2017 University of California Combined Research and Extension Plan of Work

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I. Plan Overview

1. Brief Summary about Plan Of Work

The University of California's Division of Agriculture and Natural Resources (UC ANR) and its two primary units, the Agricultural Experiment Station (AES) and Cooperative Extension (CE), represent the true land grant component of the University of California. UC ANR has programs in every county in California, academics on four campuses, nine Research and Extension Centers (RECs), eight Statewide Programs, and two UC system wide Institutes. The UC ANR network engages academics across UC ANR campuses and counties, and UC faculty from the other campuses, to encourage integrated teams to work on complex issues that require multidisciplinary approaches to find solutions. The UC ANR connections also include faculty from the State University system, private colleges and universities, and stakeholders representing federal and state governmental agencies, organizations representing agricultural and natural resource production, non-governmental organizations (NGO's), and other interest areas including the environment, youth, and nutrition.

Strategic Vision 2025

UC ANR envisions a thriving California in 2025 with sustainable and productive food, fiber, and natural resource systems strengthened by a close partnership between the University of California and the people of the state. By actively connecting the public with the University's research and educational resources, ANR serves as a catalyst for science-based innovations that enable the state to adapt to ever-changing physical, social and economic conditions. Mutually sustained by this strong alliance, the University remains relevant, and the people of California enjoy a high quality of life, a healthy environment, and economic success in a global economy.

UC ANR's mission is to:

- maintain and enhance connections that fully engage UC with the people of California
- achieve innovation in fundamental and applied research and education that supports:

- economic success in a global economy
- a sustainable, healthy, productive environment
- science literacy and youth development programs
- sustainable, safe, nutritious food production and delivery

California's Future Challenges and UC's Response

The challenges facing California are numerous and will require multiple strategies to ensure UC's vision for California becomes reality. UC and its partners can strategically focus UC ANR's efforts on some of these challenges.

Increasing global and domestic populations require increased, safe and sustainable, food production:

The state's increasing population will result in an expanding urban footprint and a decrease in some of the most fertile lands available for agricultural production. This will create an even greater need for increasing crop production per unit area, requiring research and educational programs to address such issues as crop improvement, nutrient management, sustainable management systems, and pest and disease management strategies. Not only must food supplies increase, they must be safe. One in four Americans reports an experience with food-borne illness annually. This is even higher in California, partially due to the state's rich diversity of cultures. With increasingly more of our food and food ingredients imported from countries with different production practices, we can anticipate more food recalls and food allergies.

The UC ANR network and its unique research and education programs offers the opportunity to respond to local needs for increased food products and value, as well as the opportunity to test varieties which will respond to global food and marketing needs. The REC system offers opportunities for testing and evaluation of plant and animal varieties as well as systems of production. Opportunities abound for field testing of biotechnology developed in campus labs, and for the evaluation of methods to reduce the impact of invasive species through the continuum of county and campus-based academics. Industry needs and requirements can be discussed, applied and tested in soil, water, and weather conditions throughout the state.

Increased population leads to intensified competition for water resources among urban, environmental and agricultural uses:

The state's expanding population and increased water allocations for environmental purposes will result in a decrease in water available for agricultural production. Urban development on prime agricultural land pushes production to more marginal land which requires more water to produce the same quantity of product. Together these trends create a need for production processes that utilize less water and lower quality water. The UC ANR network works with a broad spectrum of stakeholders to identify local and regional water policy issues and can be the catalyst for initiating research and educational programs that develop solutions.

Many of UC ANR's RECs and campus field stations have the infrastructure to investigate approaches to water conservation. For example, many field stations have sophisticated irrigation systems that allow for precise water applications. These systems enable research in water use efficiency, deficit irrigation, and management strategies to reduce water needs. The field stations also have the capacity to support alternative crops research that may identify new varieties or crops that require less water.

California faces diminishing and more costly energy supplies:

The demand and cost for energy continues to rise as a result of population growth, urban development, and global competition. Innovative strategies for management and use of the state's natural and agricultural resources will help create a more sustainable energy future. In particular, UC ANR's research and extension network can provide California agriculture with new production technologies and practices which minimize energy consumption and utilize renewable energy sources. ANR innovations with partners can provide technology, marketing and policy advancements to enable expanded use of forest, range, and agricultural resources for renewable energy production.

Environmental constraints will continue to increase in California:

California's environmental regulations, arguably the most intense in the country, will affect agriculture and natural resource production. Research, extension, and education programs offer the potential for multiple stakeholders to compare the impacts of regulatory programs, and recommend new and creative methods for protecting the environment, while simultaneously producing goods and services. Links between

campus and county programs allow for collaboration in both research and outreach programs.

The mixture of regional crops and animal products grown in California will change:

A combination of factors, including climate change, population growth, water availability, technological change, and global demand, will accelerate changes in the type and distribution of crops grown in California. Projected changes in temperature, rainfall and snowpack will result in geographical shifts in crop locations. Population growth will continue to occupy what is currently prime agricultural land forcing production onto other more marginal lands. Associated with population growth is the increasing municipal demand for water which will change water allocation in many areas, resulting in inadequate supplies available for current crop production and requiring relocation of agricultural operations. Global demand for products will also have a significant influence on the types and amounts of crops grown throughout the state.

UC ANR is uniquely positioned to address the shifts in crop production that will have to occur. UC ANR has the capacity to investigate the suitability of areas for growing crops not previously produced in similar climates and to alter or develop production systems to create sustainable systems in these new environments. Both short and long-term research can be conducted under controlled situations not available when utilizing cooperators' operations.

The capacity to use nutrition to positively impact human health will be a reality:

Obesity, diabetes, heart disease, stroke, hypertension, cancer and bone diseases are just some of the human health threats related to poor nutrition and lifestyle choices. UC discoveries and educational outreach will help understand, evolve solutions, and inform the public about diseases associated with nutrient deficits, excesses, and imbalances and food sensitivities. Current and future technologies based on genetics, genomics, proteonomics and other methods will contribute to the creation of designer foods to enhance nutrition and reduce health risk.

California's youth will need more complementary education programs:

A challenge for California is to engage the state's youth to become empowered citizens. ANR's system of research-based non-formal education can be used to develop new approaches to science literacy and school readiness (pre-K) especially among low income and under-represented populations. ANR can provide, through its 4-H Youth Development programs, alternative academic pathways and promote leadership development and citizenship opportunities that keep youth engaged in their educational pursuits and development. With other internal UC and external partners, UC ANR programs will complement the K-12 school system and reinforce development of skill sets to prepare youth for higher education, future career opportunities and informed participation in civic affairs and public policy.

California's future depends on:

- A sustainable, nutritious, and safe food supply that improves the health and well-being of its population
- A clean, healthy, sustainable environment including comprehensive strategies to prevent and control California wildfires
- Clean and secure supplies of water to meet the needs of people, agriculture, and the environment
- Secure supplies of energy with increased energy efficiency in agriculture and natural resource systems, and improved use of biofuels and other by-products
- A science literate population capable of making informed choices
- Enlightened and prepared leadership capable of making strategic decisions
- Choices and solutions that come from innovation

- Economic opportunities and jobs

UC ANR's Strategic Initiatives

To meet the state's most pressing challenges, UC ANR members position our cutting-edge science and education programs to focus on identified priority areas. The Strategic Vision 2025 identified nine multidisciplinary, integrated strategic initiatives. UC ANR moved forward on the following five strategic initiatives, which represent the best opportunities for the Division's considerable infrastructure and talent to seek new resources and new ways of partnering, within and outside the University, to find solutions to the issues that will be facing California in 2025: 1) Healthy Families and Communities; 2) Endemic and Invasive Pests and Diseases; 3) Sustainable Natural Ecosystems; 4) Sustainable Food Systems; and 5) Water Quality, Quantity, and Security. The strategic initiative leaders and advisory panel members developed five-year plans of action for implementing each initiative. As part of this process, they identify the 'areas of inquiry' where UC ANR has the opportunity to make a significant, visible difference to the people of California, which provide the basis for the targeted, internal, competitive grants program. As such, the Division continues to invest in short-term, high-impact research, education and outreach projects that address high-priority issues that are consistent with the Strategic Vision; encourage collaboration among academics; strengthen the research extension network; and demonstrate relevance and likelihood of impact on significant agricultural, economic, environmental and social issues in California.

UC Presidential Initiatives

In addition, UC ANR will play a critical role in four of the 11 UC Presidential Initiatives. To capitalize on the collective strength of the UC system, President Napolitano has launched initiatives to focus UC resources on local and global food issues; speed the translation of UC research into products and services; achieve carbon neutrality across the UC system by 2025; enhance community college transfers; stabilize tuition; strengthen UC's engagement with Mexico; provide financial support for undocumented students; expand opportunities for advanced degrees; increase support for new and future faculty members through post-doctoral fellowships; and improve services for student veterans. While the President encourages collaboration among all campuses, the national laboratories and UC ANR to enhance the work of these initiatives, UC ANR will play a more significant role in the following: the Global Food Initiative, the Carbon Neutrality Initiative, the UC-Mexico Initiative, and the Innovation and Entrepreneurship Initiative.

UC ANR Vice President Humiston's Vision

In August 2015, Glenda Humiston took the reins as the new UC ANR Vice President. Moving forward, she will focus on growing funding, partners and visibility. She leads the Division toward achievement of the Strategic Vision 2025, recognizing that it will require 1) leveraging its assets with a wide array of external partners, projects and resources; and 2) increasing public awareness of the contribution agricultural and natural resources provide to California's well-being. However, there is no "one size fits all" approach; each region or sector needs tools and strategies to meet their particular goals and needs.

She envisions many opportunities for UC ANR to enhance how it serves its mission, supports the array of people and programs that it administers, and expands its influence. She highlights how some existing initiatives might be expanded and provides ideas for new opportunities. Capitalization on those opportunities will require some new and, perhaps, innovative collaborations - possibly with what might seem to be unlikely allies. In some cases the partnership may involve a single UC institution; however, in most cases, connecting multiple institutions and interdisciplinary resources will prove much more powerful. Her focus is on these opportunities, as well as addressing three major internal challenges that she has identified.

Chief among challenges is the availability of adequate resources to do the job. The past decade of cuts

must be turned around by developing new resources. To do this, UC ANR leadership will collaborate closely with the various UC funds development and external relations offices. By identifying where external stakeholders might form new and/or deeper connections with - and get excited about - specific UC programs, UC ANR will support development of new and/or expanded funding sources. For example, industry sectors and corporate interests that might donate a moderate sum can be convinced to increase that amount for endowed chairs because they feel it more permanent and/or would want to honor something by securing naming rights. In 2015, UC ANR established the first-ever endowed chairs in Cooperative Extension with two $1 million endowments - the UC Cooperative Extension Presidential Chair for Tree Nut Genetics and the UC Cooperative Extension Presidential Chair for Tree Nut Soil Science and Plant Water Relations. Half the funds for the endowed chairs was provided by UC President Janet Napolitano; the other half was donated by the California Pistachio Research Board. Matching programs, planned giving and new interdisciplinary approaches all have potential to increase giving if done in a strategic and collaborative manner. Finally, another opportunity is to provide more administrative support for grant writing and proposal development at every level.

A second key challenge for UC ANR and all academic institutions is the level of scientific illiteracy among our population, coupled more recently with a growing lack of trust in science. This leads to dubious policy decisions, reduced investments in research and great damage to people, ecosystems and the economy. Better communication between scientists and the general public is desperately needed. Thanks to the powerful partnership between UC campuses and UCCE, as well as the Research Extension Centers (REC), 4-H, Master Gardeners and other allied institutions, UC ANR will facilitate materials, messages and venues to help address this increasingly dangerous state of affairs. Although many of the UC ANR programs named above are known by the people and organizations that directly utilize their services, the vast majority of the population and many decision makers remain unaware of them. Facilitating the expanded use of science-based information to solve current problems and engaging the general public in carrying out that activity will help to both change how the lay public views science and increase their understanding of scientific principles.

A third challenge is the need for a clear understanding and agreement among all the components of UC ANR as to roles, responsibilities, processes and expectations. Changes have occurred in both UC and UC ANR leadership in the past several years; concurrently, society at large has experienced new thinking in terms of best practices for management, outreach, communication, leveraging partnerships and how organizations should function. Some within UC ANR feel that these changes have contributed to a much-improved system, while others are frustrated; external partners appear to have similarly mixed opinions. Moving forward, it is imperative that all UC ANR stakeholders - both internal and external - have a clear sense of the UC ANR vision and mission, how its various elements serve that vision and how to optimize their engagements with each other.

UC ANR's Federal Planned Programs

The Division's six Federal Planned Programs are listed below. Although Sustainable Energy is not one of the Division's current, five strategic initiatives, the Division plans and reports on this topic separately given it was identified as one of the strategic vision's original nine initiative areas, "Initiative to Improve Energy Security and Green Technologies through Innovative Science Linking," and research and extension work on this topic continues to grow, evolve, and innovate.

1) Healthy Families and Communities
2) Sustainable Food Systems
3) Endemic and Invasive Pests and Diseases
4) Sustainable Natural Ecosystems
5) Water Quality, Quantity, and Security
6) Sustainable Energy

Estimated Number of Professional FTEs/SYs total in the State.

Year	Extension		Research	
	1862	1890	1862	1890
2017	321.0	0.0	358.0	0.0
2018	323.0	0.0	358.0	0.0
2019	325.0	0.0	358.0	0.0
2020	327.0	0.0	358.0	0.0
2021	329.0	0.0	358.0	0.0

II. Merit Review Process

1. The Merit Review Process that will be Employed during the 5-Year POW Cycle

- Internal University Panel
- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review

2. Brief Explanation

Scientific Peer Review
Each project funded under the Hatch Act is peer reviewed at the department level in the colleges/school at Berkeley, Davis, and Riverside. A peer review committee is appointed by the department chair. The committee evaluates the relevance, quality and scientific value of the proposed research. Upon completion of the peer review, the project is also reviewed at the dean's office for USDA compliance and forwarded to the Vice President's office for final review and submission to NIFA.
Merit Review
The Division's organizational structure emphasizes that resource allocation decisions will be driven by programmatic considerations and developed through a broad participatory process. This process will include review of the quality and relevance to program goals for all of the Division's programs.
At the statewide level, the UC ANR Program Council meets almost monthly. It is chaired by the UC ANR Associate Vice President, and includes four Executive Associate Deans, five strategic initiative leaders, and two CE representatives. The Associate Vice President - Business Services and the Director of Program Planning and Evaluation serve as ex officio members. This group coordinates Divisionwide planning and delivery of programs and develops recommendations for allocation of Division resources. The Program Council reviews Divisionwide programmatic budget requests, the UC ANR internal competitive grants program proposals, and Cooperative Extension academic position proposals from a statewide perspective to make specific recommendations on budget expenditures and resource allocation

principles. These recommendations are then considered by the UC ANR Vice President for final allocation decisions.
UC ANR's strategic initiative leaders and advisory panels are key players in helping the Division meet its goals, by organizing division-wide conferences, developing five-year, statewide strategic plans, coordinating the internal competitive grants program, and contributing to the development of new, priority Cooperative Extension specialist and advisor positions.
UC ANR's competitive grant program proposals are reviewed by ad hoc, technical committees recruited by the strategic initiative leaders. The membership of these committees depends on the proposals received and includes external experts. After each proposal receives at least two technical reviews by academics, who have no conflict of interest with the proposal, the strategic initiative advisory panels recommend a slate of highly ranked proposals to Program Council. Program Council members work in small groups, based on their expertise, to review and rate the proposals. Each of the recommended proposals is discussed in detail by Program Council, and they make the final recommendations for funding. The UC ANR Vice President makes the final decisions on allocations.
UC ANR's program teams provide an umbrella structure for the Division's many workgroups to meet. The program teams meet as part of the strategic initiative conferences, as well as having their own program team meetings. These program teams carry out their essential leadership functions and enhance inter-workgroup communication and collaboration. In this way, CE and AES personnel along with non-ANR partners are brought together to work on emerging and continuing issues. They look at the Division's program priorities and determine the programs that will best address these needs.

III. Evaluation of Multis & Joint Activities

1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?
UC ANR is a key player in improving California's future by providing leadership and innovation through research, education, and service. UC ANR research and extension professionals will plan and deliver programs that address the critical issues facing California in the areas of agriculture, natural resources and human resources by pooling the expertise of UC's AES and CE academics, by collaborating with colleagues across the UC system, in other institutions, agencies, and states, and by consulting with the external stakeholders. The UC ANR program planning processes involve stakeholder input through the strategic initiatives, program teams, workgroups, advisory groups, and other listening sessions and focus groups, to bring AES and CE together to discuss the critical issues in respective program areas.

2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?
The needs of under-served or under-represented groups will be addressed through research and extension programs in all planned programs. Nutrition programs will focus on adults and children at risk, including individuals living in poverty, recent immigrants and African American, Native American, and Latino populations. Youth development programs also will work with at-risk youth in both urban and rural settings. Curricula and educational materials will be developed for and adapted to specific needs of under-served and underrepresented groups, including translation of materials into the appropriate languages. In particular, the California 4-H Youth Development Program plans outreach and education activities to increase Latino youth participation. Agricultural programs will include those focusing on limited resource farmers, including recent immigrants from Southeast Asia. In addition, programs, demonstrations and field days are often provided in a variety of languages to meet the needs of different groups.

3. How will the planned programs describe the expected outcomes and impacts?
We use our internal reporting system, which follows the logic model format, to capture and provide descriptions of anticipated outcomes. The inputs, outputs and activities that will lead to achieving the anticipated outcomes are included in the plan.

4. How will the planned programs result in improved program effectiveness and/or
UC ANR will continue to work to foster collaborative teams of AES faculty, CE specialists and CE advisors to address the critical issues facing California's agricultural, natural and human resources. This includes integrating the efforts of workgroups and their respective program teams, statewide programs, the strategic initiative advisory panels, and, of course, individual innovators. In this way, UC ANR will work to prevent duplication of effort and to ensure that the most complete body of knowledge and expertise is available to address the issues by including all those with expertise in relevant areas.
UC ANR faculty, specialists and advisors also collaborate with their colleagues in other states on topics that cross state boundaries such as invasive pests, youth development issues, and varietal development. This draws together a wider spectrum of expertise and allows for a greater number of stakeholders to be served.

IV. Stakeholder Input

1. Actions taken to seek stakeholder input that encourages their participation

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey specifically with non-traditional groups
- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public

Brief explanation.

UC ANR will continue to use a variety of mechanisms to seek stakeholder input on the development of statewide program priorities and use of its research, extension and education funds. CE advisors delivering programs in 58 California counties receive input on local needs from their local clientele on a daily basis. All of the input received from stakeholders is used by UC ANR members in program planning and implementation at the local, regional, and statewide level.
Strategic Planning Process
UC ANR embarked on an inclusive strategic planning effort in 2008. In developing the Strategic Vision, external stakeholders were consulted about the trends and issues of the next twenty years and were invited to comment on the draft Strategic Vision document More specifically, UC ANR drew on leaders in agriculture, nutrition, human and community development and natural resource fields, and some of the best minds across the breadth of the UC. The Steering Committee membership included the former UC ANR VP; the AES Deans; a UCCE County Director; UC's Vice President for Research and Graduate Studies; UC's Provost; a grower who was also a former UC Regent, former USDA Deputy Secretary and former Director of CDFA; and another grower who was

also chair of the President's Advisory Commission on Agriculture and Natural Resources. Under the general guidance of the Steering Committee, five teams identified general themes and issues anticipated for California in the year 2025 and UC ANR's capacity to address future trends and issues. These teams drew on scientific literature and surveyed leaders and thinkers in their respective areas to document the issues and challenges facing California in 2025. In addition, an independent consultant surveyed key external stakeholders to determine their opinions about the major challenges and issues. Then the UC ANR Program Council synthesized the five reports and survey data into a draft Strategic Vision. The draft was further refined with edits responding to comments received from the Steering Committee, UC ANR academics and staff, and external stakeholders. The final Strategic Vision 2025 was delivered to the UC Regents in May 2009. Stakeholders continue to be involved in the implementation of the strategic initiatives.

UC ANR Workgroups and Program Team Meetings

UC ANR workgroups and program team meetings are the primary mechanism for accomplishing the Division's high priority research and extension goals through grassroots leadership. The many Divisionwide workgroups are aligned into 18 program teams. The workgroups bring together AES and CE personnel and non-ANR partners to work on emerging and continuing priority issues in Division program areas. The workgroups involve external stakeholders in their program planning process and workgroup activities and projects. The involvement of external stakeholders in the workgroups ensures that real world needs are brought to the attention of the Division as programs are planned and implemented. External stakeholders on the workgroups include individual producers, representatives from local community groups, state and federal agencies, industry groups, consumer groups, and colleagues from other higher education institutions.

Formal Advisory Groups

The President's Advisory Commission on Agriculture and Natural Resources identifies informational needs for California's agricultural, natural and human resources interests and advises the President on how the University can best meet these needs through its science-based research, classroom instruction and educational outreach. The members represent around 30 business, consumer, youth and government leaders from throughout California, and meet twice a year to provide input. UC ANR's Vice President and the four AES Deans participate as members of this Commission. UC ANR's leadership uses the Commission's advice to inform strategic planning and decision-making.

Each of the three colleges at Berkeley, Davis and Riverside and the School of Veterinary Medicine at Davis, have external stakeholder advisory councils that meet at least annually to provide feedback on their research, extension, and teaching programs. In addition, departments may have advisory boards. The Statewide Programs also have advisory groups with external members, which meet regularly to review progress and offer recommendations for future program direction.

Commodity Organizations/Marketing Order Boards

Members of these organizations provide annual input on research and extension needs for their commodities to UC ANR members through regular meetings and discussion of funding for research projects. In addition, members from the California Commodity Committee meet with the Vice President to offer specific recommendations on program planning and funding issues.

Statewide Program Reviews & Strategic Planning

Each of the Division's statewide programs undergoes a routine program review. A diverse review committee is appointed, which includes a broad range of members from across the UC ANR

network as well as external stakeholder representatives. As part of the review process, the committee solicits input from key stakeholder groups, through interviews and/or surveys.

UC ANR will continue to support Statewide Programs to engage in rigorous, strategic planning processes that actively involve stakeholders, both internal across the ANR network and external partners, throughout the process. The approach is collaborative and utilization-focused. The strategic plans are expected to provide a straight-forward and measurable road map for the future, to inform decision-making and improve performance. As such, these plans include indication of those responsible for implementation as well as intended outcomes and specific metrics to demonstrate progress and success over time.

Research and Extension Center Strategic Planning

UC ANR will continue its new strategic planning effort for each of the nine centers in the Division's Research and Extension Center system. The Associate Vice President appoints members from across the UC ANR network, including CE advisors, CE specialists, and AES faculty from the various counties and the three UC ANR campuses, as well as members from external stakeholder groups. As part of the process the committee members get input from colleagues in the stakeholder groups they represent. The REC strategic planning process is designed to be inclusive, future-oriented, and utilization-focused. The diverse perspectives are intended to come together to develop long-term, big picture plans that will serve as "living documents" to set direction and focus effort over the next 20 years.

2(A). A brief statement of the process that will be used by the recipient institution to identify individuals and groups stakeholders and to collect input from them

1. Method to identify individuals and groups

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

Brief explanation.

UC ANR will use a variety of formal and informal methods to identify stakeholders. As described earlier, UC ANR units have some formal advisory groups such as the President's Advisory Commission on Agriculture and Natural Resources that operates on a system wide basis while there are also advisory groups at the campus and county level. In addition, internal workgroups have external stakeholder members who have been recommended by the workgroup members. The Division also convenes focus groups, listening sessions and other groups to provide input to its program planning process. Also, county-based programs do needs assessments as part of their program development activities. Surveys may be used by both local units and statewide units to solicit recommendations for individuals and groups that may be appropriate to give input on UC ANR programs and/or critical issues facing the state.

2(B). A brief statement of the process that will be used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public

Brief explanation.

UC ANR will continue to meet with and survey both traditional and non-traditional stakeholder groups and individuals to collect their input on the development of statewide program priorities and use of its research, extension and education funds.

3. A statement of how the input will be considered

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Action Plans
- To Set Priorities

Brief explanation.

External stakeholder input is used to identify current critical issues, emerging issues and program priorities for the short, medium and long-term planning periods. By considering the external stakeholder needs and identification of issues, UC ANR can assess how best to deploy its resources to address the needs. Division administrators consider the external stakeholder input along with internal stakeholder input as they make resource allocation decisions and in their strategic planning efforts.

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Healthy Families and Communities

2. Brief summary about Planned Program

Projecting into the future, the major challenge for human development systems - our families, school and communities - will be to remain or become resilient settings for promoting positive development of the children, youth, and adults within them, given the unprecedented changes in the world. How we tap into and nurture resilience, the human capacity for transformation and change, will be vital knowledge as we move forward into the future of transformational change. ANR is positioned to address this issue through its statewide network of researchers and educators dedicated to the creation, development, and application of knowledge in agricultural, natural and human resources.

Improving the health of California's adults and children, enhancing their quality of life and reducing their health care costs are critical to the future of California. As obesity rates rise, more people will develop diabetes, heart disease, and risk factors related to chronic disease due to poor nutrition and lack of physical activity. Coordinated, comprehensive nutrition and physical activity programs, created through partnerships, including with school site personnel and regional growers, can help families and communities thrive.

To promote healthy families and communities UC ANR's role will be to:

- identify effective strategies for preventing childhood obesity and chronic diseases related to food.
- form collaborations among UC faculty, industry, school personnel, and state and county agencies to deliver nutrition education programs to California's population.
- equip families with the tools to make informed decisions about food/nutrition and healthy lifestyle choices.
- conduct research on identifying the factors that contribute to resilient communities.
- identify effective strategies for prevention of health issues such as focusing on high-risk populations and aging population's nutritional status, including food choices, food handling, and use of supplements.
- deliver effective education to individuals and families, who, with improved management skills, would have the resources to make informed decisions.
- equip consumers with the tools to make informed decisions regarding food choices, nutrition, health agriculture and environmental issues.
- work with community leaders in developing key social and economic information on the economic viability of communities, and develop strategies to enhance community economic development.
- deliver education programs at the community level, including serving a wide range of audiences from youth (4-H); volunteers (Master Gardeners, Master Food Preservers, 4-H); low-income families (EFNEP; and food stamp eligible populations (UC CalFresh program) and culturally diverse groups.
- develop youth programs that use active learning strategies, including formal and non-formal education, to increase civic engagement, healthy living, and self-directed learning, while incorporating a range of approaches that engage youth with community service and service learning.
- strengthen science and math skills to prepare youth for jobs and opportunities in higher education.
- expand the science education and literacy programs through nutrition and physical activity programs.
- develop, test, edit, and validate effective education tools, materials, and curricula for use in UC ANR programs and in the general education setting.
- create, validate, and disseminate innovative methods of evaluating the effectiveness of programs.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation	0%		2%	
305	Animal Physiological Processes	0%		7%	
501	New and Improved Food Processing Technologies	0%		2%	
604	Marketing and Distribution Practices	0%		4%	
606	International Trade and Development Economics	0%		4%	
607	Consumer Economics	0%		2%	
608	Community Resource Planning and Development	1%		6%	
610	Domestic Policy Analysis	0%		3%	
611	Foreign Policy and Programs	0%		1%	
701	Nutrient Composition of Food	0%		5%	
702	Requirements and Function of Nutrients and Other Food Components	1%		28%	
703	Nutrition Education and Behavior	23%		12%	
723	Hazards to Human Health and Safety	0%		3%	
724	Healthy Lifestyle	11%		3%	
801	Individual and Family Resource Management	1%		0%	
802	Human Development and Family Well-Being	7%		9%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	2%		4%	
805	Community Institutions and Social Services	4%		1%	
806	Youth Development	46%		4%	
903	Communication, Education, and Information Delivery	4%		0%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

The changing economic, political and social environments in California have major impacts on our youth and families. The human resource issues cross demographic and socioeconomic lines, affecting all

ages, from children to the elderly to diverse cultural groups.

California's Healthy Families and Communities program will focus on the following five areas:

Human Health and Nutrition

Nutritional status of Californians is a critical issue with 5 of the top 10 fatal diseases (heart disease, cancer, stroke, diabetes and liver disease) directly related to poor diet, inactivity and obesity. Poor food choices and feeding practices negatively impact maternal/child health and contribute to undesirable birth outcomes, nutritional deficiencies, failure to thrive, increased infections, and childhood anemia and obesity. Research demonstrates that poor nutrition during pregnancy predisposes the infant to chronic health problems later. Many children and adults do not eat enough healthy foods while over consuming high-fat, high-sugar foods and beverages.

Childhood Obesity

Childhood obesity is a critical health risk with the number of overweight children in California almost tripling since 1970. Thirty percent of children and adolescents are overweight or at risk of becoming overweight. UC ANR campus and county researchers are making inroads into developing science-based strategies to prevent childhood obesity and diabetes and to promote wellness. The focus will be on a multifaceted, prevention strategy: a coordinated, comprehensive school health, nutrition, and physical activity program, created through partnerships with school site personnel, regional growers, and UC ANR.

Youth Development

Youth need support systems and opportunities to be prepared for college, science-related careers and to provide leadership and participate effectively in an increasingly complex society. CA has a large stake in the healthy development, productivity, and leadership capacity of its future generation to build strong communities and address the many challenges facing the state. Skills needed by youth to take advantage of opportunities for success include leadership, planning, decision making, problem solving, critical thinking, and valuing diversity. Research indicates that youth learn from formal and non-formal forms of education and that peers and environments have a great influence on the educational and extracurricular activities they choose. Youth learn best through "hands on" activities. Youth need opportunities to discover and expand the range of their assets and capacities, and to practice and demonstrate their value to the community.

Family and Consumer Well Being

California has the largest total and welfare population of any state in the nation. The overall well-being of many individuals is of concern as support programs are reduced/eliminated. More than half of Americans report living paycheck to paycheck. There is a need for additional knowledge, skills, and motivation to build financial security and to strengthen the capacity of families and individuals to create and maintain self-sufficiency.

Community Development

Communities, large and small, are struggling to remain solvent and maintain the quality of life for their residents. The ability of communities to respond to critical economic and social issues is complicated by growing populations, greater demands on schools, limited resources, lack of health services, utility systems, a shortage of affordable housing, and concerns for resource use and allocation.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

• Continuation of public and private funding, in-kind support, and volunteer efforts for programs at current or higher levels, adjusted for inflation
• Continuation of collaborative relationships with statewide and local governmental and non-governmental agencies addressing youth, nutrition and health, and community issues, and with other states' CE and AES programs
• Availability of qualified research and extension professionals and technical and paraprofessional personnel in the workforce who will accept appointment to vacated and newly created positions
• Continuation of public policy and regulatory environment permitting use of recombinant DNA research techniques for the development of nutritionally improved foods and allowing consumers access to foods and food products of transgenic origin

2. Ultimate goal(s) of this Program

• Lower incidence of obesity among children and adults in California
• Improved overall health and wellness of California adults and children
• Reduced health disparities among ethnic groups in California
• Lower health care costs for Californians
• Lower costs for public assistance and food assistance programs serving mothers of infants
• Increased engagement in community activities and assumption of leadership responsibilities by youth
• Increased understanding of a wide variety of scientific, technological and agricultural topics by youth
• Increased numbers of youth engaged in healthy non-formal and/or out-of-school activities that result in positive youth development
• New contributions in the field of youth development regarding effective practices
• Improved attitudes, understanding and skills in financial self-sufficiency
• Strengthened links between community engagement and academic learning as demonstrated by service learning efforts
• Greater importance placed on the value of civic engagement
• Increased involvement by the public in public policy decisions such as use of agricultural, natural and personal resources
• Increased number and quality of collaborations among community members, schools, community organizations and agencies
• Increased formal and informal education

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	13.0	0.0	4.4	0.0
2018	13.0	0.0	4.4	0.0
2019	13.0	0.0	4.4	0.0
2020	13.0	0.0	4.4	0.0
2021	13.0	0.0	4.4	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

UC ANR's integrated research and extension activities will conduct research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs will use PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations	● Public Service Announcement ● Billboards ● Newsletters ● TV Media Programs ● Web sites other than eXtension ● Other 1 (Collabs w/other agencies/orgs)

3. Description of targeted audience

- Adults, children, youth and families in general
- Children in general
- Low and moderate income adults, children, youth and families
- Adults and children at-risk for nutrition-related health problems, including individuals living in poverty, recent immigrants, and African-American, Native American, and Hispanic populations
- Nutrition and healthcare professionals
- Preschool, primary and secondary school teachers and administrators
- Professional childcare providers
- Public agencies and private organizations concerned with food, nutrition and health

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Classes/Short Courses Conducted
- Workshops Conducted
- Demonstrations and Field Days Conducted
- Newsletters Produced
- Web Sites Created or Updated
- Research Projects Conducted
- Videos, Slide Sets, and other AV or Digital Media Educational Products Created
- Manuals and Other Printed Instructional Materials Produced

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Low-income individuals and families, participating in nutrition and consumer education programs, gain knowledge of food resource management techniques.
2	Low-moderate income individuals and families, participating in nutrition and consumer education programs, adopt recommended food resource management techniques.
3	Children and youth, participating in-school and afterschool educational programs, increase their level of science, agricultural and environmental literacy.
4	Youth educators and child resource specialists, participating in youth development education programs, gain knowledge of youth development practices.
5	Children and youth, participating in nutrition education programs, gain knowledge of nutrition.
6	Adults, participating in nutrition education programs, adopt recommended dietary practices.
7	Individuals, participating in nutrition education programs, adopt safe food handling and preparation techniques.
8	Youth educators and child resource specialists, participating in youth development education programs, adopt recommended youth development practices.
9	Youth educators and program extenders, participating in the programs, including 4-H and SET, gain knowledge of best practices to extend science, engineering, and technology education and opportunities.
10	Teachers, participating in health and nutrition programs, adopt recommended practices to prevent childhood obesity and foster a school environment that reinforces nutrition education.
11	Community garden managers, non-profit agency personnel, small business owners, and low-income members of the public, participating in Master Gardener and other urban horticulture programs, gain knowledge about sustainable gardening practices.
12	Individuals participating in food safety education, gain knowledge of safe food handling, preparation, and preservation techniques.
13	Percentage of 4-H youth (4th- 12th graders) make positive choices.
14	Percentage of 4-H youth (4th- 12th graders) effectively communicate.
15	Percentage of 4-H youth (4th- 12th graders) build connections.
16	Percentage of 4-H youth (4th- 12th graders) apply content knowledge and skills in health, citizenship and science to contribute to the health, growth, and well-being of self, family, community, nation, and the world.
17	Percentage of 4-H youth (4th- 12th graders) express interest and engage in science.
18	Percentage of 4-H youth (4th- 12th graders) express positive attitudes and aspirations toward science.
19	Percentage of 4-H youth (4th- 12th graders) develop science skills and abilities.
20	Percentage of 4-H youth (8th-12th graders) apply learning, and make a contribution through science.
21	Percentage of 4-H youth (4th- 12th graders) appreciate cultural diversity.
22	Percentage of 4-H youth (4th- 12th graders) engage in community and community issues.
23	Percentage of 4-H youth (4th- 12th graders) have understanding of the democratic process.
24	Percentage of 4-H youth (8th-12th graders) have awareness of community and community issues.
25	Percentage of 4-H youth (4th- 12th graders) choose food consistent with Dietary Guidelines.
26	Percentage of 4-H youth (4th- 12th graders) improve physical activity practices.

27	Percentage of 4-H youth (4th- 12th graders) avoid and prevent negative risk behaviors.

Outcome # 1

1. Outcome Target

Low-income individuals and families, participating in nutrition and consumer education programs, gain knowledge of food resource management techniques.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 801 - Individual and Family Resource Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Low-moderate income individuals and families, participating in nutrition and consumer education programs, adopt recommended food resource management techniques.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 801 - Individual and Family Resource Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Children and youth, participating in-school and afterschool educational programs, increase their level of science, agricultural and environmental literacy.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 4

1. Outcome Target

Youth educators and child resource specialists, participating in youth development education programs, gain knowledge of youth development practices.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 5

1. Outcome Target

Children and youth, participating in nutrition education programs, gain knowledge of nutrition.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 6

1. Outcome Target

Adults, participating in nutrition education programs, adopt recommended dietary practices.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 7

1. Outcome Target

Individuals, participating in nutrition education programs, adopt safe food handling and preparation techniques.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 8

1. Outcome Target

Youth educators and child resource specialists, participating in youth development education programs, adopt recommended youth development practices.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 9

1. Outcome Target

Youth educators and program extenders, participating in the programs, including 4-H and SET, gain knowledge of best practices to extend science, engineering, and technology education and opportunities.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 10

1. Outcome Target

Teachers, participating in health and nutrition programs, adopt recommended practices to prevent childhood obesity and foster a school environment that reinforces nutrition education.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 11

1. Outcome Target

Community garden managers, non-profit agency personnel, small business owners, and low-income members of the public, participating in Master Gardener and other urban horticulture programs, gain knowledge about sustainable gardening practices.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 805 - Community Institutions and Social Services

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 12

1. Outcome Target

Individuals participating in food safety education, gain knowledge of safe food handling, preparation, and preservation techniques.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 13

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) make positive choices.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 14

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) effectively communicate.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 15

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) build connections.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 16

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) apply content knowledge and skills in health, citizenship and science to contribute to the health, growth, and well-being of self, family, community, nation, and

the world.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 17

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) express interest and engage in science.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 18

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) express positive attitudes and aspirations toward science.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 19

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) develop science skills and abilities.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 20

1. Outcome Target

Percentage of 4-H youth (8th-12th graders) apply learning, and make a contribution through science.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 21

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) appreciate cultural diversity.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 22

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) engage in community and community issues.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 23

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) have understanding of the democratic process.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 24

1. Outcome Target

Percentage of 4-H youth (8th-12th graders) have awareness of community and community issues.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 25

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) choose food consistent with Dietary Guidelines.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 703 - Nutrition Education and Behavior
- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 26

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) improve physical activity practices.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 724 - Healthy Lifestyle

- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 27

1. Outcome Target

Percentage of 4-H youth (4th- 12th graders) avoid and prevent negative risk behaviors.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 724 - Healthy Lifestyle
- 806 - Youth Development

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Description

California continues to face its worst drought in decades. Water supply and quality for agricultural, urban, and environmental systems has become one of the state's biggest challenges.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Types of evaluation:

- needs assessment
- process evaluation
- outcomes evaluation

Types of evaluation studies:

- case study
- single group, nonexperimental
- quasi-experimental
- experiment

Methods for data collection:

- survey
- interview
- focus group
- observation
- journal
- portfolio review
- document review
- expert or peer review

Timing:

- pre/post
- time series
- retrospective

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Sustainable Food Systems

2. Brief summary about Planned Program

The ability to provide quality, affordable and accessible food will be the defining economic, sociopolitical and ethical issue of our time. It is a global challenge. But it is also a challenge to California, one of the world's top agricultural producers. In 2012, the farm gate value of California reached a record $44.7 billion, up from $37.9 billion during 2010; 2012 saw a 3% increase in the sales of its products. California remained the number one state in cash farm receipts, representing 11.3% of the U.S. total. The state provides nearly half of fruits, nuts and vegetables grown in the United States, and produces more than 400 commodities. The state is a major contributor of dairy products. In order to maintain California's strong food production system, we need to adapt to ever changing conditions such as unprecedented challenges from world competition, increased input costs, environmental constraints, severe water limitations, high regulatory pressures and labor limitations. In order to maintain California's strong food production system, we need to adapt to ever changing conditions such as unprecedented challenges from world competition, increased input costs, environmental constraints, severe water limitations, high regulatory pressures and labor limitations. In order to maintain California's strong food production system, we need to adapt to ever changing conditions such as unprecedented challenges from world competition, increased input costs, environmental constraints, severe water limitations, high regulatory pressures, labor limitations, and climate change. Consistent with trends worldwide, California is likely to have warmer winters and springs leading to reduced snow-pack, increasing the seasonality of water flows and directly affecting our ability to grow plants and produce food to support growing populations.

Only an interdisciplinary approach can effectively address the severe challenges food insecurity presents to social justice and the California economy, and the dangers that declining agricultural productivity present to national and global food security. Part of the solution lies in increasing the productivity of agriculture, and also in making agricultural products more accessible to consumers, especially those who lack adequate access to healthy fruits and vegetables.

UC ANR scientists have played a key role to play in both increasing agricultural productivity and access to healthy food. UC ANR is helping to introduce new crops and enterprises and developing new uses for existing crops and animals. Working with producers, UC ANR improves the nutritive value of California commodities. California agriculture benefits by the value added to its commodities and its competitive advantage in national and international markets. UC ANR also works with producers and communities to increase access to California products through new kinds of distribution models and by creating new markets for small and local producers (including farm-to-institution programs and Community Supported Agriculture projects). Agriculture's enhanced economic viability - through increased productivity and enhanced access - improves the quality of life, human health, education, and other services in both rural and urban California and contributes to the growth of the state's overall economy.

To enhance a sustainable food system UC ANR's role will be to:

- develop and encourage innovations in genetic, genomics, biotechnology, and traditional breeding approaches, producing crops tolerant to drought and suboptimal soils, new crops to enhance nutrition and reduce chronic diseases and specific health conditions, plants with unique applications, and plants that

produce value-added products.

• encourage innovation in a wide range of new technologies that impact California agriculture and food, including mechanization in agricultural production, irrigation water management, and postharvest quality and value-added products.

• explore the potential of new commodities, expand the uses and markets for existing commodities, and extend information on production and marketing practices.

• develop and disseminate science-based practices for production, including organics, for local marketing to ensure continuation of California's competitive advantage.

• generate science-based information on marketing strategies to develop international markets for existing and new California agricultural commodities in developing countries, where population increases will be largest and where world income growth is likely to be concentrated over the next 20 years.

• develop and disseminate knowledge on the role of consuming products associated with healthy diets.

• identify agricultural crops and systems that share mutually beneficial uses for wildlife and recreation.

• foster direct marketing options such as farmers markets in low-income communities.

• teach people better ways to manage resources to maximize their food purchasing power.

• direct effort at the development of farm production practices to control contamination of foods from microbes, toxins, and chemicals and to understand the biology of food contamination.

• develop methods to prevent, detect, respond, and recover from outbreaks of foodborne illness, including trace-back and trace-forward labeling to identify contaminated food products.

• develop methods to identify contaminated products.

• create and apply technologies to eliminate contamination from the farm to the processor, handler, and consumer.

• develop strategies for food producers and handlers to respond and recover from outbreaks.

• educate community organizations and consumers on safe food handling practices.

• develop educational programs for growers and dairies farmers and ranchers to reduce their greenhouse-gas emissions, including using less fertilizer and more cover cropping.

• develop and encourage innovations in genetic, genomics, biotechnology, and traditional breeding approaches, producing new varieties of crops, animals and forest species that thrive in California as the climate changes.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	14%		7%	
111	Conservation and Efficient Use of Water	4%		2%	
201	Plant Genome, Genetics, and Genetic Mechanisms	1%		14%	
202	Plant Genetic Resources	3%		3%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	5%		8%	
204	Plant Product Quality and Utility (Preharvest)	7%		3%	
205	Plant Management Systems	32%		3%	
206	Basic Plant Biology	1%		13%	
212	Diseases and Nematodes Affecting Plants	2%		4%	
302	Nutrient Utilization in Animals	2%		3%	
307	Animal Management Systems	11%		2%	
311	Animal Diseases	2%		2%	
501	New and Improved Food Processing Technologies	0%		3%	
502	New and Improved Food Products	2%		4%	
503	Quality Maintenance in Storing and Marketing Food Products	2%		1%	
601	Economics of Agricultural Production and Farm Management	5%		3%	
604	Marketing and Distribution Practices	3%		1%	
702	Requirements and Function of Nutrients and Other Food Components	0%		20%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	3%		2%	
723	Hazards to Human Health and Safety	1%		2%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Projected population growth, widespread poverty and declining agricultural productivity within the context of climate change create an urgency to increase food production in ways that are more efficient

and sustainable. California agriculture plays a vital role in providing an abundant source of safe, nutritious, and remarkable inexpensive food for its residents, the nation, and the world. California agriculture faces unprecedented challenges to its sustainability, including climate change, water, regulation, labor, invasive species, urbanization, and other factors.

An exploding population in the West has caused significant competition for land and water. Prime farmland is being lost at increasing rates, particularly in southern California, coastal regions, and the Central Valley. Local and state governments will need assistance from the land grant system in dealing with land use issues aimed at slowing the loss of critical farmlands and loss of agricultural jobs. Loss of prime farmland through urbanization and parcelization will gradually increase America's dependence on foreign sources of certain foods. The global food supply provides consumers with products originating from plant and animal sources around the world, increasing the risk of food borne illnesses.

California producers are being called upon to greatly reduce their negative impacts on air and water quality. California's Central Valley is heavily impacted by increasing population and concomitant air degradation. Farmers and other businesses are being asked to reduce both dust and combustion emissions. Federal and state regulations aimed at improving the quality of both ground and surface waters will significantly change many farming and ranching practices. The dairy industry has instituted Comprehensive Nutrient Management Plants required by the Central Valley Water Quality Control Board. These will drastically change the way they manage nitrogen, water and waste. New technologies and monitoring systems will be needed to manage the nitrogen and nutrient cycles on dairies and cropping systems.

California producers must continue to improve the efficiency and quality of agricultural production in an ecologically and environmentally sound manner. Maintaining a safe, environmentally and economically sustainable system for production of food, fiber, and ornamentals is an important priority.

Climate change will greatly affect California's agricultural industry. Recent and predicted increases in temperature will have major impacts on where and what kinds of plants can be grown. The numbers and kinds of invasive pests and diseases are increasing because of rising temperatures overall and the lack of winter chill periods allows many pests to breed throughout the year.

UC ANR's Sustainable Food Systems program will focus on enhancing economic viability, environmental sustainability, food safety, and food security.

Economically, the cost-price squeeze has been intensive for many of our producers. Most of California's crops are not federal program crops and must follow the dictates of markets, which can be quite volatile with high risk. The globalization of markets has resulted in significant competition from overseas producers that have lower labor, energy or regulatory costs. Economic innovation and cost control is needed to address economic viability issues.

Agriculture is a large and highly valued component of California's economy, and it's economic sustainability needs to be balanced with environmental sustainability. The profitability of California farms is challenged by sharply rising production costs, depressed value of some crops due to overproduction, increased competition for water, increased diversity and availability of imported crops, and trade restrictions that limit export markets. Organic production of plants and animals, and other consumer-oriented sustainability definitions (e.g. range-fed beef, humane animals, sustainability indexes) are a dynamic sector of agriculture that will help shape economically and environmentally sustainable agricultural systems for the future.

Foodborne illness affects 1 in 4 Americans annually, with higher rates in California. Older Californians, young children, pregnant women, and those with illnesses will continue to be at heightened

risk for foodborne illnesses. These foodborne illnesses place a burden on the health care systems and reduce the productivity of our workforce. Consumer health and agricultural sustainability require a food supply that is produced, processed, distributed, and prepared in a manner that prevents or minimizes contaminants. The health of livestock and poultry, and the control of pathogens and contaminants in fresh and processed food products are pivotal control points in assuring food safety for consumers, and begins with agricultural production systems.

Lack of food security affects and will continue to challenge communities and the entire state. Currently 1 in 10 California households are affected by food insecurity. The populations proven the most vulnerable to food insecurity are projected to grow much faster than those who are not. Only an interdisciplinary approach can effectively address the severe challenges that food insecurity presents to social and environmental justice.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

• The sustainability of our agricultural systems will be challenged by decreased resource availability and increased costs all levels of the production and delivery system. California will be especially challenged by water availability and drought. All forms of energy inputs (electricity, diesel, gasoline, natural gas and propane) will substantially increase in cost over the long-term. Since agriculture is energy intensive in its present form, it will be especially vulnerable.

• It must be assumed that labor intensive crops will have significant problems obtaining and holding labor forces during peak demand periods. Disruptions to the flow of labor from Latin America and also to competition from other industries will be a major factor for many of the high-value agricultural enterprises.

• New regulatory initiatives on the part of state and federal regulatory agencies will create new costs that are unique to the US and to California that other global competitors will not have.

• Environmental concerns among consumers will create a market demand for products that are produced with more "environmentally friendly" systems.

• The global market place will favor low cost producers of most commodities. This will result in the decline of certain sectors of American agriculture. Production of these products will shift to those countries that can deliver the product to the world market place most competitively. US foreign policy aimed at assisting lesser developed nations and at stabilizing relations with countries such as China will result in products from these countries entering the US market place at prices that are significantly lower than domestic sources.

• New microbial and chemical threats (natural, accidental or intentional) on an ongoing basis.

• Loss of farmlands and the globalization of the world market place will gradually increase our dependence on foreign sources for certain components of our food system. This dependence will present

additional venues of vulnerability for food contamination. Foreign sources will also provide additional opportunities for intentional tampering and the introduction of substances and organisms. These substances will either cause injury to humans or simply cause alarm among consumers. This will, in turn, disrupt the domestic market place. It may also make the US market place more sensitive to disruptions because of global transportation issues, energy shortages or political unrest.

2. Ultimate goal(s) of this Program

- Development and adoption of new crop species and crop varieties that improve the nutrition, access, and affordability to California consumers and improve the competitive position of California producers
- Adoption of new technologies and improved cultural, water, and nutritional systems by California producers that lead to more efficient and less costly production, with less detrimental impacts on the environment
- Adoption of improved management information, forecasting and decision making systems by California producers that improve competitive advantage and profitability
- Enabling California agriculture to remain economically viable, maximizing its opportunities in markets where it has a competitive advantage
- Production of California commodities with minimal or no detrimental impact on the state's natural resources and environment
- Implementation and coordination of dairy producer manure and nutrient management plans
- Adoption and use of models for cooperative agreements and relationships all along the waste stream to improve waste management practices and systems
- Improved communication between regulators and producers leading to development and utilization of environmental quality assurance programs
- Increased adoption of improved resource management practices and improved utilization of the food dollar by low-income and underserved populations
- Improved food safety knowledge and practices for food suppliers, processors, retailers and consumers
- Improved food handling techniques throughout the food production, processing, storage and consumption system
- Adoption of new detection techniques and countermeasure practices for food contaminants
- Increased producer, handler and consumer knowledge and improved skills in appropriate use and management of new food technologies, additives and contaminants
- Decrease in the number of Californians who suffer from food borne illness each year
- Reduction in the cost of medical care, lost work hours and deaths due to food borne illness

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	10.3	0.0	16.2	0.0
2018	10.3	0.0	16.2	0.0
2019	10.3	0.0	16.2	0.0
2020	10.3	0.0	16.2	0.0

2021	10.3	0.0	16.2	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

UC ANR's integrated research and extension activities will conduct research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs will use PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class	● Public Service Announcement
● Workshop	● Newsletters
● Group Discussion	● TV Media Programs
● One-on-One Intervention	● Web sites other than eXtension
● Demonstrations	● Other 1 (Collabs w/other agencies/orgs)

3. Description of targeted audience

• Food producers (e.g. farmers/ranchers and rangeland owners/operators/managers, including conventional, organic, small and large producers)
• Agricultural advising professionals (e.g. Pest Control Advisors, crop advisors, landscape professionals)
• Allied industry companies including seed and supply companies
• Food processors, handlers, retailers and suppliers
• Public regulatory agencies and private non-profit advocacy groups
• Food consumers, members of the general public

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Classes/Short Courses Conducted
- Workshops Conducted
- Demonstrations and Field Days Conducted
- Newsletters Produced
- Web Sites Created or Updated
- Research Projects Conducted
- Videos, Slide Sets and other A/V or Digital Media Educational Products Created
- Manuals and Other Printed Instructional Materials Produced

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Farm and ranch owners/managers and allied industry professionals, participating in the programs, gain knowledge of crop and varietal selection factors and research-based performance data.
2	Farm and landscaping owners/managers and allied industry professionals, participating in the programs, gain knowledge of cultural practices and other aspects of comprehensive management systems for plant production.
3	Farm and ranch owners/managers, participating in the programs, gain knowledge of business management practices and marketing strategies, including the costs and risks associated with producing specialty crops.
4	Farm and ranch owners/managers, participating in the programs, gain skills in business management practices.
5	Farm and landscaping owners/managers and allied industry professionals, participating in the programs, gain knowledge of pest and disease management for plant production.
6	Farm and landscaping owners/managers and allied industry professionals, participating in the programs, gain knowledge of irrigation management and drainage.
7	Farm and landscaping owners/managers and allied industry professionals, participating in the program, gain skills to improve comprehensive management systems for plant production.
8	Farm and ranch owners/managers and allied industry professionals, participating in food safety programs, gain knowledge on on-farm control of food contaminants and quality assurance programs.
9	Ranch owners/managers and allied industry professionals, participating in the programs, gain knowledge of aspects of comprehensive management systems for animal production.
10	Farm owners/managers and allied industry professionals, participating in the programs, are more likely to try out or adopt recommended cultural practices or other aspects of comprehensive management systems for plant production.
11	Farm and landscaping owners/managers and allied industry professionals participating in the program gain knowledge of aspects of plant nutrition management.
12	Ranch owners/managers and allied industry professionals, participating in the program, gain skills to improve comprehensive management systems for animal production.
13	Ranch owners/managers and allied industry professionals, participating in the programs, are more likely to try out or adopt recommended practices or other aspects of comprehensive management systems for animal production.
14	National priority outcome indicator: number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased, increased economic return, and/or conservation of resources.

Outcome # 1

1. Outcome Target

Farm and ranch owners/managers and allied industry professionals, participating in the programs, gain knowledge of crop and varietal selection factors and research-based performance data.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 202 - Plant Genetic Resources
- 204 - Plant Product Quality and Utility (Preharvest)

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Farm and landscaping owners/managers and allied industry professionals, participating in the programs, gain knowledge of cultural practices and other aspects of comprehensive management systems for plant production.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 206 - Basic Plant Biology
- 601 - Economics of Agricultural Production and Farm Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Farm and ranch owners/managers, participating in the programs, gain knowledge of business management practices and marketing strategies, including the costs and risks associated with

producing specialty crops.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 604 - Marketing and Distribution Practices

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 4

1. Outcome Target

Farm and ranch owners/managers, participating in the programs, gain skills in business management practices.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 601 - Economics of Agricultural Production and Farm Management
- 604 - Marketing and Distribution Practices

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 5

1. Outcome Target

Farm and landscaping owners/managers and allied industry professionals, participating in the programs, gain knowledge of pest and disease management for plant production.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 212 - Diseases and Nematodes Affecting Plants

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 6

1. Outcome Target

Farm and landscaping owners/managers and allied industry professionals, participating in the programs, gain knowledge of irrigation management and drainage.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 7

1. Outcome Target

Farm and landscaping owners/managers and allied industry professionals, participating in the program, gain skills to improve comprehensive management systems for plant production.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 8

1. Outcome Target

Farm and ranch owners/managers and allied industry professionals, participating in food safety programs, gain knowledge on on-farm control of food contaminants and quality assurance programs.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 311 - Animal Diseases
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 9

1. Outcome Target

Ranch owners/managers and allied industry professionals, participating in the programs, gain knowledge of aspects of comprehensive management systems for animal production.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 302 - Nutrient Utilization in Animals
- 307 - Animal Management Systems
- 311 - Animal Diseases
- 601 - Economics of Agricultural Production and Farm Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 10

1. Outcome Target

Farm owners/managers and allied industry professionals, participating in the programs, are more likely to try out or adopt recommended cultural practices or other aspects of comprehensive management systems for plant production.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 205 - Plant Management Systems

- 307 - Animal Management Systems

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 11

1. Outcome Target

Farm and landscaping owners/managers and allied industry professionals participating in the program gain knowledge of aspects of plant nutrition management.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 12

1. Outcome Target

Ranch owners/managers and allied industry professionals, participating in the program, gain skills to improve comprehensive management systems for animal production.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems
- 311 - Animal Diseases

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 13

1. Outcome Target

Ranch owners/managers and allied industry professionals, participating in the programs, are more likely to try out or adopt recommended practices or other aspects of comprehensive management systems for animal production.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 307 - Animal Management Systems
- 311 - Animal Diseases

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 14

1. Outcome Target

National priority outcome indicator: number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased, increased economic return, and/or conservation of resources.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water
- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 307 - Animal Management Systems
- 311 - Animal Diseases
- 601 - Economics of Agricultural Production and Farm Management
- 604 - Marketing and Distribution Practices

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Description

California continues to face its worst drought in decades. Water supply and quality for agricultural, urban, and environmental systems has become one of the state's biggest challenges.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Types of evaluation:

- needs assessment
- process evaluation
- outcomes evaluation

Types of evaluation studies:

- case study
- single group, nonexperimental
- quasi-experimental
- experiment

Methods for data collection:

- survey
- interview
- focus group
- observation
- document review
- expert or peer review

Timing:

- pre/post
- time series
- retrospective

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Sustainable Natural Ecosystems

2. Brief summary about Planned Program

Population growth is one of the most important issues that will affect California's natural resources. Future urban and suburban growth is projected to shift more toward rangelands and forests. The wildland-urban interface will expand highlighting trade-offs between urban growth and natural lands. The impact will include habitat loss/fragmentation and degraded water quality.

The earth's temperature has risen 1 degree Fahrenheit in the last 100 years, and is projected to continue to heat up at an accelerated rate in the future. Consistent with trends worldwide, California is likely to have warmer winters and springs leading to reduced snow-pack, increasing the seasonality of water flows and directly affecting our ability to conserve natural resources. In addition, wildfires will likely increase, and other "natural disasters" will be more frequent and severe.

To maintain and enhance sustainable natural ecosystems UC ANR's role is to develop research and educational information on:

- ecosystem management systems to ensure that they provide clean air, carbon sequestration, water, and wildlife and plant habitat to guide land use planning
- ecosystem restoration methods for degraded natural ecosystems
- fire-resilient ecosystems
- new production and harvest technologies and practices that provide for sustainable supplies of products while preserving environmental quality

- develop methods for determining the impacts of climate change on natural ecosystems and resulting changes in the provisions of services and products.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	2%		5%	
102	Soil, Plant, Water, Nutrient Relationships	4%		15%	
104	Protect Soil from Harmful Effects of Natural Elements	0%		2%	
111	Conservation and Efficient Use of Water	6%		3%	
112	Watershed Protection and Management	9%		3%	
121	Management of Range Resources	24%		3%	
122	Management and Control of Forest and Range Fires	4%		1%	
123	Management and Sustainability of Forest Resources	19%		1%	
131	Alternative Uses of Land	4%		2%	
132	Weather and Climate	1%		6%	
133	Pollution Prevention and Mitigation	2%		9%	
135	Aquatic and Terrestrial Wildlife	3%		9%	
136	Conservation of Biological Diversity	10%		11%	
141	Air Resource Protection and Management	5%		8%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		4%	
212	Diseases and Nematodes Affecting Plants	0%		3%	
311	Animal Diseases	0%		3%	
605	Natural Resource and Environmental Economics	4%		7%	
610	Domestic Policy Analysis	1%		4%	
723	Hazards to Human Health and Safety	2%		1%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

California leads the nation in the value of agricultural and ecosystem diversity. The state's population is also the most diverse, populous and rapidly growing, which continues to increase demands on California's natural resources. Issues involving natural resources are far ranging, from urban areas to wildlands, and from aquatic to terrestrial ecosystems.

Land use conflicts are frequent throughout the state. Land use decisions can, and have, resulted in loss of plant and animal species, open space and wildlife, deterioration of water quality, increased dispersal of invasive species, and habitat fragmentation. Incorporation of approaches that maintain critical ecosystem conditions on a landscape scale over the long term, while providing products, recreation and habitat, is critical for California. Sustaining diverse ecosystems while meeting societal needs and desires is at the core of this area.

California's prosperity is tied to effective management of available water for the values and benefits held by its citizenry. Proposed development, population growth, agricultural production, and ecosystem sustainability in California are dependent upon reliable sources of high quality water. California had over 600 water bodies listed as impaired under the federal Clean Water Act of 1972 based on the 2002 Section 303(d) list. Identified contaminants that impair water quality, affect ecosystem health and potentially threaten human health include nutrients, pesticides, sediment, and bacteria. Temperature and sediment threaten spawning and rearing habitat for aquatic species, such as salmon, and degradation of riparian habitat compound these impairments to beneficial uses derived from clean water.

The negative impacts of air pollution include crop injury, global warming, plant and animal biodiversity shifts, human health impairment and others. Generation of particulate matter (PM) and photoxidant gases from farming and livestock operations can be significant contributors to air pollution, including ozone generation, reducing crop yields, impairing human health and contributing to other environmental impacts.

The impacts of climate change on natural ecosystems will result in changes to the provision of products and services. The effects of unprecedented changes in the world, such as global warming, exploding population levels, and the transition from a carbon economy to renewable, reliable sources of energy, will be felt in California and will create challenges for our families and communities.

Wildland fire management systems require many approaches based upon a greater understanding of fire behavior, the ecological role of fire in natural systems, ecosystem health, and fire suppression strategies. Fire and fuels management directly affect water and air quality, and have impacts on habitat, invasive species spread, and other ecosystem functions.

Accurate science-based information is the cornerstone of making sound personal decisions and public policy. California needs a public with greater understanding of science, so that they can make informed personal choices and public policies regarding food production, diet and health, and the natural and human-made environment.

UC ANR's integrated research and extension activities will address issues related to sustaining California's natural resources over the long-term while continuing to provide products, recreation and habitat for the state.

California's Sustainable Natural Ecosystems program will focus on the following areas:

• Land Use: biological, economic, social, and physical aspects of land use, including urban and rural uses and trends, characteristics of land use planning and policy approaches and issues, mitigation or prevention of land use related problems.

• Water Quality: biological and physical aspects of water quality, the economic and social activities that affect water quality and solutions to prevent or mitigate water quality problems.

• Air Quality: biological and physical aspects of air quality, including sources, characteristics,

movement and mitigation or prevention of air quality problems.

• Sustainable Use of Natural Resources: biological, economic, social and physical aspects of the sustainability of natural resources in California, including management practices that promote ecological sustainability along with economic opportunity on a landscape scale, characteristics of natural resources-use planning policy approaches and issues, mitigation or prevention of natural resource use related problems.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

• Continuation of funding (public and private) at current or higher levels.
• Continuation of agency and organization collaboration at current or higher levels.
• Availability of personnel to be appointed to new and/or vacated Agricultural Experiment Station and Cooperative Extension positions.
• Natural resource related policies and regulations (local, state, federal) which allow for management of natural resources based upon scientific information, concepts and knowledge.

2. Ultimate goal(s) of this Program

• Utilizing science-based research and educational approaches to address environmental issues in partnership with others, including agricultural groups, environmental groups, and regulatory bodies
• Assisting in the development of flexible and effective water policies and strategies using its econometric, hydrological, and policy expertise
• Encouraging innovation in a wide range of new technologies which impact the California natural resource economy, including development of new forest products and utilization of forest byproducts
• Significant and measurable improvement in air quality in California.
• Improved agricultural productivity linked to improved air quality
• Reduced incursions of invasive species in urban and rural settings
• Improvement in native biodiversity
• Cleaner air, soil and water associated with improved land use and natural resource use practices
• Increased area of sustainable open space and natural habitats for the environment, recreation and wildlife
• Developing new production technologies and practices for California agriculture that conserve natural resources and preserve environmental quality
• Producing technology, marketing and policy advancements to enable expanded use of agricultural resources for the production of ecosystem services such as carbon sequestration, waste recycling, wildlife habitat, and renewable energy generation

• Providing science-based information to regulators to inform the development of policies and regulations that protect environmental quality while sustaining the economic viability of agricultural production
• Reduced natural resource system failure and related economic, environmental and social losses
• Decrease in the number of acres burned by wild fires
• Providing accessible science information to enable people to adapt to ever-changing physical, social and economic conditions

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	9.6	0.0	9.6	0.0
2018	9.6	0.0	9.6	0.0
2019	9.6	0.0	9.6	0.0
2020	9.6	0.0	9.6	0.0
2021	9.6	0.0	9.6	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

UC ANR's integrated research and extension activities will conduct research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs will use PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class	● Public Service Announcement
● Workshop	● Newsletters
● Group Discussion	● TV Media Programs
● One-on-One Intervention	● Web sites other than eXtension
● Demonstrations	● Other 1 (Collabs w/other agencies/orgs)

3. Description of targeted audience

- Farmers
- Ranchers
- Inland fishery owners/operators

- Governmental agencies
- Agricultural and fishing organizations
- Owners/managers of private and public rangeland, forest and wildlands
- Community organizations
- Resource managers

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Classes/Short Courses Conducted
- Workshops Conducted
- Demonstrations and Field Days Conducted
- Newsletters Produced
- Web Sites Created or Updated
- Research Projects Conducted
- Videos, Slide Sets and Other AV or Digital Media Educational Products Created
- Manuals and Other Printed Instructional Materials Produced

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Farm, ranch, private and public forest and wildland owners/mangers, participating in natural resource management programs, gain knowledge of strategies and techniques for sustainable use of natural resources.
2	Fire protection and land management agencies, land and home owners, community organizations, and landscape professionals, participating in wildland fire education programs, gain knowledge on how to increase fire resistance of homes and landscaping.
3	Farm, ranch, and landscape owners/managers and allied industry professionals and governmental agency representatives, participating in air quality education programs, gain knowledge of the atmospheric system and/or how policies, products, plants, and practices can help improve air quality.
4	Ranch and private and public rangeland owners/managers, participating in rangeland management programs, gain knowledge of recommended techniques for rangeland monitoring and management, and grazing and browsing.
5	Ranch and private and public rangeland owners/managers, participating in the programs, adopt recommended techniques for rangeland monitoring and management, and grazing and browsing.
6	Farm owners/managers and allied industry professionals participating in soil quality education programs, gain knowledge of soil conditions and management practices to improve soil health.
7	Forest landowners and agency personnel gain knowledge of management and sustainability for forest resources.
8	Owners/managers of private and public lands, participating in sustainable natural ecosystem education programs, will adopt recommended strategies and techniques for sustainable use of natural resources.

Outcome # 1

1. Outcome Target

Farm, ranch, private and public forest and wildland owners/mangers, participating in natural resource management programs, gain knowledge of strategies and techniques for sustainable use of natural resources.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Fire protection and land management agencies, land and home owners, community organizations, and landscape professionals, participating in wildland fire education programs, gain knowledge on how to increase fire resistance of homes and landscaping.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 122 - Management and Control of Forest and Range Fires

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Farm, ranch, and landscape owners/managers and allied industry professionals and governmental agency representatives, participating in air quality education programs, gain knowledge of the atmospheric system and/or how policies, products, plants, and practices can help improve air quality.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 141 - Air Resource Protection and Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 4

1. Outcome Target

Ranch and private and public rangeland
owners/managers, participating in rangeland management programs, gain knowledge of recommended techniques for rangeland monitoring and management, and grazing and browsing.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 121 - Management of Range Resources

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 5

1. Outcome Target

Ranch and private and public rangeland owners/managers, participating in the programs, adopt recommended techniques for rangeland monitoring and management, and grazing and browsing.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 121 - Management of Range Resources

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 6

1. Outcome Target

Farm owners/managers and allied industry professionals participating in soil quality education programs, gain knowledge of soil conditions and management practices to improve soil health.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 7

1. Outcome Target

Forest landowners and agency personnel gain knowledge of management and sustainability for forest resources.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 8

1. Outcome Target

Owners/managers of private and public lands, participating in sustainable natural ecosystem education programs, will adopt recommended strategies and techniques for sustainable use of natural resources.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 101 - Appraisal of Soil Resources

- 121 - Management of Range Resources
- 135 - Aquatic and Terrestrial Wildlife
- 136 - Conservation of Biological Diversity
- 141 - Air Resource Protection and Management
- 610 - Domestic Policy Analysis

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Description

California continues to face its worst drought in decades. Water supply and quality for agricultural, urban, and environmental systems has become one of the state's biggest challenges.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Types of evaluation:

- needs assessment
- process evaluation
- outcomes evaluation

Types of evaluation studies:

- case study
- single group, nonexperimental
- quasi-experimental
- experiment

Methods for data collection:

- survey
- interview
- focus group

- observation
- document review
- expert or peer review

Timing:

- pre/post
- time series
- retrospective

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Endemic and Invasive Pests and Diseases

2. Brief summary about Planned Program

Economic impacts from endemic and invasive pests and diseases can include direct and indirect costs to agriculture and livestock industry, as well as to fisheries and water delivery systems. Human health threats associated with pest and disease organisms are also of serious concern. To ensure the sustainability of the state's food and agricultural production and its natural resources, as well as the health of the economy, California and the world must constantly update the exclusion, detection, eradication, and control of invasive pests and diseases. Using integrated pest management as a systems-based approach, ANR focuses on long-term prevention of pests and their damage.

To manage endemic and invasive pests UC ANR's role is to:

- provide science-based information to support exclusion strategies and policy, including knowledge of invasive biology to better assess risk, prediction, and intervention.
- develop innovative technologies for rapid identification through surveillance and detection systems.
- develop effective and economic technologies and tactics for use in diverse agricultural, natural, and urban systems to mitigate or control organisms for reduced environmental impact.
- develop economical control or management strategies to maintain price competitiveness in the global economy.
- increase the knowledge of invasion biology to better assess risk, prediction, and intervention.
- increase our understanding of how changing environments influence emergence of endemic pests and diseases and the introduction of new species and vectors.
- build a spectrum of interdisciplinary expertise from field to bench, whole-organism to molecular, ensuring effective translation of scientific advances into practical applications.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	1%		0%	
111	Conservation and Efficient Use of Water	0%		1%	
133	Pollution Prevention and Mitigation	0%		1%	
135	Aquatic and Terrestrial Wildlife	2%		3%	
136	Conservation of Biological Diversity	1%		3%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		3%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		1%	
206	Basic Plant Biology	1%		1%	
211	Insects, Mites, and Other Arthropods Affecting Plants	16%		13%	
212	Diseases and Nematodes Affecting Plants	19%		30%	
213	Weeds Affecting Plants	13%		2%	
215	Biological Control of Pests Affecting Plants	4%		14%	
216	Integrated Pest Management Systems	39%		9%	
305	Animal Physiological Processes	0%		3%	
311	Animal Diseases	1%		3%	
312	External Parasites and Pests of Animals	1%		3%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%		1%	
721	Insects and Other Pests Affecting Humans	2%		4%	
722	Zoonotic Diseases and Parasites Affecting Humans	0%		3%	
723	Hazards to Human Health and Safety	0%		2%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

The management of key pests in California's diverse agricultural, natural, and urban ecosystems is an ongoing effort. The same environment that allows a tremendous plant, crop, and animal diversity also

provides numerous niches for various pest organisms, including weeds, insects, plant diseases, nematodes, mites, and vertebrate pest and disease causing organisms. In addition, the speed and frequency of international travel today, combined with the volume of imported food, commodities, and materials, has increased the introduction of invasive species and diseases into the state. Programs developed to manage pests require constant maintenance and adjustment as new pests are introduced, new crops are brought into production, new crop protection products are introduced or removed, and new technologies are introduced (advances in weather monitoring, pest modeling, site specific agriculture, GIS applications, etc.). UC ANR's integrated research and extension activities will address the issue of the negative impact of key pest species on plant and animal systems in agricultural, natural, and urban environments.

California's Endemic and Invasive Pests and Diseases program will focus on the following areas:

ANR scientists focus on long-term prevention of pests or their damage through the ecosystem-based strategy they developed called Integrated Pest Management. This systems-based approach utilizes a wide range of biological, cultural and physical controls with chemical control restricted to an as-needed basis when monitoring indicates economic thresholds have been exceeded.

This will include a specific focus on understanding of invasive species and their modes of entry into the state, assisting in the eradication or reducing the spread of newly introduced species, and developing methods of effectively dealing with recent introductions.

The priority components of pest management that ANR research and extension programs will address include the basic biology of pest species; genetics and systematics (origin, diversity); epidemiology and modeling invasion biology; prediction of social/economic consequences; biological control; cultural control; prediction, early detection, and prevention of invasion; management of weeds; and alternatives to chemical pesticides.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension

- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

- Continuation of funding (public and private) at current or higher levels.
- Continuation of agency and organization collaboration at current or higher levels.
- Availability of personnel to be appointed to new and/or vacated Agricultural Experiment Station and Cooperative Extension positions.
- Pest and disease related policies and regulations (local, state, federal) which allow for management based upon scientific information, concepts and knowledge.
- New regulatory initiatives on the part of state and federal regulatory agencies will create new costs that are unique to the US and to California that other global competitors will not have.
- Environmental concerns among consumers will create a market demand for products that are produced with more "environmentally friendly" systems.
- Increased international travel and volume of imported goods will continue to introduce new invasive pests and diseases into California.
- As global climate patterns shift, the distribution of endemic pests will change, and many habitats will become more susceptible.

2. Ultimate goal(s) of this Program

- Increased utilization of effective pest monitoring and use of economic thresholds to make treatment decisions
- Increased awareness, broad adoption and use of new and improved pest management practices and products, including greater use of pesticide resistance management practices, increased use of less toxic and more environmentally safe pesticides and greater reliance on alternative methods of control such as resistant varieties, biological controls, and/or cultural controls
- Improved understanding of the complexity of pest management through demonstration of knowledge of systems and interaction of biological, climatological, ecological and other factors in managing pests
- Increased professionalism of crop and pest consultants through improved certification programs
- Development or refinement of risk assessments for various invasive species and their impacts and action plans to include applied research and extension components
- Development of a more proactive California approach to deal with potential invasive species including the development and implementation of methods of preventing entry of such species into the state
- Cooperation among California Department of Food and Agriculture, U.S. Department of Agriculture Agricultural Research Service, UC ANR, and other agencies when newly invasive species are detected to deal with these species through coordinated local eradication, expanded monitoring, suppression, and/or management and by focusing and coordinating research and extension efforts
- Better and more accurate quantification and communication of the economic and sociological consequences of invasive species for both past and potential introductions
- A coordinated and integrated approach by UC to deal with invasive species negatively impacting the state
- More reliable, effective and economic management of important pest species by pest control advisors, growers and other horticulturalists
- Reduced use of environmentally significant or toxic pesticides

• Sustained profitability of California agriculture through more effective and reliable pest management practices

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	7.7	0.0	12.1	0.0
2018	7.7	0.0	12.1	0.0
2019	7.7	0.0	12.1	0.0
2020	7.7	0.0	12.1	0.0
2021	7.7	0.0	12.1	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

UC ANR's integrated research and extension activities will conduct research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs will use PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class ● Workshop ● Group Discussion ● One-on-One Intervention ● Demonstrations	● Public Service Announcement ● Billboards ● Newsletters ● TV Media Programs ● Web sites other than eXtension ● Other 1 (Collabs w/other agencies/orgs)

3. Description of targeted audience

- Farmers
- Ranchers
- Rangeland owners/managers
- Landscaping professionals
- Owners/operators of allied agricultural industries
- General public

- Crop and pest consultants

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Classes/Short Courses Conducted
- Workshops Conducted
- Demonstrations and Field Days Conducted
- Newsletters Produced
- Web Sites Created or Updated
- Research Projects Conducted
- Videos, Slide Sets and Other AV or Digital Media Educational Products Created
- Manuals and Other Printed Instructional Materials Produced

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Farm, ranch, rangeland, and landscaping owner/operators and managers and allied industry professionals, participating in the programs, gain knowledge of pest management techniques, including Integrated Pest Management strategies.
2	Farm, ranch, rangeland, and landscaping owner/operators and managers and allied industry professionals, participating in the programs, adopt recommended prevention, detection and monitoring, and treatment practices for pest management, including Integrated Pest Management strategies.
3	Farm, ranch, rangeland, and landscaping owner/operators and managers and allied industry professionals, participating in the programs, realize lower costs for pest prevention and management.
4	Farm, ranch, rangeland, landscaping, and boat owner/operators and managers, allied industry professionals, and members of the public participating in the programs, gain knowledge of prevention, detection, and treatment strategies and techniques for management of invasive species.
5	Decreased incidence of endemic and invasive pests and diseases.
6	Farm and landscaping owner/operators and managers, and other allied industry professionals, participating in the programs, gain skills to detect, monitor, and treat endemic and invasive pests and diseases.

Outcome # 1

1. Outcome Target

Farm, ranch, rangeland, and landscaping owner/operators and managers and allied industry professionals, participating in the programs, gain knowledge of pest management techniques, including Integrated Pest Management strategies.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 216 - Integrated Pest Management Systems
- 312 - External Parasites and Pests of Animals

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Farm, ranch, rangeland, and landscaping owner/operators and managers and allied industry professionals, participating in the programs, adopt recommended prevention, detection and monitoring, and treatment practices for pest management, including Integrated Pest Management strategies.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 216 - Integrated Pest Management Systems
- 312 - External Parasites and Pests of Animals

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Farm, ranch, rangeland, and landscaping owner/operators and managers and allied industry professionals, participating in the programs, realize lower costs for pest prevention and management.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 216 - Integrated Pest Management Systems

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 4

1. Outcome Target

Farm, ranch, rangeland, landscaping, and boat owner/operators and managers, allied industry professionals, and members of the public participating in the programs, gain knowledge of prevention, detection, and treatment strategies and techniques for management of invasive species.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 135 - Aquatic and Terrestrial Wildlife
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 216 - Integrated Pest Management Systems
- 312 - External Parasites and Pests of Animals

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 5

1. Outcome Target

Decreased incidence of endemic and invasive pests and diseases.

2. Outcome Type : Change in Condition Outcome Measure

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 6

1. Outcome Target

Farm and landscaping owner/operators and managers, and other allied industry professionals, participating in the programs, gain skills to detect, monitor, and treat endemic and invasive pests and diseases.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 213 - Weeds Affecting Plants

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes

- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Description

California continues to face its worst drought in decades. Water supply and quality for agricultural, urban, and environmental systems has become one of the state's biggest challenges.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Types of evaluation:

- needs assessment
- process evaluation
- outcomes evaluation

Types of evaluation studies:

- case study
- single group, nonexperimental
- quasi-experimental
- experiment

Methods for data collection:

- survey
- interview
- focus group
- observation
- document review
- expert or peer review

Timing:

- pre/post
- time series
- retrospective

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Sustainable Energy

2. Brief summary about Planned Program

California faces diminishing and more costly supplies of energy even as the demand for energy continues to rise as a result of population growth and increased world consumption. Demands from the public for renewable sources of energy and more energy-efficient agriculture and food production will have a major impact on our food production and transportation.

To improve energy security and green technologies UC ANR's role is to:

• research and support innovative new production technologies that minimize fossil fuel energy consumption and use renewable energy sources throughout the California food production system.

• develop innovative new technologies and marketing, genetic, genomic, engineering, and agronomic techniques to produce sustainable biofuels from forest, waste, and agricultural resources for renewable energy production, including genetic and biotech innovations from UC scientists.

• form highly interdisciplinary teams across UC, agency, and private-sector partners to generate energy savings in food and waste systems and create innovations in biofuel production.

• develop science-based policy-relevant research and information to guide lawmakers on issues related to energy.

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%		2%	
123	Management and Sustainability of Forest Resources	22%		0%	
133	Pollution Prevention and Mitigation	0%		2%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		12%	
202	Plant Genetic Resources	0%		13%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		8%	
204	Plant Product Quality and Utility (Preharvest)	0%		1%	
205	Plant Management Systems	0%		1%	
206	Basic Plant Biology	0%		23%	
212	Diseases and Nematodes Affecting Plants	0%		2%	
402	Engineering Systems and Equipment	22%		1%	
403	Waste Disposal, Recycling, and Reuse	0%		4%	
511	New and Improved Non-Food Products and Processes	0%		17%	
601	Economics of Agricultural Production and Farm Management	0%		3%	
605	Natural Resource and Environmental Economics	22%		6%	
608	Community Resource Planning and Development	34%		0%	
609	Economic Theory and Methods	0%		1%	
610	Domestic Policy Analysis	0%		2%	
611	Foreign Policy and Programs	0%		1%	
701	Nutrient Composition of Food	0%		1%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Innovation is needed to efficiently manage energy resources in agricultural and food systems and to explore and develop environmentally sustainable conversion of biofuels.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

• Continuation of funding (public and private) at current or higher levels.
• Continuation of agency and organization collaboration at current or higher levels.
• Availability of personnel to be appointed to new and/or vacated Agricultural Experiment Station and Cooperative Extension positions.
• Energy related policies and regulations (local, state, federal) which support the development of sustainable energy technologies.

2. Ultimate goal(s) of this Program

• Improved energy security and green technologies through innovative science linking engineering, agricultural, biological, and environmental sciences
• Utilizing innovative new technologies, marketing, genetic, genomic, engineering and agronomic techniques to produce sustainable biofuels from forest, waste, and agricultural resources for renewable energy production
• Forming highly interdisciplinary teams across UC, agency, and private sector partners to accomplish energy savings in food systems, water systems, and innovations in biofuel production
• Developing science-based policy-relevant research and information that will guide lawmakers in the important areas related to energy

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	0.4	0.0	2.8	0.0
2018	0.4	0.0	2.8	0.0
2019	0.4	0.0	2.8	0.0
2020	0.4	0.0	2.8	0.0
2021	0.4	0.0	2.8	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

UC ANR's integrated research and extension activities will conduct research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs will use PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class	● Public Service Announcement
● Workshop	● Newsletters
● Group Discussion	● TV Media Programs
● One-on-One Intervention	● Web sites other than eXtension
● Demonstrations	● Other 1 (Collabs w/ other agencies)

3. Description of targeted audience

- Relevant agency and private-sector partners
- Lawmakers working on issues related to energy
- Members of the public in general
- Agricultural producers of crops for use as biofuels

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Workshops Conducted
- Web Sites Created or Updated
- Research Projects Conducted

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Program participants gain knowledge about new improved methods related to producing sustainable energy.

Outcome # 1

1. Outcome Target

Program participants gain knowledge about new improved methods related to producing sustainable energy.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 123 - Management and Sustainability of Forest Resources
- 511 - New and Improved Non-Food Products and Processes

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Description

California continues to face its worst drought in decades. Water supply and quality for agricultural, urban, and environmental systems has become one of the state's biggest challenges.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Types of evaluation:

- needs assessment
- process evaluation
- outcomes evaluation

Types of evaluation studies:

- case study
- single group, nonexperimental
- quasi-experimental

- experiment

Methods for data collection:

- survey
- interview
- focus group
- observation
- document review
- expert or peer review

Timing:

- pre/post
- time series
- retrospective

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

Water Quality, Quantity and Security

2. Brief summary about Planned Program

The Water Quality, Quantity and Security program will be coordinated by the new UC ANR California Institute for Water Resources. The institute will provide leadership to engage with state entities to help identify water priorities in California and help engage existing UC campus-based Water Centers to implement statewide water planning, research and outreach. The focus is on planning, policy, and problem solving. The institute will serve as a vehicle for bringing teams of people together to work on projects of statewide priority.

UC ANR's role in improving watershed and water management practices and policies:

- develop innovative scientific techniques, products, and processes to improve water use efficiency and water conservation management practices
- develop and encourage the adoption of management practices that prevent degradation of watersheds and water resources caused by pesticides, salinity, chemicals, animals wastes, nutrients, sediment, and pathogens, such as:
- techniques to improve irrigation efficiency and management so that irrigation more precisely matches crop requirements to water supply (both quantity and quality0, including monitoring, delivery, uniformity and scheduling
- genetically improved crops to increase yields, introduce novel traits, and adapt plants to water-limited conditions
- methods to use degraded water sources(e.g. , salinity water, urban and agricultural wastes)
- assist in the development of flexible and effective water policies and strategies using UC's econometric, hydrological, and policy expertise
- take science-based research and educational approaches to address these issues in partnership with others, including agricultural groups, environmental groups, and regulatory entities

3. Program existence : Mature (More then five years)

4. Program duration : Long-Term (More than five years)

5. Expending formula funds or state-matching funds : Yes

6. Expending other than formula funds or state-matching funds : Yes

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	4%		23%	
103	Management of Saline and Sodic Soils and Salinity	7%		3%	
111	Conservation and Efficient Use of Water	33%		14%	
112	Watershed Protection and Management	30%		10%	
123	Management and Sustainability of Forest Resources	0%		1%	
124	Urban Forestry	2%		0%	
131	Alternative Uses of Land	0%		3%	
132	Weather and Climate	0%		6%	
133	Pollution Prevention and Mitigation	19%		10%	
135	Aquatic and Terrestrial Wildlife	0%		4%	
202	Plant Genetic Resources	0%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		2%	
205	Plant Management Systems	1%		3%	
206	Basic Plant Biology	0%		3%	
311	Animal Diseases	0%		2%	
403	Waste Disposal, Recycling, and Reuse	3%		0%	
404	Instrumentation and Control Systems	0%		2%	
405	Drainage and Irrigation Systems and Facilities	1%		2%	
605	Natural Resource and Environmental Economics	0%		5%	
723	Hazards to Human Health and Safety	0%		2%	
	Total	100%		100%	

V(C). Planned Program (Situation and Scope)

1. Situation and priorities

Water is the life blood of California's economy. As such water supply and quality for agricultural, urban, and environmental systems are critical issues facing the state over the next twenty years and beyond. Several issues are paramount:

• The supply of water will be limited for all users.
• Competition for water will intensify among agricultural, urban, and environmental users, with water being transferred from agriculture to the latter two groups.
• Short- and long-term climate trends will exacerbate the problems associated with water availability.
• Degradation of water quality will become more important as a major public issue.
• Legal and regulatory decisions will have significant impacts on water use and quality among all sectors.

The availability of traditionally-relied upon sources of water is expected to decrease. For example, California will have to reduce its use of Colorado River water by 0.8 million acre-feet, a reduction of about 20 percent. The current drought has severely decreased reserves, and climate change is expected to reduce the Sierra snowpack. Coupled with the aging of the infrastructure for water delivery (e.g., the 1,100 miles of levees on the Sacramento-San Joaquin Delta), it will take a coordinated effort at the state, regional, and local levels to meet the projected increases in water demand.

California's Water Quality, Quantity, and Security program will focus on the three areas included in the program title.

2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Multistate Extension
- Integrated Research and Extension
- Multistate Integrated Research and Extension

V(D). Planned Program (Assumptions and Goals)

1. Assumptions made for the Program

• Continuation of funding (public and private) at current or higher levels.
• Continuation of agency and organization collaboration at current or higher levels.
• Availability of personnel to be appointed to new and/or vacated Agricultural Experiment Station and Cooperative Extension positions.
• Water resource related policies and regulations (local, state, federal) which allow for management of water resources based upon scientific information, concepts and knowledge.

2. Ultimate goal(s) of this Program

• Increased clean water, environmental health and high functioning aquatic, coastal, and riparian habitats
• Developing innovative scientific techniques, products, and/or processes to improve water-use efficiency and water management practices to conserve water
• Reduction in the number of impaired water bodies throughout California

V(E). Planned Program (Inputs)

1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2017	2.3	0.0	1.5	0.0
2018	2.3	0.0	1.5	0.0
2019	2.3	0.0	1.5	0.0
2020	2.3	0.0	1.5	0.0
2021	2.3	0.0	1.5	0.0

V(F). Planned Program (Activity)

1. Activity for the Program

UC ANR's integrated research and extension activities will conduct research projects, workshops, education classes and demonstrations, as well as one-on-one interventions. In addition, the programs will use PSAs, newsletters, mass media, web sites and collaborations with other agencies and organizations to create and deliver programs.

2. Type(s) of methods to be used to reach direct and indirect contacts

Extension

Direct Methods	Indirect Methods
● Education Class	● Public Service Announcement
● Workshop	● Newsletters
● Group Discussion	● TV Media Programs
● One-on-One Intervention	● Web sites other than eXtension
● Demonstrations	● Other 1 (Collabs w/other agencies/orgs)

3. Description of targeted audience

- Governmental agencies
- Water managers
- UC campus-based water centers
- The general public
- Farmers
- Ranchers

- Agricultural organizations
- Owners/managers of private and public rangeland, forest and wildlands

V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(H). State Defined Outputs

1. Output Measure

- Classes/Short Courses Conducted
- Workshops Conducted
- Demonstrations and Field Days Conducted
- Newsletters Produced
- Web Sites Created or Updated
- Research Projects Conducted
- Videos, Slide Sets and Other AV or Digital Media Educational Products Created
- Manuals and Other Printed Instructional Materials Produced

☑ Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

V(I). State Defined Outcome

O. No	Outcome Name
1	Farm, ranch, and rangeland owners/managers and allied industry professionals, participating in water quality education programs, gain knowledge of management practices for improving water quality.
2	Farm, ranch, and rangeland owners/managers and allied industry professionals, participating in water quality education programs, adopt management practices for improving water quality.
3	Farm owner/operators, allied industry professionals, and members of the public, participating in water conservation education programs, gain knowledge of water use and conservation practices.
4	Farm, ranch, and landscape owners/managers, and allied industry professionals and governmental agency representatives, participating in the programs, gain skills to conserve water and protect water quality.
5	Farm owners/managers, allied industry and natural resource professionals, and members of the public, participating in the programs, adopt of water conservation practices.

Outcome # 1

1. Outcome Target

Farm, ranch, and rangeland owners/managers and allied industry professionals, participating in water quality education programs, gain knowledge of management practices for improving water quality.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 2

1. Outcome Target

Farm, ranch, and rangeland owners/managers and allied industry professionals, participating in water quality education programs, adopt management practices for improving water quality.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 133 - Pollution Prevention and Mitigation

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 3

1. Outcome Target

Farm owner/operators, allied industry professionals, and members of the public, participating in water conservation education programs, gain knowledge of water use and conservation practices.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 111 - Conservation and Efficient Use of Water

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 4

1. Outcome Target

Farm, ranch, and landscape owners/managers, and allied industry professionals and governmental agency representatives, participating in the programs, gain skills to conserve water and protect water quality.

2. Outcome Type : Change in Knowledge Outcome Measure

3. Associated Knowledge Area(s)

- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

Outcome # 5

1. Outcome Target

Farm owners/managers, allied industry and natural resource professionals, and members of the public, participating in the programs, adopt of water conservation practices.

2. Outcome Type : Change in Action Outcome Measure

3. Associated Knowledge Area(s)

- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management

4. Associated Institute Type(s)

- 1862 Extension
- 1862 Research

V(J). Planned Program (External Factors)

1. External Factors which may affect Outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Populations changes (immigration, new cultural groupings, etc.)

Description

California continues to face its worst drought in decades. Water supply and quality for agricultural, urban, and environmental systems has become one of the state's biggest challenges.

V(K). Planned Program - Planned Evaluation Studies

Description of Planned Evaluation Studies

Types of evaluation:

- needs assessment
- process evaluation
- outcomes evaluation

Types of evaluation studies:

- case study
- single group, nonexperimental
- quasi-experimental
- experiment

Methods for data collection:

- survey
- interview
- focus group
- observation
- document review
- expert or peer review

Timing:

- pre/post
- time series
- retrospective