College of Natural and Agricultural Sciences
Department of Microbiology and Plant Pathology
Riverside, California 92521

November 12, 2024

TO: Department Chairs, Leafy Greens Project Researchers, and others interested in lettuce and spinach research
FROM: Alexander I. Putman, UC Liaison to California Leafy Greens Research Program
SUBJ: Submission of Research Proposals for funding by the California Leafy Greens Research Program in 2025-2026

The California Leafy Greens Research Program will consider proposals for new and continuing research projects for 2025-2026. Please see the list of research priorities on pages 2-6 below. If you have questions regarding the research priorities, you are welcome to contact Jennifer Clarke at the Leafy Greens Research Program's office at 831-424-3782.

To be considered for funding, each proposal should be carefully prepared in accordance with the following instructions:

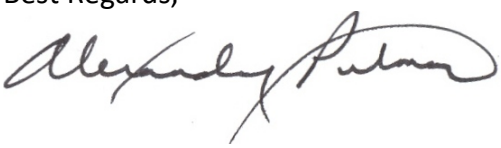
- Adhere to the format found on pages 7-9 below.
- Send the proposal as a single PDF file.
- Obtain the necessary approval but retain the signature page in your own files.
- Submit your proposal electronically to me at **aiputman@ucr.edu** in a new email with the subject "2025 CLGRP RFP", followed by your name. If submitting more than one proposal, send each in a separate email with a unique subject line.
- Proposal submission deadline: **5 pm Pacific** on **December 12, 2024**

If you intend to submit a proposal this year, please contact me by email by November 27, 2024 with a tentative title and brief description (<150 words).

A brief interim progress and/or oral report will be due at mid-year and an annual presentation and report are required at the end of the funding cycle. These requirements should not be considered optional and the dates for the presentations will be included in information sent to you if your project is funded.

You are encouraged to circulate this invitation for proposals to other interested researchers.

Best Regards,



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University of California, Riverside

CALIFORNIA LEAFY GREENS RESEARCH PROGRAM
2025-2026 RESEARCH PRIORITIES

The California Leafy Greens Research Program (CLGRP) funds research on iceberg, romaine, leaf and butter lettuces, spinach, and lettuce components of spring mix. The Board prioritizes practical, applied research projects that address the immediate needs of the industry. While no list of research priorities can be entirely exhaustive, the CLGRP Board welcomes proposals on additional topics, provided they offer potential benefits to the California Leafy Greens Industry. If you have ideas for new projects or need feedback on the level of interest before writing a full proposal, we encourage you to contact us.

PLANT BREEDING

Lettuce

- Develop germplasm resistant to multiple diseases, without compromising postharvest quality and shelf-life performance. Key diseases identified by growers include Downy mildew, Verticillium wilt, lettuce dieback disease, Sclerotinia rot (lettuce drop), Fusarium wilt, Tospoviruses, Bacterial leaf spot, Pythium wilt, Phytophthora, and Black Root Rot. As romaine is now the predominant lettuce type in California, breeding efforts should prioritize this variety.

- Develop germplasm with enhanced nutrient uptake, water-use efficiency, and adaptability to increasingly stressful environmental conditions. This includes improved yield, processing efficiency, resistance to Tipburn, and novel head architecture and leaf traits. Nitrogen and water-use efficiency are critical for maintaining production with reduced inputs.

- Development of germplasm with resistance to both Nasonovia Nr:0 and Nr:1 biotypes.

- Development of germplasm with resistance to thrips and thrips transmitted viruses with a focus on Impatiens necrotic spot virus (INSV).

- Development of lines with improved shelf-life, increased nutritional values, and desirable sensory qualities to support increased consumption and reduce food waste.

- Development of germplasm that has traits that reduce or prohibit the colonization of Shiga toxin-producing E. coli bacteria (STEC), such as E. coli O157:H7 and Salmonella.

Spinach

- Development of durable resistance to spinach downy mildew, with an emphasis on currently described races.

- Development of germplasm with multiple disease and pest resistance: Downy mildew is the major limiting factor in spinach production, particularly for organic growers. The key goal is to develop germplasm with robust polygenic resistance to downy mildew. Germplasm with resistance to leaf spot diseases such as Stemphylium and Cladosporium and damping-off disease (Pythium, Rhizoctonia, and Fusarium) are also needed. Genetic resistance to other diseases and pests will only be valuable if combined with essential downy mildew resistance genes.

- Development of germplasm with improved nutrient uptake and water utilization capabilities and generally improved adaptability for better performance under increasingly stressful environmental conditions.

- Development of germplasm that is less prone to the uptake of heavy metals.

- Development of germplasm with improved processing traits for the fresh-cut industry, including decreased sensitivity to mechanical damage and bruising of leaves (or improved pliability and elasticity).

Spring Mix

- Development of germplasm with multiple disease resistance, emphasizing downy mildew and bacterial leaf spot.

- Development of lines with improved shelf-life, increased nutritional values, and desirable sensory qualities to support increased consumption and reduce food waste.

DISEASE MANAGEMENT ISSUES

Lettuce

Verticillium wilt, Fusarium wilt, Pythium wilt, Sclerotinia, Phytophthora, and Black Root Rot impact lettuce yields on the Central Coast. The industry needs innovative approaches, emphasizing new concepts to limit disease loss from both pathogens.

Thrips and Impatiens necrotic spot virus (INSV) dramatically increased in the Salinas Valley, causing economic loss to growers and shippers. Thrips and INSV have become a top priority for the leafy greens industry, and solutions are urgently needed. Not only has Pythium wilt emerged as a pathogen that is causing significant crop loss in lettuce production, but soil-borne pathogens such as Fusarium, Verticillium, and Sclerotinia have also contributed to losses. These pathogens are also often associated with a co-infection of INSV. The industry needs more information on how cultural practices, chemical applications, weather patterns, and variety selections affect disease severity and co-infections.

Funding up to $200,000 is available for projects that can demonstrate rapid outcomes and solutions for Thrips and INSV management.

Downy mildew is the primary foliar disease in most production areas. In recent seasons, powdery mildew has been more frequently observed in warm, dry production areas. Growers need to know the best approaches for managing foliar disease in conventional and organic production systems.

Spinach

Downy mildew is the most significant disease in spinach production. Crop losses can be substantial in all areas where spinach is produced. While the Board has supported work in monitoring spinach downy mildew races, it is also interested in an integrated approach to explore disease prevention and management techniques utilizing new technologies and breeding strategies that may lead to better control, particularly in organic production systems.

INSECT MANAGEMENT ISSUES

The industry remains interested in research that offers the most effective, economical, and sustainable approaches to ongoing insect management issues. Increased regulatory pressures regarding water quality in agricultural settings indicate the need for continued work confirming which management practices are most effective at keeping residual amounts of insecticides from entering adjacent surface waters while maintaining effective control of insect pests.

Western Flower Thrips

Thrips are problematic not only because of the damage they inflict and the diseases they vector but also because of standards set by export customers regarding the presence of these pests. The industry has seen a rise in insect vectored diseases, particularly Impatiens necrotic spot virus (INSV), which have caused substantial crop loss. See Disease Management Issues above.

Aphids

Several species of aphids cause economic damage to leafy greens. The percentage of acreage under organic production is increasing, and growers have relied on aphid resistance in certain lettuce varieties to control this pest. A new biotype of aphid has emerged, and it appears to have overcome the resistance gene in current commercial varieties. Organic aphid pest management has become a widespread problem without resistant varieties.

Soil-borne Pests

Soil-borne pests remain an issue, and continued work, particularly on springtails, is encouraged.

Integrated Pest Management

The industry is always interested in evaluating new chemistries and comparisons between important insecticidal materials for leafy greens' major pests. A comprehensive approach to integrated insect pest management and the capability to respond to new insect threats remains a priority. Organic growers are particularly challenged with pest management.

VERTEBRATE PEST MANAGEMENT

Rodents

The industry has seen unprecedented increases in rodent activity in leafy green fields. Research is needed to identify the factors driving rodent population growth and develop integrated pest management (IPM) strategies. Key areas include field studies to understand environmental and agricultural drivers, the evaluation of real-time rodent monitoring tools, and the integration of biological, mechanical, habitat management, and chemical controls.

Birds

Growers are experiencing significant bird damage in leafy green fields. Research is needed necessitating research into effective deterrent strategies. This includes studying bird behavior, developing monitoring tools, and evaluating control methods such as habitat modification, deterrents, and exclusion techniques to minimize crop losses while ensuring food safety compliance.

EFFICACY AND SUSTAINABILITY OF BIOLOGICALS

The sustainable production of leafy greens faces significant challenges due to the increasing pressure from pests and diseases, the growing demand for reduced chemical pesticide use, and increased business costs. This priority emphasizes the need for comprehensive studies assessing biologicals' efficacy, safety, economic viability, and environmental impact as part of integrated pest management (IPM) strategies for leafy greens. Please refer to pests and diseases highlighted in the RFP.

- Evaluate the efficacy of biologicals in reducing/managing damage from pests and diseases in leafy greens.

- Develop and promote integrated pest management (IPM) strategies that incorporate biologicals as one component of a whole system program. Investigate the synergistic effects of combining-biologicals with cultural practices, crop rotation, and other pest management techniques.

- Evaluate the cost-effectiveness of adopting biologicals in leafy greens production. Determine the potential for reduced pesticide application costs and increased yields.

- Conduct comprehensive risk assessments to identify potential microbial hazards associated with using biologicals in leafy greens production. Please review the LGMA Metrics section 7b(2) for guidance.

WATER QUALITY, USAGE, AND NUTRIENT MANAGEMENT

Regulations coming from the Regional Water Quality Control Boards will put further pressure on the industry to reduce nitrogen use and tailwater discharge. There is a need to develop and evaluate management practices, equipment, or engineering solutions to minimize off-farm movement of sediment and pest management materials into surface water, increase nitrogen-use efficiency, and prevent nitrate leaching into groundwater. These solutions must be cost-effective and pose a minimal disruption to farming operations. Solutions are also needed to optimize water utilization of lettuce crops in the Salinas Valley and desert growing regions.

SURFACE WATER SANITATION

Research is needed to evaluate and optimize automated water treatment systems to meet the requirements for sanitizing surface water in leafy greens production. This research should focus on testing various systems to determine their effectiveness in maintaining water quality, minimizing sanitizer use, and ensuring compliance with food safety standards. The goal is to identify the most efficient and cost-effective solutions for consistent water sanitation in fresh produce fields.

WEED MANAGEMENT

As the agricultural labor supply shrinks, the industry seeks new, less labor-intensive solutions for weed control.

MECHANIZATION/ROBOTICS

The industry has valued automation in thinning and weeding and continues to seek advancements in mechanization and robotics for weeding, pest management, and harvest.

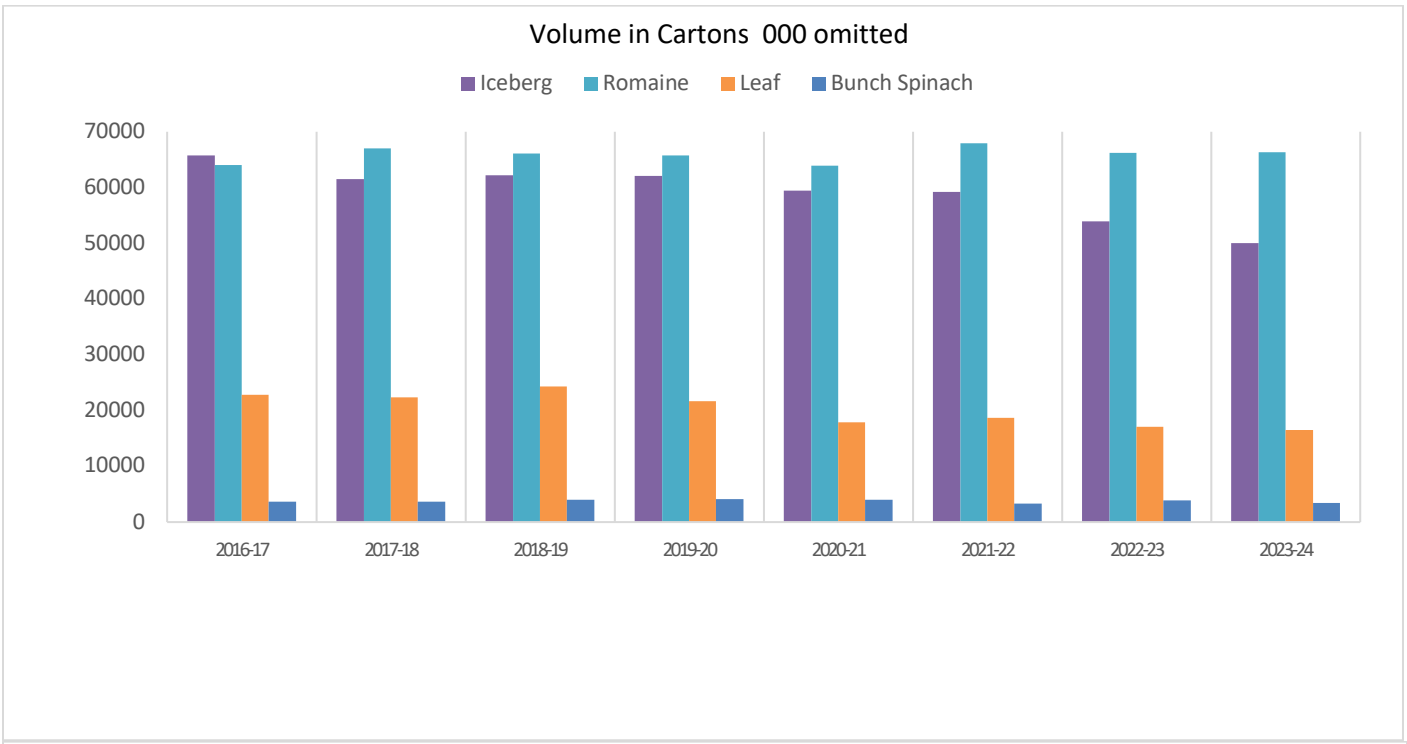
SUSTAINABILITY

Research is needed to position the California Leafy Greens industry to meet future national and global demands by increasing production and reducing agriculture's environmental footprint. Water use efficiency is important in the industry's cropping system and processing facilities. The industry is also interested in waste reduction and upcycling technologies.

FOOD SAFETY

Funding for food safety projects is administered through the Center for Produce Safety. The current call for pre-proposals has a deadline of November 6, 2024. http://www.centerforproducesafety.org/

Industry Trends for Informational Purposes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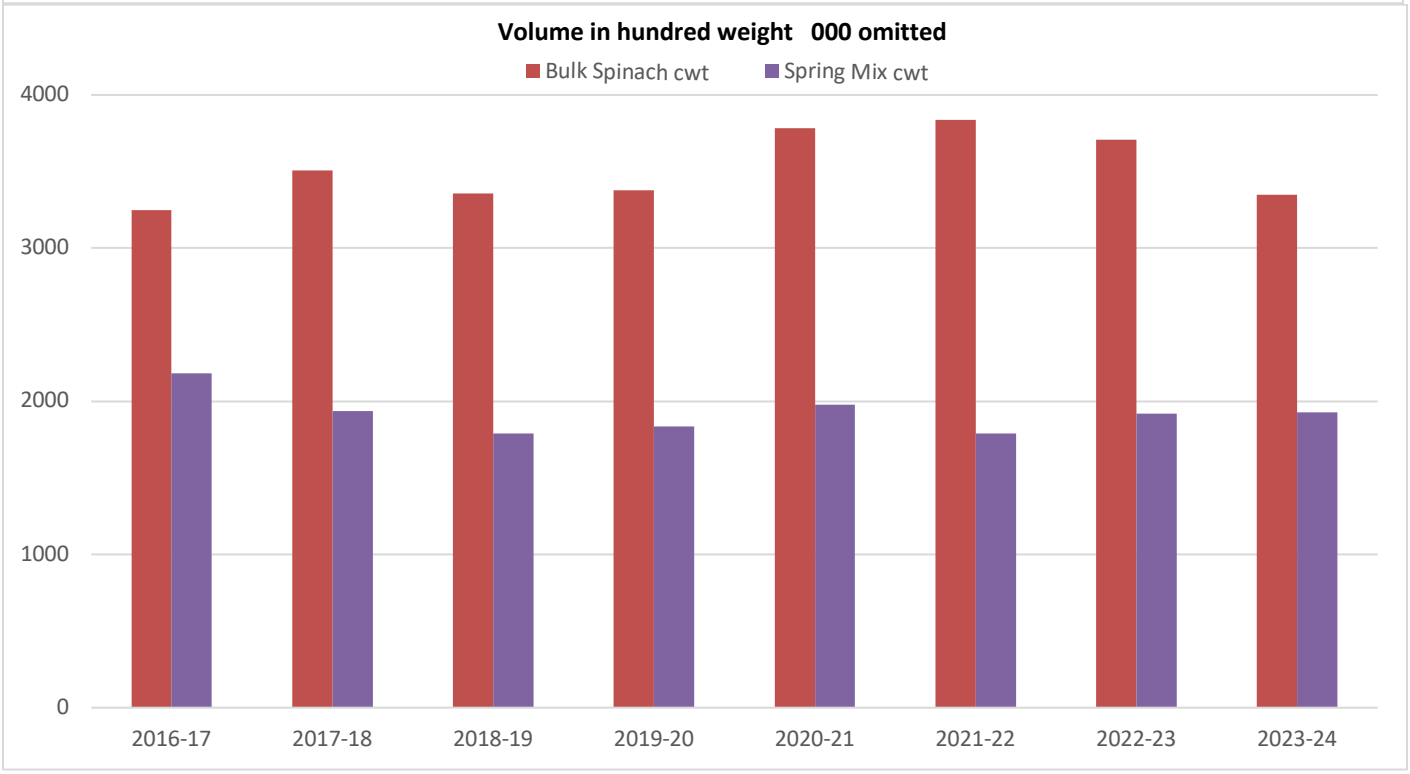
Volume in hundred weight 000 omitted
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2016-17
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2018-19
2019-20
2020-21
2021-22
2022-23
2023-24

GENERAL FORMATTING REQUIREMENTS

- Executive Summary (includes Identification, List of Immediate Objectives, List summary of last year's results, and Abstract) limited to 2 pages
- Main body (includes Rationale, Brief summary of last year's results, Procedures, and References) limited to 6 pages
    - Exception: for proposals from comprehensive, multi-trait or multi-investigator breeding programs, the main body is limited to 10 pages
    - Tables and figures that are appended to the end of the proposal (after the References and before Budget) do not count against the Main Body page limit
- Margins: 1 inch, all sides
- Font: Times New Roman 12 point
- Line spacing: minimum of single
- Do not format main body of proposal with paragraphs indented in a numbered outline
- Limit bold, italics, or underline formatting of text in paragraphs

PROPOSAL FORMAT

Executive Summary

Identification

- Project title
- Funding year (April 1, 2025 to March 31, 2026)
- Principal investigator with contact info including phone numbers and email address
- Cooperating personnel (complete contact info not required)
- Total funds requested (rounded to nearest dollar)
- Location(s) where research will be performed

List of Immediate Objectives

- Each objective should be written in a single, concise sentence
- For each objective, include a single-sentence description of the deliverables to the industry

List summary of last year's results

- If applicable
- Bulleted list

Abstract

- Non-technical, limited to 400 words

Main Body

Rationale

A. Significance, need, and benefit to lettuce industry
B. Brief literature review
    - Especially from previous CLGRP-funded projects
C. Long-range objectives
    - These are the overall goals of consecutive single-year projects
    - Including estimated time frame to achieve long-range objectives

CALIFORNIA LEAFY GREENS RESEARCH PROGRAM
RESEARCH PROPOSAL FORMAT for 2025-26

Brief summary of last year's results

- To elaborate from bulleted list in Executive Summary as needed
- Please include charts or tables to help convey progress on large, complex projects

Procedures

- For each objective separately
- Briefly identify method used for statistical analysis

Explanation of Related Research Funding

- Identify your current or pending research funding that has relevance or overlap with the proposed research
- If there is overlap, briefly discuss how the objectives for this proposal are unique or supplement current or pending research

References

- Minimum of 1, Maximum of 10

Tables and Figures

- Tables and Figures here do not count against the page limit
- Tables and Figures may also be inserted in the main body, but these do count against the page limit

NOTE: See next page for budget template

Summary of Changes to this Document

- Added "Explanation of related research funding" section to Main Body
- Added limit of text formatting
- Clarified where Tables and Figures that do not count against main body page limit should be placed

Budget

April 1, 2025 – March 31, 2026

PERSONNEL
- Title 1
  - Salary
  - Benefits
- Title 2 (if applicable)
  - Salary
  - Benefits

Personnel Subtotal

EXPENSES
- Supplies
- Computer Analysis
- Field Operations
- Other Items or Costs

Expenses Subtotal

TRAVEL

EQUIPMENT

NET REQUEST

Budget Justification

- Provide a brief justification for the expenses requested above.

End of budget template

Additional Budget Instructions:
- List salary and benefits for each employee title separately
- As always, the Research Program does not cover indirect costs
- Do not include tuition, travel to non-Research Program meetings/conferences, or PI salary/benefits.
- There is no need to allocate costs of the research to the different types of lettuces
- If your proposal budget involves more than one institution, create a separate budget page for each institution. Contracts will be written directly from CLGRP to each institution.
- Round all amounts to the nearest dollar

Signature

- Obtain the approvals that are required by your institution
- If you obtain signatures, put them on a separate page and retain in your own files