowledge

1. Applying new systems

Deliverable: Description of new methods for growing avocados to be used by California avocado growers to trial new growing methods that include measurement and analysis of improvement in profitability.

Outcome: New ideas for growing systems are trialed by California avocado growers

2. Focus farms/demonstration groves

Deliverable: Establishment and maintenance of avocado groves managed to specific protocols with key cultural management activities measured. These groves then used for regular field days to demonstrate cultural management and to serve as centers of discussion on grove management.

Outcome: Practical demonstration of avocado growing techniques.

3. Growing guides

Deliverable: Pocket sized booklets that are weather-proof and contain essential information for assessing the trees California avocado growers can use while on the grove.

Outcome: Easy to read essential facts available to California avocado growers.

E. Innovation culture

1. Expert forums

Deliverable: Establishment of a number of discussion forums covering subjects important to growing avocados comprised of experts and interested California avocado growers.

Outcome: Discussion between California avocado growers and experts.

2. Grower discussion groups

Deliverable: The establishment of discussion groups composed of California avocado growers within the same neighborhood for sharing of ideas and experiences in growing avocados.

Outcome: Discussion between California avocado growers on common themes to improve cultural management.

7. Requirements for Information Systems

A. Collection

1. Monitoring of trees

Deliverable: A system for measuring and collating to central database the phases of the tree growth cycle.

Outcome: California avocado trees phenological state defined at all times of the year.

2. Real time monitoring of pests and diseases

Deliverable: A system for measuring and collating to a central database pest and disease populations.

Outcome: California avocado growers know population changes of pests and diseases in real time.

3. Grove management monitoring

Deliverable: Methods for collecting information on the growth and development of fruit, tree growth and expenditure for addition to a central database.

Outcome: California avocado trees meeting expectations of yield, growth and costs.

4. Climate and weather

Deliverable: A system for collating to a central database weather information.

Outcome: Extreme weather events are signaled in time to allow for mitigation practices.

B. Analysis

1. Changes in key systems

Deliverable: Methods to describe changes in key systems related to the growth and development of the tree and fruit and grove costs.

Outcome: Key systems on the grove affecting income and costs changes identified.

2. Economic impacts

Deliverable: Methods to describe the economic impact of changes in the timing of tree growth cycle events, pest and disease populations and weather events.

Outcome: Progressive changes in profitability are tracked throughout the year.

3. Real time inputs and feedback

Deliverable: A system that describes in real time changes on the grove to the trees and yields.

Outcome: Cultural management decisions effectiveness is tracked.

C. Meaning

1. Snapshot of the grove

Deliverable: A description of the key factors on the grove influencing profitability.

Outcome: A concise summary of the grove.

2. Managing to the thresholds of economic damage

Deliverable: A system that alerts the grower to potential economic damage.

Outcome: Economic damage is minimized.

D. Change

1. Grove doctor - holistic diagnosis and treatment of grove management

Deliverable: A system that analyses the state of the grove and recommends mitigation activity.

Outcome: Advice on grove issues is available.

2. Decision support systems

Deliverable: Methods that summarize information collected from the grove and analyze the success or failure of cultural management activity.

Outcome: Timely application of cultural management activities.

REFERENCE MATERIALS

THE CALIFORNIA AVOCADO COMMISSION'S TECHNICAL REQUIREMENTS

In aligning its technical and outreach effort with the other elements of the Commission's business plan, the CAC Board and Production Research Committee have determined the most important strategic technical requirements for the industry. Concept Proposals are now being sought for technical initiatives that meet the Commission's strategic requirements and the long and short-term needs of California Avocado Growers. The following list describes each of the strategic requirements by deliverable and expected outcome. The Technical Initiatives presented in proposals must be designed to meet at least one of the requirements in the list.

1. Requirements for Growing Systems

A. Profitable growing systems

Deliverable: Methods of fruit production that are the most productive and cost efficient and sustainable

Outcome: Profitability of producing avocados in California increases

1. Grow more fruit

Deliverable: Methods focused on improved tree nutrition, canopy health and root health that allow individual avocado trees to set and hold to the maximum of the trees yield potential each year.

Outcome: Avocado trees achieve an average 15,000 pounds per acre of fruit

2. Produce fruit more consistently

Deliverable: Methods where high yields of fruit on avocado trees are maintained from year to year

Outcome: Avocado trees where high yields vary by less than 10% per year

3. Produce bigger fruit

Deliverable: Methods where the fruit size obtained at harvest meets grower expectations

Outcome: Avocado trees producing fruit of a desired fruit size profile

4. Maintain smaller trees

Deliverable: Methods that allow tree size to be decreased without affecting tree yields

Outcome: Avocado trees readily maintained at a height that can be harvested at low cost but maintain high yields

5. Use less water

Deliverable: Improved application and scheduling of water on California avocado groves for maximum efficiency of use

Outcome: Increased profitability of water use on California avocado groves

6. Use salty water

Deliverable: Allow California avocado growers to utilize low quality water for high yields
Outcome: Avocado trees in California using saline water without decreases in yield

B. Expand the growing regions in California - the opening up of non-traditional growing areas for avocados in California brings the opportunity to expand the acreage of avocados where the input costs of production are inherently lower

1. Identifying potential growing regions

Deliverable: An assessment of the suitability of growing avocados in different regions/districts of California

Outcome: Risk assessment of growing avocados in non-traditional regions of California

2. Requirements for Harvest Strategy

A. Understanding the consequences of current harvest strategy - harvest decisions are mostly based on assessment of market prices and not tree health or consequences to future yields. Therefore an understanding of the risk to future production should also be an important consideration for harvest strategy.

1. Physiological consequences to the trees of late harvest

Deliverable: Information on the effect on tree phenology, hormones and molecular control mechanisms from late harvesting and mitigating strategies

Outcome: High production maintained on trees where fruit has been harvested late

2. Fruit drop versus increase in income

Deliverable: A model that shows that relationship between fruit drop from holding fruit longer on trees and expected increase in income

Outcome: A risk management tool that allows a California avocado grower to conduct a sensitivity analysis on holding fruit on the tree versus an increase in income

3. Impact on fruit quality of late harvest

Deliverable: Protocols for handling late harvest fruit in the market and an understanding of the ripening characteristics

Outcome: Consistent quality of California fruit for the entire harvest season

B. Relating harvest strategy to phenology - developing an the skills to understand tree condition and the crop to maturity and harvest season

1. Impact of early harvest on fruit set

Deliverable: The relationship between timing of harvest and fruit set in the year of harvest and future fruit set

Outcome: An understanding of the impact on fruit set of different timing of harvest

2. Harvest timing in relation to tree growth cycles

Deliverable: The impact of different harvest timings on changing the timing of phenological events in the tree growth cycle

Outcome: Cultural management activities that maintain consistent and high yields when changing the time of harvest

C. Alternative harvest strategies - what other methods could California avocado growers use for harvesting their fruit?

1. Select harvesting

Deliverable: The response of the tree in fruit sizing and productivity when different select harvesting strategies are used

Outcome: Grower desired fruit sizes are achieved without harming the future productivity of the trees when using multiple select harvests

2. Single harvest

Deliverable: The effect on yields, fruit size and consistency of yield when a harvest strategy of a single strip pick is used

Outcome: Cultural management activities that result in fruit of a grower desired fruit size profile at one point in time

3. Requirement for Evaluation and Development of New Germplasm

A. Produce new avocado scions or rootstocks with desired characteristics to increase grower income or reduce cost of production - seeking to use a blend of traditional methods and new technology to increase the speed at which new germplasm becomes available to California avocado growers

1. To breed, evaluate and release new rootstocks

Deliverable: New avocado rootstocks with the characteristics of pest and disease resistance or tolerance, salinity tolerance and reduced tree size while maintaining consistently high yields

Outcome: Increased income and reduced costs of production for California avocado growers

2. To breed, evaluate and release new fruiting cultivars or enhanced standard cultivars

Deliverable: New avocado fruiting cultivars with consistent high yields, early or late maturity fruit, ideal eating characteristics, pest resistance and ideal tree structure

Outcome: Increased income and reduced costs of production for California avocado growers

B. To evaluate imported germplasm with characteristics desired by the California avocado industry - to take the best new germplasm from around the world and assess its suitability for California avocado growers

1. To evaluate new avocado rootstocks and fruiting cultivars imported into California

Deliverable: The suitability of rootstocks or fruiting scions for California growing conditions

Outcome: Increased income and lowered costs of production for California avocado growers

4. Requirements for Expectations of Quality

A. Guarantee of use to consumers

1. Consistent ripening throughout the harvest season

Deliverable: An understanding and tools for predicting ripening characteristics at different fruit maturities

Outcome: Reliable ripening characteristics of California avocados at a range of maturities

2. Freedom from defects

Deliverable: The causes of fruit defects and possible control methods for California avocados

Outcome: Avocados harvested from California avocado groves are free from defects

B. Consistent eating experience

1. Harvest window for best eating quality

Deliverable: Information on the characteristics of the fruit that mark the decline in fruit quality as the fruit become increasingly mature

Outcome: The ideal harvest period for California in different growing districts

2. Consistent taste characteristics

Deliverable: Information on the components of avocado flavor

Outcome: Avocado fruit that are reliable in having ideal taste characteristics

3. Inventory management according to market conditions

Deliverable: Risk management tools for the varying storage times of fruit when fruit need to be held in storage due to slow fruit sales

Outcome: California avocados have consistent quality irrespective of market conditions

5. Requirements for Pest Management

A. Established pests - these are insects that cause economic damage directly to the fruit or to the productive capacity of the trees.

1. Survey for avocado pests in California and associated natural predators

Deliverable: A list of avocado pests and their natural enemies within California

Outcome: Scientific publications in peer reviewed journals to provide APHIS with credible documentation on presence of pests

2. Economic damage analysis of California pests

Deliverable: An analysis of the economic damage for each pest

Outcome: The annual cost to the California avocado industry for each established pest. Scientific publications in peer reviewed journals

3. Grove monitoring of established pests in California avocado groves

Deliverable: Protocols and tools for monitoring California avocado trees and fruit for established pests

Outcome: Sampling methods, real-time population monitoring of avocado pests within California, control treatments applied according to documented need.

4. Best practice management of established avocado pests in California avocado groves

Deliverable: Protocols for chemical usage and biological control to avoid resistance to control methods.

Outcome: Control options (chemical tools, bio-control etc) are maintained for a long time. Economic damage from established pests is reduced. Control of California avocado pests can be demonstrated to be sustainable.

8. Requirements for Sustainability

Attachment C **Comments by R Hofshi**

6. Requirements for Effective Grower Education

I am glad this comprehensive approach is being considered. Throughout the years we have tried most of these suggestions with an initial enthusiasm and then rapid decline in interest both from the Board and the grower community. Somehow we were not able to keep the momentum going. I truly hope this will work this time. The grower needs to benefit from research and not only pay for it.

It appears from what is suggested that the education goal is more regionally focused activities which is fair to some extent (Ventura County goes from cool coastal to very warm interior thus sub regions).

There is no opportunity for those interested in getting together at least once a year and listen not only to research results but also to each other. The annual symposium was the venue where such an event was welcomed for years; we need to revive the annual research symposium; the only opportunity growers from the entire industry can participate and interact. At the 2010 meeting at UCR with CAC President and Chairman, the researchers requested that CAC reinstate this important meeting and were told that this would happen. This is the only place where all funded researchers present posters, interact with the growers and with each other.

A. All access to knowledge

1. Research reports

Deliverable: All research agreements require comprehensive reports in formats that allow publication using up-to-date technology.

Outcome: All research funded by the California Avocado Commission is available to California avocado growers.

2. Database of knowledge

Deliverable: A repository of avocado knowledge that has an easy to use search feature which also is continually updated with new information from around the world.

Outcome: All information available on avocados is collated into a single database. Will this be web based? If so, isn't avocadosource.com serving this function already? You can contract with The Hofshi Foundation to maintain this database. If there is dissatisfaction with the ease of searching avocadosource, provide us with some ideas; don't rediscover the wheel. We will be happy to work with CAC to expand the website. An example in mind: we would like to revisit the calculators and update certain aspects such as soil type and field capacity and drainage to idealize the results generated by the irrigation calculator; we can use some help rather than CAC starting from scratch.

3. Easy location

Deliverable: A repository of avocado knowledge that is maintained in an avocado centric location.

Outcome: All information is available in an easily accessed location.

If the intent is to have a library like setting I believe we will be wasting the effort. There is no easy way to search printed material. This concept has been tried before when the internet was not as popular and with little interest.

B. No barrier to participate

1. Learning in Spanish

Deliverable: Outreach materials and presentations have English to Spanish or Spanish to English translations.

Outcome: Outreach activity can be presented in English and Spanish.

This is valuable and necessary for some of the outreach material. It will have to be in field workers' Spanish.

2. Grower friendly locations and times

Deliverable: A selection of location options to conduct outreach and other associated grower education activities that are close to the main growing regions. Where there is sufficient interest outreach activities outside of normal work hours offered.

Outcome: Outreach activity is in locations within reasonable driving distance and at times that do not conflict with other grower activities

3. Multiple participation times

Deliverable: A system where interest in outreach activity can be registered and the activity can be matched to the availability of participants.

Outcome: Outreach activity can be repeated for different groups of growers.

C. Increase in knowledge - this is regardless of educational background

1. Summarize and explain concepts

Deliverable: Identification of key concepts for successful avocado production and presentation of key concepts in easy-to-understand new non-scientific formats.

Outcome: Key concepts are described in a way easily understood by California avocado growers.

The CAS avocado manual has much of this already and needs to be amplified and enhanced and maybe translated into Spanish. Similar material is available as links associated with the calculators on avocadosource. Frank Koch's book is also a great resource albeit outdated. Again, I don't think we need to reinvent the wheel but build upon past efforts. The CAS avocado manual would be a good place to start. This will benefit CAS and the grower community of California at large.

2. Depth and detail of topics

Deliverable: Individual subjects related to growing avocados are described in increasing detail from basic summaries to technical treatises allowing California avocado growers to select the depth of knowledge they wish to access.

Outcome: Detailed information is available on key topics.

There is so much you can do with the depth of knowledge. We need to provide a base level, that is not necessarily entry level and if someone needs more in depth; such material is available in the database and the internet. I have found that the people that want in-depth knowledge are those already familiar with looking for it themselves on the internet and elsewhere.

3. Short pathway from research to grower for both domestic and international science

Deliverable: A system where new information is formatted and published to the database of knowledge.

Outcome: New knowledge is available to California avocado growers promptly.

CAC is doing a good job at posting research results and the presentations from the CAC/CAS seminars. International knowledge (international yearbooks for example) will not be shared directly with CAC. We worked hard at avocadosource to reach a level of neutrality where different industries provide us with research results. The same thing is true for peer reviewed literature. I don't believe that ASHS or Elsevier will allow CAC to post literature free of charge if at all..

D. Utilize new knowledge

1. Applying new systems

Deliverable: Description of new methods for growing avocados to be used by California avocado growers totrial new growing methods that include measurement and analysis of improvement in profitability.

Outcome: New ideas for growing systems are trialed by California avocado growers

2. Focus farms/demonstration groves

Deliverable: Establishment and maintenance of avocado groves managed to specific protocols with key cultural management activities measured. These groves then used for regular field days to demonstrate cultural management and to serve as centers of discussion on grove management.

Outcome: Practical demonstration of avocado growing techniques.

I understand that some cooperators who receive trees for trials don't bother planting the trees. We need a system to follow up on these investments and help the researchers identify good cooperators. We had that when CAC hired Wayne Brydon a few years back.

3. Growing guides

Deliverable: Pocket sized booklets that are weather-proof and contain essential information for assessing the trees California avocado growers can use while on the grove.

Outcome: Easy to read essential facts available to California avocado growers.

This is good from phenology to pests. Again, there is an excellent IPM manual published by UC for avocados. Part of this manual was funded by CAC. All this information is also available on the UC-IPM website. A pocket sized book is a good idea but I would suggest that CAC work with UC publishing to do this so we don't have to rewrite everything about diseases and pests and to obtain high quality photographs that are already in the IPM manual.

E. Innovation culture

1. Expert forums

Deliverable: Establishment of a number of discussion forums covering subjects important to growing avocados comprised of experts and interested California avocado growers.

Outcome: Discussion between California avocado growers and experts.

We used to have international liaison program that was very successful, last to visit was Inaki Hormaza. This has been discarded. Hearing our own experts over and over again is not so interesting. We already get their research reports. We need to invite experts to visit. We had great turnout when Whiley, Stassen, Ish Am and others were invited. I support building this program up again.

2. Grower discussion groups

Deliverable: The establishment of discussion groups composed of California avocado growers within the same neighborhood for sharing of ideas and experiences in growing avocados.

Outcome: Discussion between California avocado growers on common themes to improve cultural management.

The need for an annual symposium is evident, we need industry sharing of ideas.

7. Requirements for Information Systems

A. Collection

Much of the ideas below could be covered by relatively inexpensive agronomists that are sufficiently professional to be of great help to growers (the closest we can get to private consultants). If growers are happy and use the agronomists the program will become independent of 100% CAC financial backing as growers will be willing to participate in the program.

1. Monitoring of trees

Deliverable: A system for measuring and collating to central database the phases of the tree growth cycle.

Outcome: California avocado trees phenological state defined at all times of the year.

2. Real time monitoring of pests and diseases

Deliverable: A system for measuring and collating to a central database pest and disease populations.

Need cooperation by PCAs; we can't alienate this very important group that serves the industry well. We tried several years ago to also work with Kris Lynn at UCKAC who does this sort of work and it got bogged down with lack of access to CAC grower maps.... But this is a good idea and could be linked easily to the pocket-sized booklet concept above.

Outcome: California avocado growers know population changes of pests and diseases in real time.

3. Grove management monitoring

Deliverable: Methods for collecting information on the growth and development of fruit, tree growth and expenditure for addition to a central database.

Outcome: California avocado trees meeting expectations of yield, growth and costs.

4. Climate and weather

Deliverable: A system for collating to a central database weather information.

Outcome: Extreme weather events are signaled in time to allow for mitigation practices.

B. Analysis

1. Changes in key systems

Deliverable: Methods to describe changes in key systems related to the growth and development of the tree and fruit and grove costs.

Outcome: Key systems on the grove affecting income and costs changes identified.

2. Economic impacts

Deliverable: Methods to describe the economic impact of changes in the timing of tree growth cycle events, pest and disease populations and weather events.

Outcome: Progressive changes in profitability are tracked throughout the year.

3. Real time inputs and feedback

Deliverable: A system that describes in real time changes on the grove to the trees and yields.

Outcome: Cultural management decisions effectiveness is tracked.

C. Meaning

1. Snapshot of the grove

Deliverable: A description of the key factors on the grove influencing profitability.

Outcome: A concise summary of the grove.

2. Managing to the thresholds of economic damage

Deliverable: A system that alerts the grower to potential economic damage.

Outcome: Economic damage is minimized.

D. Change

1. Grove doctor - holistic diagnosis and treatment of grove management

Deliverable: A system that analyses the state of the grove and recommends mitigation activity.

Outcome: Advice on grove issues is available.

Agronomists are best qualified to do this.

2. Decision support systems

Deliverable: Methods that summarize information collected from the grove and analyze the success or failure of cultural management activity.

Outcome: Timely application of cultural management activities.

As mentioned above; there are several calculators on avocadosource that could be amplified if necessary. CAC is welcome to participate.

REFERENCE MATERIALS

THE CALIFORNIA AVOCADO COMMISSION'S TECHNICAL REQUIREMENTS

In aligning its technical and outreach effort with the other elements of the Commission's business plan, the CAC Board and Production Research Committee have determined the most important strategic technical requirements for the industry. Concept Proposals are now being sought for technical initiatives that meet the Commission's strategic requirements and the long and short-term needs of California Avocado Growers. The following list describes each of the strategic requirements by deliverable and expected outcome. The Technical Initiatives presented in proposals must be designed to meet at least one of the requirements in the list.

1. Requirements for Growing Systems

A. Profitable growing systems

Deliverable: Methods of fruit production that are the most productive and cost efficient and sustainable

Outcome: Profitability of producing avocados in California increases

1. Grow more fruit

Deliverable: Methods focused on improved tree nutrition, canopy health and root health that allow individual avocado trees to set and hold to the maximum of the trees yield potential each year.

Outcome: Avocado trees achieve an average 15,000 pounds per acre of fruit

2. Produce fruit more consistently

Deliverable: Methods where high yields of fruit on avocado trees are maintained from year to year

Outcome: Avocado trees where high yields vary by less than 10% per year

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Deliverable: Methods where the fruit size obtained at harvest meets grower expectations

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5. Use less water

Deliverable: Improved application and scheduling of water on California avocado groves for maximum efficiency of use

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6. Use salty water

Deliverable: Allow California avocado growers to utilize low quality water for high yields
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1. Identifying potential growing regions

Deliverable: An assessment of the suitability of growing avocados in different regions/districts of California

Outcome: Risk assessment of growing avocados in non-traditional regions of California

2. Requirements for Harvest Strategy

A. Understanding the consequences of current harvest strategy - harvest decisions are mostly based on assessment of market prices and not tree health or consequences to future yields. Therefore an understanding of the risk to future production should also be an important consideration for harvest strategy.

1. Physiological consequences to the trees of late harvest

Deliverable: Information on the effect on tree phenology, hormones and molecular control mechanisms from late harvesting and mitigating strategies

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2. Fruit drop versus increase in income

Deliverable: A model that shows that relationship between fruit drop from holding fruit longer on trees and expected increase in income

Outcome: A risk management tool that allows a California avocado grower to conduct a sensitivity analysis on holding fruit on the tree versus an increase in income

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Deliverable: Protocols for handling late harvest fruit in the market and an understanding of the ripening characteristics

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A. Produce new avocado scions or rootstocks with desired characteristics to increase grower income or reduce cost of production - seeking to use a blend of traditional methods and new technology to increase the speed at which new germplasm becomes available to California avocado growers

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Deliverable: New avocado rootstocks with the characteristics of pest and disease resistance or tolerance, salinity tolerance and reduced tree size while maintaining consistently high yields

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Deliverable: The suitability of rootstocks or fruiting scions for California growing conditions

Outcome: Increased income and lowered costs of production for California avocado growers

4. Requirements for Expectations of Quality

A. Guarantee of use to consumers

1. Consistent ripening throughout the harvest season

Deliverable: An understanding and tools for predicting ripening characteristics at different fruit maturities

Outcome: Reliable ripening characteristics of California avocados at a range of maturities

2. Freedom from defects

Deliverable: The causes of fruit defects and possible control methods for California avocados

Outcome: Avocados harvested from California avocado groves are free from defects

B. Consistent eating experience

1. Harvest window for best eating quality

Deliverable: Information on the characteristics of the fruit that mark the decline in fruit quality as the fruit become increasingly mature

Outcome: The ideal harvest period for California in different growing districts

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1. Survey for avocado pests in California and associated natural predators

Deliverable: A list of avocado pests and their natural enemies within California

Outcome: Scientific publications in peer reviewed journals to provide APHIS with credible documentation on presence of pests

2. Economic damage analysis of California pests

Deliverable: An analysis of the economic damage for each pest

Outcome: The annual cost to the California avocado industry for each established pest. Scientific publications in peer reviewed journals

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Deliverable: Protocols and tools for monitoring California avocado trees and fruit for established pests

Outcome: Sampling methods, real-time population monitoring of avocado pests within California, control treatments applied according to documented need.

4. Best practice management of established avocado pests in California avocado groves

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