



California Avocado Commission

Production Research Priorities

California Avocado Commission
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Cultural Methods

High Priority Topics:

1. Updated Cost Studies;
 - a. Farming is a business and costs vary depending on operation size and location. A project updating the 2011 Cost Study, providing reference formats for cost analysis, and general reference information to growers would be of value.
 - b. Updated avocado cost studies - UC Davis, Riverside, Cal Poly SLO for northern growing regions. Possible senior Projects using 2011 Cost study updated with pricing
2. “Above Average Grower” Survey
 - a. The annual California production average is between 5000-7000 pounds per acre however there are growers who consistently outperform this average with 10-year average yields exceeding 12,000 pounds per acre. A project that quantifies what practices and/or conditions allow for this level of success would provide a framework for growers to invest in their operations and build future yields.
3. Leaching Fractions with Modern Rootstocks and Water Sources
 - a. Reclaimed water is becoming more available but differs chemically from well and surface water sources. Work assessing how management techniques may need to differ when using these water sources may be of interest.
4. Nitrogen planning and nitrate credits
 - a. Nitrogen regulations will impact avocado growers in the future. Many wells and some reclaimed water may contain high nitrate levels, however this nitrogen source does not seem to be 100% plant usable. Work assessing the efficiency of nitrate in well water as a nitrogen source is needed. How does a fertilizer program need to be adjusted for these nitrates?
 - b. Are current nitrogen recommendations correct for all clonal rootstocks and scion varieties? Some cultivars, such as GEM, can flower very heavily and defoliate. Would increased nitrogen be an effective strategy to mitigate this behavior?
5. Investigate and Evaluate Current Research into Soil Health;
 - a. USDA has conducted considerable research into soil health, somewhat at the cornerstone of sustainability. The objective is the building of organic matter. Quantitatively OM translates into higher crop yields. How does this research relate to commercial avocado production in California, and if so the best approach to evaluate it and ultimately educate growers for their application.

Other Topics of Interest:

6. Rootstock trials for high carbonate and salinity conditions (Do we have enough areas with high carbonates issues that would make it worth establishing a trial?)
7. Tree stress monitoring tools review
8. Use of sulfur for soil acidification. Rates and timing by soil general type (injection of sulfuric acid vs. sulfur burner vs soil applied dry sulfur).
9. Does mulch have effects in frost areas? Does it make it colder or warmer?
10. Is pulse irrigation better than other methods? Do avocados like it or are their roots too saturated too often?
11. Can you apply too much fertilizer that it will harm the tree? Can you oversalt an avocado tree to the point of killing it with common fertilizer?
12. Precision Farming; Introduce the concepts of precision farming into avocado production in California

Irrigation

High Priority Topics:

13. Small farm automation cost analysis: many different systems exist that integrate soil moisture sensors and weather stations with automatic valves and computers to manage irrigation more efficiently and effectively. How does efficient irrigation improve grove performance (yield, phytophthora levels, pest pressure, fertilizer uptake efficiency, etc.). If automation doesn't improve these then does it ever make economic sense to invest in these systems? At what scale does it make economic sense for growers to invest in these systems?
14. Determine practical cultural practices to help mitigate chloride in groves and pursue promising technologies for this problem.
 - a. Salinity in general, and chlorides specifically, are especially detrimental to avocado production. What cultural practices or promising technologies exist to practically manage salinity and chlorides in California avocado groves?

Other Topics of Interest:

15. Irrigation Planning/Management tool including water budgeting tool
16. Small farm automated valves
17. Determine appropriate timing and duration of leaching irrigation for different levels of salinity in irrigation water, soil type, effects of winter rains, weather, etc. to maintain a healthy soil solution for avocado trees.

Pest Research

High Priority Topics:

18. Avocado Lace Bug: Dr. Mark Hoddle recently completed detailed work on the biology of the avocado lace bug in California. Important follow-up work is now needed to develop management practices for this pest of increasing importance to avocado growers.

- a. Develop effective scouting methods to accurately assess lace bug populations in avocado groves.
 - b. Determine treatment thresholds for lace bugs based on feeding damage and predicted damage based on the new biology and lifecycle data so that timely control measures can be implemented.
 - c. Conduct pesticide efficacy trials for the avocado lace bug.
- 19. Fruit flies: California has seen an unusually high number of fruit fly invasions in recent years. Hass avocados are recognized by the USDA as a non-host of fruit flies in their mature, hard green state on the tree, but this status cannot be extended to other varieties without data to support each variety's non-host status.
 - a. Data are needed for GEM, Lamb Hass and other minor varieties to establish their non-hosts status. Ideally, these data will be collected in areas where fruit fly species of importance (Oriental fruit fly, Mediterranean fruit fly, Mexican fruit fly, Queensland fruit fly) are naturally occurring, in cooperation with local cooperators, to avoid having to establish colonies in quarantine facilities in California.
- 20. Avocado thrips degree day model: the data for the existing degree day model for avocado thrips were collected about 25 years ago. Compared to current techniques for this type of work, these data are very outdated and do not reflect changes in population biology or climate that have taken place over the past 25 years.
 - a. Updated data, similar to what was recently completed for the North American bean thrips, for the degree day model of avocado thrips is needed to help avocado growers more effectively manage this pest.

Other Topics of Interest:

- 21. Persea mite bio-control
- 22. How can we measure overall tree stress levels to observe how heavy pest presence impacts productivity/fruitfulness? Dendrometers? NDVI?
- 23. Find out the impact on leaf productivity of both Persea Mite and Avocado Brown Mite in order to develop a treatment threshold to prevent both damage to tree health and over-spraying of miticides.
- 24. Make field studies to determine naturally occurring biocontrol agents currently active for both Persea Mite and Avocado Thrips as possible candidates for insectary mass-rearing and release.
- 25. Elucidate the role of *Eusieus hibisci*, a common predatory mite on avocados throughout California, in controlling Avocado Thrips and if there is a link between numbers of *E. hibisci* found in an orchard and the severity of Avocado Thrips pressure.

Ag Chem Product Research

High Priority Topics:

26. Avocado thrips and perseia mite management: Abamectin has been the primary tool for managing avocado thrips and perseia mite for decades and concern about resistance is growing.
- A survey of thrips and mite populations for abamectin resistance throughout California avocado groves would be helpful to pest control advisors for making informed decisions about abamectin use.
 - What insecticides are most effective against perseia mite and avocado thrips that can be used in lieu of abamectin?
 - What are the best timing, rate, adjuvants to use in combination with pesticides for most effective control of mites and thrips? Are any products effective if applied through chemigation?
 - What new bee-safe products are available to replace neonics?
 - What products are effective for control in organic production systems?
27. Resistance management of chemical controls for Phytophthora. How best to rotate phosphites, Orondis and Ridomil for maximum effect and control of resistance management.
- Are any phytophthora populations in California avocado groves showing resistance to currently registered products?
 - Do other active ingredients exist that could be added to the suite of products available for phytophthora management?
28. Avocado Branch Canker (Dothiorella canker, Botryosphaeria canker): recent research projects have done a good job of identifying the suite of pathogens causing branch canker in California avocado groves.
- a. Research is needed to screen fungicides for control and work with manufacturers to get products registered (ex. Syngenta Topsin)
 - b. Cultural management practices for branch canker control: pruning, when to prune, how to prune, sanitation practices, tree removal/when to remove trees.

Other Topics of Interest:

29. Evaluate Microbes that convert or fix atmospheric nitrogen to plant utilizable nitrate nitrogen. Rationale: Source of nitrogen with the potential of being more economical than nitrogen produced via petroleum and natural gas, both now and in the future. (ex: Pivot Bio, Kula Bio, Azotic Technologies, Joyn Bio, Max Plans Institute for Terrestrial Microbiology, New Leaf Symbiotic, Intrinsyx Bio, Novozymes, Corteva Utrisha)
30. Evaluate Microbes that enhance the availability and utilization of phosphate by plants. Phosphate is very immobile within the soil, certain microbes can enhance uptake and reduce the quantities of phosphate applied. (ex: Novozymes, AgBiome, BioConsortia, Bayer, Stoller, Valent BioSciences, Verdesian, Lallemand Plant Care, Symborg)
31. Humic Acids; Humates are known to provide a carbon source for stimulating the soil microbiome, which in turn provides for enhanced uptake of macro, secondary and minor elements. Research into evaluating what microbes are stimulated (UC Santa Barbara Ph.d.

project) and their efficacy in taking up nutrients by humic acid...objective is to reduce the quantities of fertilizer.

32. Deer Control; Deer cause significant damage to newly planted groves (and established) each year. Several candidate sprays are being advertised. Set up and evaluate deer repellants in randomized trials. Establish project to survey for potential repellants
33. Additional research into alternative weed control methods for new orchards.
34. Preemergent herbicide use on new orchards assessing impacts on tree establishment.

Current and Recently Funded Projects

Does artificial pollination improve yield of Hass and GEM avocado?

Lead PI: Mary Lu Arpaia, University of California, Riverside; 2024-2026

Evaluating diverse avocado rootstocks for salinity using morphological, ionic, and physiological parameters

Lead PI: Jorge Ferreira and Devinder Sandhu, USDA Salinity Lab; 2026

Addressing the relationship between soil characteristics and soil salinity in California avocado orchards

Lead PI: Jennifer King, University of California, Santa Barbara; 2025-2027

Adapting a user-friendly online irrigation calculator to avocados

Lead PI: Andre Biscaro, University of California Cooperative Extension; 2024-2025

Developing tools and information on crop water use and effective irrigation management for more profitable and sustainable avocado production

Lead PI: Ali Montazar, University of California Cooperative Extension, 2022-2025

Assessing irrigation management tools and strategies on avocado fruit quality and yield impacts

Lead PI: Ali Montazar, University of California Cooperative Extension; 2025-2028

Creating a weather station network to guide irrigation decision of avocados

Lead PI: Andre Biscaro, University of California Cooperative Extension; 2025-2027

A pesticide resistance monitoring program for avocado thrips

Lead PI: Hamutahl Cohen, University of California Cooperative Extension; 2025-2029

Surveys for avocado fruit feeding insect pests in Guatemala

Lead PI: Mark Hoddle, University of California, Riverside; 2025-2027

Investigating conditional host status of GEM avocado to fruit fly

Lead PI: Elizabeth Dann, Hort Health Pty Ltd, Australia; 2026

Impact of natural vegetation on insect pollinators in agroecosystems

Lead PI: Elizabeth Scordato, Cal Poly Pomona; 2025-2027

Enhancing integrated pest management for avocado lace bug in organic production

Lead PI: Hamutahl Cohen, University of California Cooperative Extension; 2026-2027

Improve Phytophthora cinnamomi management by monitoring field populations for changes in fungicide sensitivity and conducting efficacy field trials

Lead PI: Patricia Manosalva and James Adaskaveg, University of California, Riverside; 2025-2028

Integrated chemical and cultural practices for bot canker control in avocado

Lead PI: Fatemeh Khodadadi, University of California, Riverside; 2025-2027