

November 8, 2021

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 2022-2023

The California Leafy Greens Research Program will consider proposals for new and continuing research projects for 2022-2023. 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.

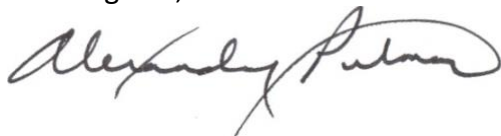
To be considered for funding, each proposal should be carefully prepared in accordance with the following instructions:

- Adhere to the format found on pages 7-9 below.
- Send the proposal as a 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 "2022 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 8, 2021**

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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Department of Microbiology and Plant Pathology
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CALIFORNIA LEAFY GREENS RESEARCH PROGRAM RESEARCH PRIORITIES for 2022-2023

The California Leafy Greens Research Program (CLGRP) provides funding for research on iceberg, romaine, leaf and butter lettuces, spinach, and lettuce components of spring mix. The Board prefers practical, applied research projects that can address the immediate needs of the industry. As no list of research priorities can be entirely inclusive, the CLGRP Board welcomes proposals on topics other than those listed below with the provision that the proposed work has the potential to benefit the California Leafy Greens Industry. We encourage phone calls if you have ideas for new projects or need feedback on the level of interest the research committee might have before writing a full proposal.

Note: In 2019 and 2020, Thrips and Impatiens necrotic spot virus (INSV) dramatically increased in the Salinas Valley, causing economic loss to growers and shippers, and losses continued in 2021. 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, 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.

PLANT BREEDING

Lettuce

- Development of germplasm with multiple disease resistance without a detrimental effect on postharvest quality and shelf-life performance. Diseases such as Downy mildew, Verticillium wilt, lettuce dieback disease, Sclerotinia rot (lettuce drop), Fusarium wilt, Tospoviruses, Bacterial leaf spot, and Pythium wilt have all been identified as significant problems by growers for many years. Romaine is the predominant type of lettuce now grown in California and should be emphasized in breeding efforts.
- Development of germplasm with improved nutrient uptake and water utilization capabilities and generally improved adaptability for better performance under increasingly stressful environmental conditions, including improved yield, processing efficiency, resistance to Tipburn, and novel head architecture and leaf traits. Germplasm with increased nitrogen-use efficiency and water-use efficiency are critical for the industry's ability to maintain lettuce volumes with lower water and nitrogen use rates.
- Development of germplasm with resistance to both Nasonovia Nr:0 and Nr:1 biotypes.
- 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.

CALIFORNIA LEAFY GREENS RESEARCH PROGRAM

RESEARCH PRIORITIES for 2022-2023

Spinach

- Development of durable resistance to spinach downy mildew, with a particular 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. Development of germplasm with robust polygenic resistance to downy mildew is key goal. Germplasm with resistance to leaf spot diseases such as Stemphylium and Cladosporium and to 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 with an emphasis on 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

Spinach

As outlined above, 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 that will explore disease prevention and management techniques utilizing new technologies and breeding strategies that may lead to better control, particularly in organic production systems.

Lettuce

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

CALIFORNIA LEAFY GREENS RESEARCH PROGRAM

RESEARCH PRIORITIES for 2022-2023

Verticillium wilt and Fusarium wilt continue to impact lettuce yields on the Central Coast. Both pathogens have been identified in adjoining locations in some of the most productive lettuce growing regions in the State. Fusarium wilt also causes significant economic losses in desert locations during the winter months. The industry needs innovative approaches, emphasizing new concepts, to limit disease loss from both of these pathogens.

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 point to the need for continued work on 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 Note above.

Aphids

There are several species of aphids that 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 evaluations of new chemistries and comparisons between important insecticidal materials for leafy greens' major pests. A comprehensive approach to integrated insect pest management, combined with the capability to respond to new insect threats, remains a priority. Organic growers are particularly challenged with pest management.

WATER QUALITY/USAGE and NUTRIENT MANAGEMENT

Issues surrounding water quality and nutrient management could also be listed as the industry's number one concern at this time. Regulations coming from the Regional Water Quality Control Boards will put further pressure on the industry to reduce nitrogen use and tailwater discharge. The need exists to develop and evaluate management practices, equipment, or engineering solutions to reduce 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 minimal disruption to farming operations.

CALIFORNIA LEAFY GREENS RESEARCH PROGRAM RESEARCH PRIORITIES for 2022-2023

Solutions are also needed to optimize water utilization of lettuce crops in the Salinas Valley and desert growing regions.

WEED MANAGEMENT

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

MECHANIZATION/ROBOTICS

The use of automation in thinning has been a valuable technology for the industry. The industry continues to seek advancements in mechanization and robotics for weeding and pest management.

SUSTAINABILITY

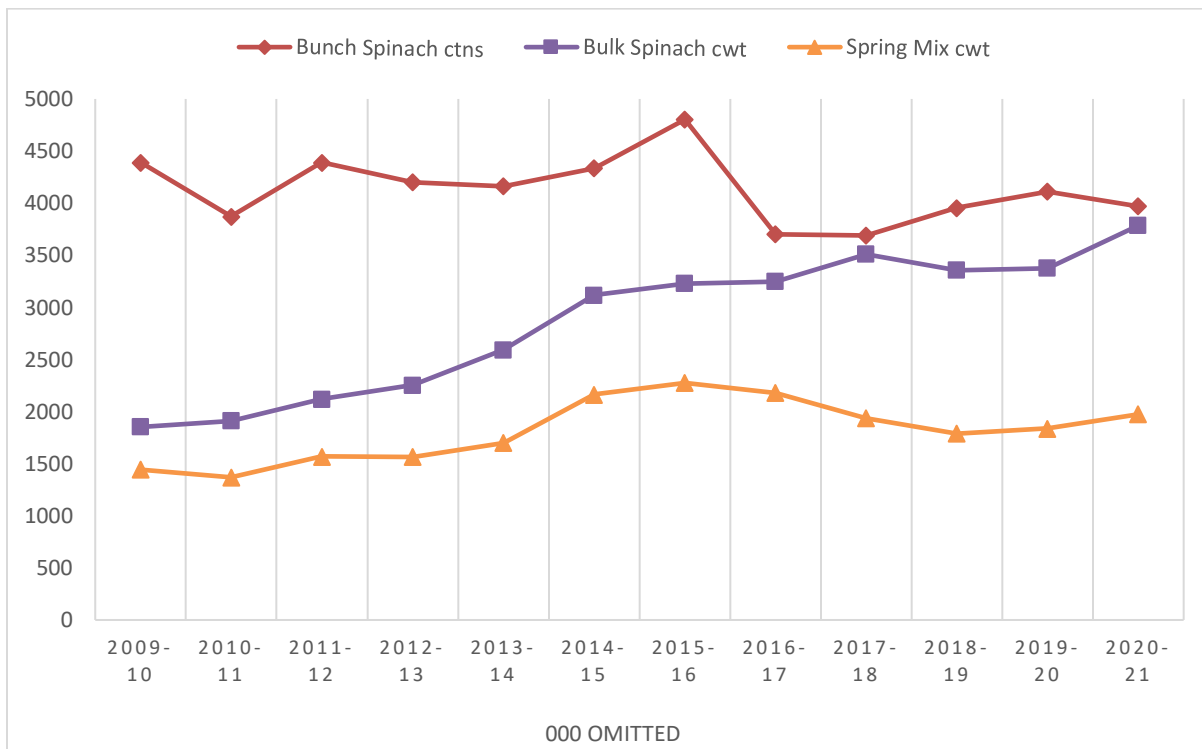
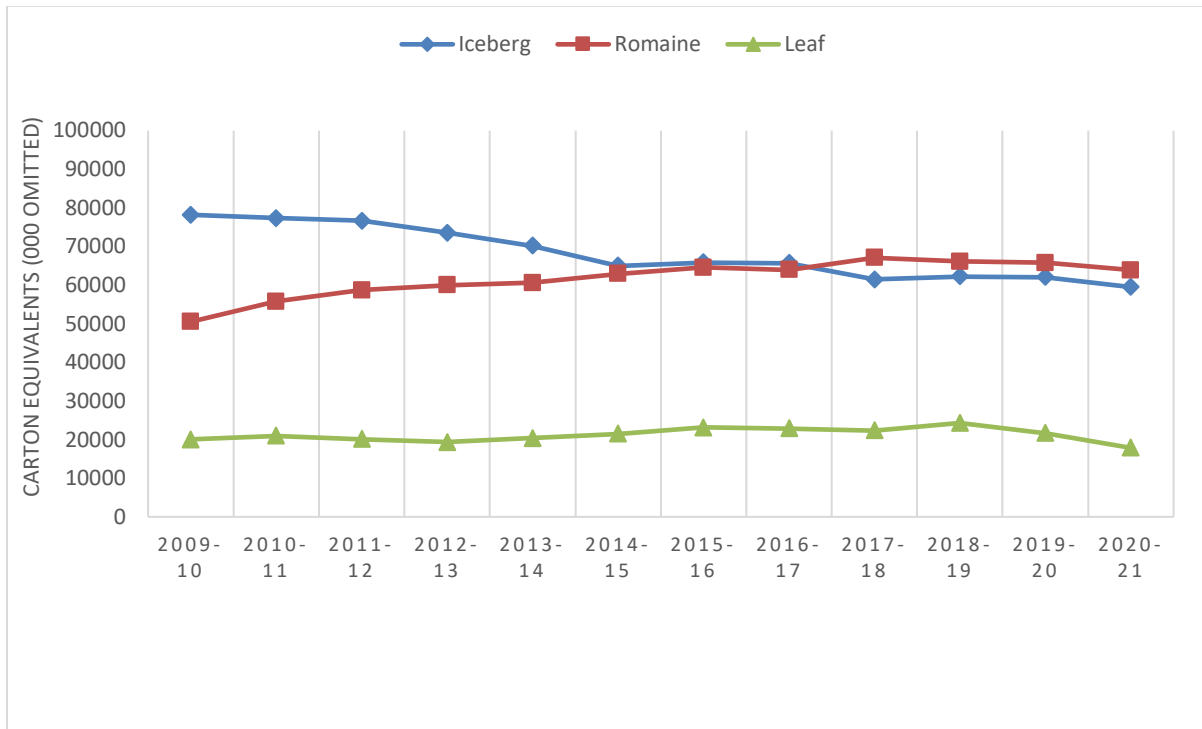
Research is needed to position the California Leafy Greens industry to meet future national and global demands by increasing production and reducing agriculture's environmental footprint. Water use efficiency is important in the industry's cropping system as well as in processing facilities. The industry 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 10, 2021. <http://www.centerforproducesafety.org/>

CALIFORNIA LEAFY GREENS RESEARCH PROGRAM
RESEARCH PRIORITIES for 2022-2023

Industry Trends for Informational Purposes



**CALIFORNIA LEAFY GREENS RESEARCH PROGRAM
RESEARCH PROPOSAL FORMAT for 2022-23**

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
 - Tables and figures that are appended to the end of the proposal 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

PROPOSAL FORMAT

Executive Summary

Identification

- Project title
- Funding year (April 1, 2022 to March 31, 2023)
- Principal investigator with contact info including phone numbers and email address
- Cooperating personnel (complete contact info not required)
- Total funds requested
- 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 (the overall goals of consecutive single-year projects)
 - Including estimated time frame to achieve long-range objectives

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

**CALIFORNIA LEAFY GREENS RESEARCH PROGRAM
RESEARCH PROPOSAL FORMAT for 2022-23**

Procedures

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

References

- Minimum of 1, Maximum of 10

NOTE: See next page for budget template

Summary of Changes to this Document

- Clarified travel exclusion includes all personnel and meetings or conferences
- Added an instruction for budget justification
- Clarified how multi-institution projects are handled
- Clarified to retain signature page in own files

**CALIFORNIA LEAFY GREENS RESEARCH PROGRAM
RESEARCH PROPOSAL FORMAT for 2022-23**

Budget

April 1, 2022 – March 31, 2023

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.

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