

# Agricultural Sustainability Institute at UC Davis

## Milestones and Workplans November 2017

**UC DAVIS**  
AGRICULTURAL  
SUSTAINABILITY INSTITUTE



University of California  
Agriculture and Natural Resources



Russell Ranch  
Sustainable Agriculture Facility



Presented to the  
ASI External Advisory Board



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# **MILESTONES & ANNUAL WORKPLANS**

## **1. AGRICULTURE, RESOURCES AND THE ENVIRONMENT**

### **SAREP 2012-2017 Milestones and Highlights**

#### **Energy and Climate Footprinting**

- SAREP: Completed and publicized work on life cycle assessments of six California crops: rice, honey, almonds, walnuts (including a case study of organic walnuts), peaches, and dried plums, and a comparative assessment of regional versus continental-scale supply chains for processed foods (tomato products). The almond work included pioneering new methods by ASI affiliate Alissa Kendall to account for medium-term sequestration of carbon in woody biomass and has been used by the Almond Board of California to engage policymakers. We also completed analytical work for a comprehensive LCA of processed tomato products, which includes assessment of impacts beyond energy and greenhouse gas footprinting.

#### **Responding to Climate Change**

- SAREP: provided input on the Science and Technical Advisory Council for the California Climate and Agriculture Network (CalCAN) and the editorial board of the California Agricultural Water Stewardship Initiative.

#### **Sustainable Management of Nutrients and Water in Agricultural Landscapes**

- SAREP: The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment was published by UC Press in 2016. We conducted separate meetings with 11 distinct groups of stakeholder representatives ranging from commodity boards to government agencies and water quality advocates for input on the Executive Summary, and delivered two outreach workshops with ANR and external partners for growers and for community members affected by water quality issues in the San Joaquin Valley. We also gave numerous presentations on the CNA findings at relevant conferences and meetings.
- SAREP: Created the Solution Center for Nutrient Management, an information portal and networking platform focused on sustainable nutrient management strategies for California farms. Includes a website with 13 distinct resource pages on topics ranging from reduction of N<sub>2</sub>O emissions to soil health, 9 farmer profiles, and a searchable research database with over 230 entries with summaries for lay audiences. The website receives over 3,000 unique visits per year. We also held three online discussion forums with 100 registered users and two roundtable meetings with 23 farmers to encourage farmer-to-researcher and farmer-to-farmer networking.

#### **Harnessing Ecosystem Services to Increase Agricultural Sustainability**

- SAREP: funded PhD student Margaret Lloyd (now UCCE Small Farms Advisor in Yolo County/Capital Corridor) to conduct research and create outreach products on use of compost and cover crops to control disease in strawberry production (as possible alternatives to methyl bromide).



- SAREP & Russell Ranch: Designed and conducted a half-day workshop for farmers on principles and practices to build soil health.
- SAREP: Initiated a new research and outreach area in diversified and perennial cropping systems (including agroforestry) with an exploratory survey to investigate the potential for expanding these strategies in California as a way to increase ecosystem services and improve farm productivity, and also to support those farmers already experimenting with these approaches.
- SAREP: Sonja Brodt is co-leading a renewed UC ANR work group on Agroecology and Organic Farming Systems, to enhance networking and collaboration in these areas across the UC system and beyond, and to raise the profile of research and outreach in these topics.

### **Russell Ranch Sustainable Agriculture Facility 2012-2017 Milestones and Highlights**

- Russell Ranch: Annual Russell Ranch field days focusing on irrigation, technology, soil health, nitrogen have brought together researchers, growers and other stakeholders (140-170 participants). We held special themed workshops on soil biology and soil health. We hosted CDFA Environmental Programs staff to observe techniques for soil health. We host several hundred visitors every year and are the go to place for sustainable agriculture and agriculture in general (via Dean Office, International Program Office, Global Affairs).
- Russell Ranch: We hired 3 farm staff members including mechanic who builds farm equipment for RR to reduce economic and environmental costs, as well as specialized equipment for researchers.
- Russell Ranch: We have created a new database for core data collected in the Century Experiment, as well as other experimental data. This database will be made available at a site hosted by the UC Davis Library.
- Russell Ranch: New publications include an overview of Century Experiment in California Agriculture and a database paper Ecological Archives (under review).
- Russell Ranch: annually hosts a number of field trips that are part of UCD courses, including SSC 100 (Southard, Introduction to Soil Science), SSC 109 (Horwath, Soil Nutrient Management), SSC 111 (Scow, Soil Microbiology), SSC 211 (Scow, Advanced Soil Microbiology). Students found differences in soil aggregate stability, soil carbon, and biodiversity in the following ranking: native grassland > organic > conventional. We encourage more courses at UCD to utilize Russell Ranch for field trips and class projects.

### **Sustainable Management of Nutrients and Water in Agricultural Landscapes**

- Russell Ranch: We are the 24rd year of our tomato-corn under organic, conventional and a mixed management system, and our wheat-fallow rotations. This includes a new 6-year rotation with 3 year alfalfa followed by tomato-corn-tomato that has proven to significantly increase yields of tomatoes and corn in rotation. An economic analysis of costs and benefits of integrating winter cover crops into tomato-corn rotations is underway.
- Russell Ranch: Analyses of our twenty-year soil survey of Century Experiment (3400 samples in 8 depth increments to 3 meters deep in 72 plots) have continued over past several years: total carbon and nitrogen, Fourier Throughput Infrared Spectroscopy

(FTIR), Permanganate oxidizable carbon (POXc) and Olsen P. These unique long term data are valuable for determining the potential for California agricultural soils to sequester carbon and offset greenhouse gas emissions (Jessica Chiartas, Kate Scow, Amelie Gaudin, Toby O'Geen UCD)

- Russell Ranch: We have investigated potential to reduce fossil fuel based mineral N inputs with legumes as part of rotations in 2 treatment of the Century Experiment
- 4 years of data show ~30% reduction in mineral N input can be provided by using winter cover crops (vetch, bell bean, oats) in a tomato-corn rotations
- Mineral fertilizer N could be reduced in tomatoes following 3 years of alfalfa in a rotation
- Russell Ranch: We have installed subsurface drip irrigation in the Century Experiment in almost all irrigated rotations. A working group of farmers, faculty, extension specialists and postdocs have used data collected from installed water meters, soil moisture probes, and evapotranspiration sensors to better understand crop water demands and optimize water use in different systems and crops. We have compared different technologies available to determine how much water to apply using drip irrigation.
- Russell Ranch: A 3 year comparison of furrow and subsurface drip irrigation in the organic tomato-corn plots (with fertility from cover crops and composted poultry manure) has found that subsurface drip irrigation results in decreased microbial biomass and activity, as well as aggregate stability, compared to furrow irrigation (Deirdre Griffin, Amelie Gaudin, Kate Scow, UCD and UC ANR--funding from Wells Fargo and UC Water Center). This raises questions about trade-offs from reducing soil ecosystem services when irrigation water and distribution is significantly reduced.
- Russell Ranch: We collaborated on a \$416,150 grant with PowWow Energy "Irrigation optimization and well pump monitoring leveraging smart meter data" funded by the California Energy Commission. A demonstration field at Russell Ranch showed that substantially reducing energy and water inputs via irrigation did not reduce tomato yield or quality.
- Russell Ranch: We have established two experiments investigating irrigation management, including: i) comparison of subsurface drip (including different drip tapes, spacing of emitters) versus flood check in alfalfa; ii) effect of deficit irrigation in processing tomatoes (Daniele Zaccaria, Dan Putnam, Isaya Kisekka)
- Russell Ranch: We compiled soil phosphorus budgets--including major stocks, inputs and outputs--in different Russell Ranch farming systems (tomato-corn and wheat) and compared them to long term vegetable experiment in the Salinas Valley (Gabriel Maltais-Landry, Peter Vitousek, Stanford University).
- Russell Ranch: In wheat plots in Century Experiment we compare water productivity in SDI versus furrow irrigated wheat (in rotation with tomatoes) and compare how injected versus broadcast application of N improves grain protein content and apparent fertilizer recovery. The overall goal is to figure out if small grains rotated with crops like tomatoes could leverage the existing SDI setups of those crops to improve water and nitrogen use efficiency. (Mark Lundy UCD)

## **Responding to Climate Change**

- Russell Ranch: Two 30 foot towers for thermal radiometers have been installed in larger research plots (wheat and tomato) adjacent to Russell Ranch. The Century Experiment was one of the demonstration sites for weekly measurements of visible, IR, and thermal data. This was followed by UAV measurements in specific plots (Darren Drewry, Simon Hook NASA; Susan Ustin UCD)
- Russell Ranch: Research on our rain-fed wheat rotations, and in adjacent small plots, have focused on drought resistant and perennial wheat varieties from the Land Institute in Kansas, with the goal of identifying new varieties resistant to drought. In particular water and N productivity, as well as soil N and C as a function of productivity, was measured in perennial wheatgrass Kernza. The variety survived its first season in California without any irrigation in the driest year on record. Experiments are being expanded to larger plots to measure water and fertilizer interactions, carbon sequestration, rhizosphere communities and other parameters under more realistic conditions. Multiple benefits (grain-though low productivity, forage, and C farming) are being explored (Mark Lundy UCD)

## **Closing the Loop**

- Russell Ranch: We have investigated use of biodigestate—the by-product of biogas generation-- as a source of N fertility to grow tomatoes and corn. We measured performance of liquid and solid forms of anaerobically digested food waste and dairy manure perform. We found that fertigation in subsurface drip with liquid biodigestate from food but not dairy waste could support tomatoes at yields similar to those obtained with mineral fertigation systems. A solid form of biodigestate supported yields of furrow irrigated corn similar to those grown with mineral fertilizer. (Rhuihong Zhang, Sungpyo Kim, Kate Scow UCD; funded by California Department of Food and Agriculture (CDFA))
- Russell Ranch: We are in the 7th year of our long term biochar experiment looking at effects of this soil amendment made from pyrolyzed walnut hulls (from Dixon Ridge farm) on a tomato-corn rotation. We found biochar (10 tons/ha) boosted corn yields by 8% in year 2 but not year 4---after that the benefit disappeared. Also, biochar amendment changes water relations in soil: adding biochar (20 tons/ha) to sandy soil, but not the higher clay RR soil, increased soil water holding capacity by 17%. (Deirdre Griffin, Daoyuan Wang, Sanjai Parikh, Kate Scow, UCD).

## **Harnessing Ecosystem Services to Increase Agricultural Sustainability**

- Russell Ranch: For the past four years, Russell Ranch soils were used to study the effect of organic, conventional and mixed systems soil on survival of Shiga Toxin producing E. coli (STEC) on lettuce in growth chamber experiments. The organic managed soil appears to be more suppressive to the pathogen than conventional soil with the mixed system soil being intermediate in its response.
- Russell Ranch: Biodiversity research during the past five years has focused on milkweed habitat for monarch butterflies and associated insects with an extensive corridor of milkweed plantings. Investigations focus on identifying factors determining consequences of species interactions, with a specific emphasis on factors that change over time. For example, monarch caterpillars do best on milkweed in the late spring and early fall and

researchers are exploring roles of climatic factors, predator communities and changes in plant quality/defense (Louie Yang, UCD).

- Russell Ranch: We launched a soil health research and outreach program that includes data collection, surveying grower attitudes about soil biodiversity, special workshops, collaboration with NRCS, and development of outreach tools.

## **2017-2018 SAREP AGRICULTURE, RESOURCES AND THE ENVIRONMENT WORKPLAN**

### **Energy and Climate Footprinting**

- SAREP: Complete life cycle assessment of environmental impacts of processing tomato production and processing and disseminate results.
- SAREP: Continue engagement with Community Alliance for Agroecology around environmental justice concerns in relation to life cycle assessment and related research studies.

### **Responding to Climate Change**

- SAREP: Continue participation on Science/Technical Advisory Committee for the California Climate and Agriculture Network (CalCAN).

### **Sustainable Management of Nutrients and Water in Agricultural Landscapes**

- SAREP: Assess need for additional outreach products for the California Nitrogen Assessment, and collaborate with Cooperative Extension and other colleagues and external partners to create outreach events around the state.

### **Harnessing Ecosystem Services to Increase Agricultural Sustainability**

- SAREP: Publish a concept paper on current status and benefits of agroforestry systems, utilizing lessons from international case studies, and establish a web presence for this work on SAREP's website.
- SAREP: Conduct outreach on whole orchard recycling research project led by ASI affiliate Amelie Gaudin.
- SAREP: Begin new project on agronomic, economic, and marketing feasibility of elderberry hedgerows as a commercial specialty crop in California, as a means to incentivize more hedgerow planting.
- SAREP: Begin new project to develop e-learning modules for organic specialty crop farmers on key topics including nutrient and irrigation management, pest, disease and weed management, and farm economics and marketing, in collaboration with Organic Farming Research Foundation and Cal Poly San Luis Obispo.
- SAREP: Continue to build networking and web presence around diversified and perennial farming systems and agroecology on SAREP's website.
- SAREP: Work with co-leader and members of the new UC ANR Agroecology and Organic Farming Systems Work Group to plan inaugural meeting activities at the ANR statewide conference

## **2017-2018 RUSSELL RANCH AGRICULTURE, RESOURCES AND THE ENVIRONMENT WORKPLAN**

### **Closing the Loop: Integrating Sustainable Waste Management in Agriculture**

- Expand experiments in small plots evaluating different agricultural waste materials for fertility, carbon sequestration potential, soil structure, drought resilience, and contamination.

### **Sustainable Management of Nutrients and Water in Agricultural Landscapes**

- Create real-time information integration platform (in collaboration with industry and engineers) to improve data collection from our experiments and help develop decision making tools using sensor, GIS and climatic data; fuel use and farm operations; and measurements on crops, inputs, soils, etc.
- Investigate short and long-term effects on agriculture and environment, costs and benefits, of winter cover crop use in conventional and organic row crop systems.
- Compare both experimentally and by modeling the effect of different irrigation management systems on crop resilience and economic return, agronomic properties, soil health, and ecosystem services

### **Harnessing Ecosystem Services to Increase Agricultural Sustainability**

- Soil biodiversity campaign—sequencing of microbial communities in different farming systems of Century Experiment at 20 years; functional analyses of microbial community responses to farming operations and inputs
- Increase data collection from Century Experiment: measure new parameters, more frequent measurements, improve laboratory capabilities, obtain base of funding to support.

### **Responding to Climate Change**

- Launch a climate smart agriculture outreach program at Russell Ranch that includes data collection, surveying grower attitudes about adaptation and mitigation with respect to climate change, and create outreach tools.



## **2. FOOD AND SOCIETY**

### **SAREP 2012-2017 Milestones and Highlights**

We collaborate with our county UCCE partners in all of the projects and programs described below. All projects are funded by extramural grants and gifts.

Sonja Brodt was selected as state co-coordinator (along with Cooperative Extension advisor Jeff Stackhouse), for the Western Sustainable Agriculture Research and Education (WSARE) Professional Development Program, to replace ASI affiliate Morgan Doran. This work entails administering annual funds of approximately \$20,000 for professional development in sustainable agriculture and food systems. The initial activities chosen for funding include professional training on achieving social equity in agriculture and food systems outreach work, to be conducted by SAREP staff, and travel grants to attend a SARE cover crops conference in winter, 2017, and the SARE national conference in spring 2018.

### **BUILDING REGIONAL MARKETS AND COMMUNITY**

#### **Farm to School**

- Expanded farm to school procurement evaluation across the state
- Conducted farm to school tours for policymakers and developed a policy brief
- Participating in evaluating two garden-based learning/nutrition education projects (Shaping Healthy Choices, Calaveras School District)
- Evaluating outcomes of ProCureWorks, a project to expand sustainable food procurement in large school districts and hospitals in California

#### **Values-based Supply Chains**

- Developed research and resources on values-based supply chains and food hubs (available on SAREP's website and in peer-reviewed journals)
- Conducting research with 4 other land grant universities on supporting small and medium-sized producers through values-based supply chains (specialty foods, food hubs)
- Developed a Northern California Food Hub Network

#### **Small, beginning, immigrant farmer marketing assistance**

- Conducted wholesale tours and developed marketing, food safety resources for these farmers
- Convened statewide educators who work with these farmers to target resources and collaborate more effectively together
- Conducting tours for beginning farmers at established farms (CRAFT) in 7 northern California counties.
- Working with Hmong farmers in Fresno to grow, process and build markets for dried Moringa.

### **Urban Agriculture**

- Assessed the state of urban ag work/outreach among extension professionals and urban farmers across the state, identifying needs, challenges and opportunities (peer-reviewed publication)
- Assisted with development of an ANR website on Urban Agriculture resources
- Conducted urban ag tours led by youth with associated curriculum
- Conducted marketing workshops for urban farmers as part of an urban ag workshop series statewide

### **Agritourism**

- Conducting agritourism workshops for ag professionals and developing topical resources guides in Northern and Southern California.

### **FOOD SYSTEM ASSESSMENTS/ FOOD POLICY**

- Completed two countywide food system assessments (San Luis Obispo, Kern), available on SAREP's website
- Partnering on a Food Policy Council research and outreach project, focusing on 10 case studies of food policy councils in California

### **FARM AND FOOD SYSTEM WORKERS AND HEALTHY RURAL COMMUNITIES**

- Completed two farmworker time and activity studies for DPR to update their data on pesticide exposure in caneberries and broccoli

### **SOCIAL AND RACIAL JUSTICE IN THE FOOD SYSTEM**

- Convening regular staff meetings about how to better address social and racial justice in our programming.
- Conducting a social/racial justice internal assessment
- Building community relationships to strengthen SAREP's capacity to better incorporate social/racial justice in its research and outreach
- Helped organize a national extension convening on Dismantling Racism in the Food System

## **2017-2018 SAREP FOOD AND SOCIETY WORKPLAN**

### **BUILDING REGIONAL MARKETS AND COMMUNITIES**

- Continue evaluation of farm to school and garden based learning projects (Calaveras, ProCureWorks); share results widely.
- Organize outreach for 2 AFRI projects (surveys of small and mid-scale farms) about participation in values-based supply chains.
- Continue tours, outreach for small and medium-sized farms (wholesale tours, workshops, mixers); focus some on university/college food service, engage students.

- Continue working with Hmong farmers in Fresno, especially on developing buyer networks for Moringa.
- Continue coordinating Northern CA Food Hub Learning Community and increasing capacity for individual hubs to become more profitable. Explore new, viable markets.
- Participate in Urban Ag workshops for urban farmers, providing expertise on marketing.
- Develop and expand agritourism in California. Explore linkages with Art Councils
- Explore opportunities for small and medium-sized farms to work with food security initiatives on campuses.
- Explore opportunities to engage with CropMobster and ANR to build statewide food systems platform.

#### **FOOD SYSTEM ASSESSMENT/FOOD POLICY**

- Work with Kern County on using results of completed Kern County Food System Assessment
- Complete food policy council case studies and collaborate on statewide food policy council survey on use of research/information to inform policy.

#### **FARM AND FOOD SYSTEM WORKER HEALTH AND COMMUNITY WELLBEING**

- No plans to start new projects

#### **SOCIAL/RACIAL JUSTICE IN THE FOOD SYSTEM**

- Pursue internal and external capacity building on Social/Racial Justice in the Food System with funding (20% FTE total) from WSARE and ANR.
- SAREP Cross-cutting activity:
- Western SARE Professional Development Program, California statewide co-coordination (with UC Cooperative Extension Co-coordinator Jeff Stackhouse): select an advisory committee and administer travel grants for the National SARE conference and cover crops conference.

### 3. EDUCATION AND LEADERSHIP – INCLUDES STUDENT FARM

#### 2012-2017 Milestones and Highlights

##### Recognizing leaders in the field of Sustainability

- ASI has consistently brought together leaders in the field of sustainability by recognizing the work of a UC colleague who epitomizes the qualities of two great figures in California agriculture -- livestock geneticist Eric Bradford and sustainable farmer Charlie Rominger. Since 2012, the Bradford-Rominger Sustainability Leadership Award has gone to: Kenneth Tate (Extension Specialist, UC Davis, 2012), Rose Hayden-Smith (Ventura County UCCE, 2013), Mary Bianchi (San Luis Obispo UCCE, 2014), Dr. Isao Fujimoto (UC Davis Community Development and Asian Studies Senior Lecturer Emeritus, 2015), Dr. Daniel Mountjoy, (UC Alumnus currently with Sustainable Conservation, 2015), and David Lewis (Napa County UCCE, 2016). In addition to awardees, the following keynote speakers participated in this event: Craig McNamara (Sierra Orchards), LaDonna Redmund, (Food Justice Activist), Navina Khanna (Food Justice Activist), Patrick Mulvaney (Sacramento Farm to Fork), and Anya Fernald (Bel Campo).
- ASI also administers the Shapiro Family Award for best dissertation in agroecology or a related field.
- The Constant M. and Tempest B. van Vlierden Scholarship in Sustainable Agriculture were also awarded during this period; three SA&FS students were among the ten inaugural recipients during the 2011/2012 academic year.

##### Student Farm

- 2017 marked three significant events at the Student Farm: the farm's 40th anniversary, Mark Van Horn's retirement after 30 years of service and hiring of the new Student Farm Director, Katharina Ullmann.
- SF and ASI promoted Carol Hillhouse into role of Student Farm Associate Director in order to meet the Student Farm's growth and expansion while articulating and assessing learning within our expanding internships, by developing and rolling out the Leadership Development Training Program (LDTP), and by providing leadership in expanding new projects such as the Sustainable Living and Learning Communities (SLLC), the Community Table Project (CTP), and additional work with other UC partners in experiential learning in food and agriculture systems.
- The Student Farm experienced tremendous growth between 2012 and 2017; during this time period the number of students completing internships for academic credit rose from 50 students/year to 125 students/year. The total number of students engaged at the SF on a weekly basis for an academic quarter - as course enrollees, employees, volunteers or interns – is approximately 500/year. Additionally, we continue to employ between 12 to 20 students as Lead Student Farmers and Gardeners each quarter, funded in part through increased Market Garden sales and grant funds from the True North Foundation. In order to manage this growth, we have formalized and expanded the experiential learning opportunities available at the Student Farm.

### **Formalizing opportunities:**

- Between 2012 and 2017 we initiated and made significant advancements in our Leadership Development Training Program (LDTP) for our Lead Student Farmers and Gardeners (LSF/Gs), i.e., student employees. This enhances the abilities of our LSF/Gs to effectively serve the rapidly increasing number of students involved at the SF.
- The SF's Kids in the Garden program expanded our winter training program for the students leading spring and fall tours into a formal 2-unit winter quarter course titled Garden and Farm-Based Experiential Education Methods (PLS 193). The class has consistently received high marks and praise from enrollees. Since 2012, roughly 10,000 of primary school children and 1,000 parent and teacher chaperones have participated in Kids in the Garden field trips to the Student Farm.
- We worked with SF staff and Assessment Lead from the Center for Educational Effectiveness, Dr. Kara Moloney, to create a curriculum map of SF's educational offerings. We also developed a new learning assessment method that we call the Field Learning Demonstration, or FLD, to better meet the needs of second and third quarter interns. The SF continues to partner with Dr. Moloney to study and improve our methods of assessing experiential learning.
- With support from the UC Global Food Initiative SF staff worked with UC colleagues to document experiential learning opportunities in sustainable agriculture and food systems across the UC. These were documented in a series of student-produced videos from several UC campuses, including three produced at UC Davis, and summarized in the GFI published guide: "Learning from the Ground Up". Additionally, this group hosted two workshops (one at our facility in Davis, one at UCLA) on experiential learning in sustainable agriculture and food systems within UC and co-sponsored the Sustainable Agriculture Education Association's national conference at UC Santa Cruz in July, 2016. Several student employees participated in the Davis workshop and the national conference in Santa Cruz. These events allowed our students to learn from, and interact professionally with, staff and students from campuses around the state and country who are engaged in similar work supporting experiential learning in sustainable agriculture on student farms.
- New support from UC GFI was awarded in May 2017. This is allowing us to work further with colleagues at UCB and UCSC to expand our experiential learning work in food and agriculture systems and develop best practices tool kits that can be shared with other UC and non-UC campuses that are newly engaging in this area.

### **Expanding opportunities:**

- The 7-acre organic Market Garden increased the number of interns it can support, in part because sales almost doubled during the 2012-2015 time period. The Market Garden also continues to provide experiential learning opportunities through its compost program.
- Each quarter six interns work with the Flower Project learning to grow, harvest, arrange and market cut flowers for the campus market. The Flower Project is led by SF Program Rep Julia Schreiber.
- In 2016, the SF started a new GFI-funded Food Access project called the Community Table Project (CTP) to address food insecurity among UC Davis students. SF program staff and interns, working with several partners - including the Pantry and Fruit and



Veggie Up, donated over 10,000 pounds of fresh, healthy organic SF produce to students. Simultaneously, SF staff and interns are expanding outreach efforts to increase the diversity of SF student participants and broaden the representation of those participating in the UC Davis food system. CTP currently provides approximately 10 student internships per quarter.

- Both graduate and undergraduate students are leading the development of new crop varieties of tomatoes, peppers, common beans and lima beans for organic farming systems. This is part of a \$1 million, four year grant from USDA Organic Research and Extension Initiative with colleagues from the Plant Sciences department and the Organic Seed Alliance.

**SF staff continue to cultivate a community where students have a voice.**

- Students have leadership roles at the Student Farm and organize various activities and events such as social events, ‘farm dialogues,’ and student-led skills workshops in areas outside normal SF activities. In addition to helping students learn from one another and develop their leadership capacity, these events strengthen the SF community and students’ voice in the Farm’s development.

**SF continues to be a leader in school gardens and the farm-to-school movement.**

- In collaboration with partners on campus and around the state on several of grant-funded projects focused on school gardens, garden-based education and farm-to-school. These have included train-the-trainer programs to reach diverse communities and provide professional development, training and support for teachers, nutritionists, garden educators, food service providers, farmers and others involved in developing regional farm to school networks and school garden programs. With our partners, we awarded 90 mini-grants over three years for trainers to deliver our school garden trainings in their own regions. We developed and used a webinar format for the first time to connect our network of new trainers and communicate more efficiently with colleagues around the state. Funding from state agencies for these projects ended in 2013. More recently this work has been reflected in new partnerships with Yolo Farm to Fork to expand field trip offerings to older children and with Soil Born Farms to participate in their annual School Garden Symposiums as workshop leaders, coordinators. And finally, the new GFI Experiential Learning funding is allowing us to work with UCSC and UCB to develop a model for a campus-based school garden internship program placing college student interns from universities in surrounding communities.
- SF staff collaborated with research partners in the UCD Department of Nutrition to roll-out a multi-component farm to school intervention program in schools called “Shaping Healthy Choices” that impacts children’s wellness through procurement of regional produce, nutrition education, school gardens and family involvement. Carol Hillhouse supported school garden development at the research sites and led teacher workshops there. Gail Feenstra (SAREP) led the produce procurement research in the school districts studied and provided technical assistance.
- A SF and SAREP team planned a highly successful Farm to School bus tour that highlighted strong regional programs. The event allowed for leaders in this region to learn together and network with local, state, and national officials or their staff. This resulted in conversations between ASI staff, UCCE personnel, and staff for US Congressman John

Garamendi and ultimately resulted in ASI hosting a roundtable with Congressman Garamendi, other regional officials and experienced stakeholders from his district. In this venue we are able to dialog and offer strategies for strengthening farm to school efforts here.

#### **SF continues to play a leadership role in the ongoing development of the UC Davis Sustainable Living and Learning Community (SLLC)**

- The SLLC is a new campus neighborhood focused on farming, food, the built environment and sustainability. Coordination within the SLLC is an important part of the SF's growth and development planning, including programs, infrastructure and fundraising. The SLLC was one of two CAES projects supported and a semifinalist in the "Big Ideas" campus fundraising campaign. Currently, SF staff are working with faculty in Landscape Design and Architecture to secure funding for a community planning/visioning process while also communicating with those leading the campus Long Range Development Plan. SF has facilitated ongoing SLLC community member meetings for the last several years. In 2016, Carol Hillhouse organized a fall series of community workshops and students, with support from SF staff, organized a spring seminar both focused on the SLLC process.

#### **Sustainable Agriculture and Food Systems major**

- In fall 2012, the first group of incoming freshman SA&FS majors started their studies. The program continues to grow and currently has more than 100 students enrolled. During this period, the SA&FS major was selected as winner of the MacArthur Foundation-funded Digital media learning grant competition and featured in an article in the Chronicle of Higher Education. ASI plays a key role in offering courses that are required for all SAF majors (e.g. PLS 15, 190 and the Senior Capstone Course – ESP191A and B) or can help SAF majors meet requirements of the curriculum (e.g. PLS 49, 193, and various internships)

### **2017-2018 STUDENT FARM WORKPLAN**

#### **Post-Secondary Experiential Learning and Formal Post-Secondary Education**

- Maintain management practices and non-student staff positions in order to continue to offer effective mentoring and transformative experiences for the recently expanded SF student population.
- Advance the Student Farm program planning and development process. In particular, continue refining the LDTP and record best practices.
- Continue to develop the Community Table Project and the Flower Project and explore ways to increase the quantity and quality of internships and other learning opportunities at the Student Farm and elsewhere within ASI. Develop a plan for sustaining CTP past conclusion of GFI funding in September 2018.
- Continue supporting the organic breeding project SCOPE and other research and learning opportunities for graduate and undergraduate students.

- Continue shepherding and contributing to the Sustainable Agriculture & Food Systems major by contributing to academic advising, teaching several core and other required courses, and providing in numerous internships for SA&FS majors.
- Further the development of the SLLC concept in collaboration with the different SLLC entities, faculty, departments and campus leadership in areas of planning and development. Continue engaging with campus planners and development staff and potential donors to move the SLLC forward.

#### **Education for Primary and Secondary School Audiences**

- Provide on-campus, hands-on educational programs in food, nutrition, agriculture and ecology to 2000 or more regional primary and secondary school students and their teachers and chaperones.
- In collaboration with researchers in taxonomy and crop development, offer fall tours for upper elementary students that provide basis for understanding how humans develop diverse food crops.
- Continue to collaborate with faculty within the School of Education to provide site and content for teacher credential program students in their science teaching methods class as well as for students in the environmental education course.
- Work with partners to provide field-based experiences for traditionally underrepresented high school students and increase their awareness of college and career futures in sustainable agriculture.
- With other UC campuses develop effective programs for placing and mentoring UC students as interns in school garden programs within the region

#### **Cultivating Leadership in Sustainable Agriculture and Food Systems**

- Identify 2018 winner for the Bradford-Rominger Sustainability Leadership Award

#### 4. FOOD SYSTEM INFORMATICS (FORMERLY “SUSTAINABILITY BENCHMARKS”)

##### **MILESTONES 2012-2017**

Launched in late 2011 with a major gift from Mars Incorporated to support ASI's Sustainable Sourcing of Agricultural Raw Materials project, from 2012 through 2017 this initiative has grown into a rich work area comprising information management and the development of decision-making tools to improve sustainability, complemented by a series of landscape level assessments that not only provide information for use in decision-making by food system actors, but which both use and are used to improve decision-making tools.

*Some major milestones and accomplishments during this period include:*

- Completion of a global food system sustainability benchmarking study in 2014, providing a backbone for defining and measuring food system sustainability and a comprehensive definition of sustainability through the lens of global commodity sourcing, synthesized from three perspectives: major international sustainability initiatives, global food manufacturers and business, and grassroots/livelihoods perspectives. This body of work includes standardization and cross-definition of both the issues related to sustainability (things we care about), and the indicators that can be used to measure them, evaluated through 2 distinct but related frameworks: impact (how agricultural supply chains effect the world around them) and vulnerability (how the world effects the sustainability of supply chains and/or the food system).
  - Major outputs from this benchmarking study include:
    - Global food system stakeholder consultations in 2011 and 2012
    - Food System Sustainability Ontology development & launch
    - Partnerships with myriad technology and food system actors. (See <http://asi.ucdavis.edu/programs/sustainable-sourcing> for list.)
- Development and launch of a “checklist generator” decision-making tool in 2015, using the “Food System Sustainability Ontology” as a basis for optimization algorithms that determine a minimum set of indicators that can be used to give comprehensive understanding of sustainability for a specific case. (Supported by Mars + supplementary funding from Kraft and Barilla). A California processing tomato workshop to test the prototype “checklist generator” with a wide range of stakeholders was held in August 2015 (with funding and participation by Barilla.)
- Four (4) peer reviewed publications and 1 op-ed piece (2014-2015. See ASI publications: <http://asi.ucdavis.edu/resources/asi-publications>)
- Launch of IC-FOODS in 2016. ASI is a founding partner of IC-FOODS, the “International Conference/Center/Consortium on Food Ontology Operability and Data Semantics” (<https://www.ic-foods.org/>), led by Matthew Lange in UC Davis Food, Science, and Technology Department, and supported through seed funding from the UC Davis Innovation Institute for Food and Health (IIFH). IC-FOODS is developing an informational platform that enables interconnection of technologies and datasets capable of supporting decision-making and automation, as well as appropriate levels of traceability and transparency. Our Food System Sustainability Ontology provides a cornerstone of the information continuum. A highly successful inaugural conference was held in November 2016, and the second annual conference is Nov. 6-8, 2017.

- In partnership with Oxford University and Pace University Law School, ASI co-sponsored two workshops in what is foreseen as an annual series: “Modelling Food Systems for Sustainability” in July 2016 and “Food System Impact Valuation” in April 2017. Each of these initial workshops occurred at Oxford; in future the venue may rotate among partners. It also is envisioned that there will continue to be significant cross-over participation between these workshops and IC-FOODS.
- Food System Informatics is providing the scientific underpinnings for the burgeoning Internet of Food. Through the Oxford and IC-FOODS partnerships, ASI is leading the way in leveraging the resources mentioned above to further the design, assembly, and articulation of computable, international standard vocabularies for agriculture, food, and health, particularly as these relate to vulnerability, sustainability, and resilience of our food systems.
- A growing portfolio of inter-related regionally-focused activities:
  - In 2015 we secured funding and launched a project with the **Sacramento Area Council of Governments (SACOG)**. This use case is designed to evaluate the potential use of the “Sustainable Sourcing Checklist Generator” in an inclusive regional setting rather than a commodity-specific context. The goals of the project are to use input from a wide variety of stakeholders in the Sacramento region to identify the most important sustainability issues that the region faces and to identify a suite of indicators that efficiently and effectively provide metrics for tracking these issues.
  - In 2016-2017 we undertook the **Bay Area Regional Advance Mitigation Planning (RAMP)** project. RAMP is an ongoing statewide effort to develop a framework for conducting mitigation for impacts from infrastructure projects in a more systematic, effective manner. This effort is a collaboration between state and federal resource and infrastructure agencies, environmental non-profit organizations, and UC Davis. Working landscapes are a key part of these planning efforts, both for compensation for loss of farmland and through agricultural areas potentially serving as habitat for listed species.
  - ASI secured funding from the **Strategic Growth Council (SGC)** to collaborate with them and Conservation Biology Institute to develop **guidelines for development of Regional Conservation Assessments (RCA)**. RCA are an element of California state legislation AB 2087 and are being used to help guide conservation and infrastructure development in California. This project started in July 2017 and will continue into 2018.
  - In 2016 we successfully applied for major funding from the U.S. EPA to investigate links between human health, ecosystem service valuation, and sustainability indicators in the Sacramento region. This two-year project launched in October 2017.
  - We applied for funding from the **Southeast Connector JPA** for funding to augment the work conducted under the SACOG grant. A contract is currently being finalized for this stakeholder-focused work to begin.
  - The ASI team, in collaboration with other UC Davis researchers, SGC, and CBI submitted a funding proposal to the **California Landscape Conservation Cooperative (LCC)** to provide technical assistance for the LCC’s Central Valley Landscape Conservation Project. This ongoing project is an effort to coordinate planning and



conservation efforts by multiple agencies and organizations in the working landscapes of the Central Valley. We expect to hear shortly whether or not the proposal was successful.

- The ASI team, in collaboration with Ohio State University, successfully applied for a 4-year grant from the **National Science Foundation** in 2017, to launch a Research Coordination Network on “Smart Regional Foodsheds”, which starts January 2018.

## 2017-2018 FOOD SYSTEMS INFORMATICS WORKPLAN

In 2017, ASI was awarded 2 major complementary grants funded by the National Science Foundation (NSF) and the Environmental Protection Agency (EPA) supporting this work, which will be implemented in combination with several smaller related grant projects already underway. Our workplan for 2017-18 is:

- Launch *NSF Smart Regional Foodsheds* project in January 2018, collaborating with various other workstreams.
- Continue work on the EPA-funded project. This will continue through the end of October 2018 (and beyond).
- Continue work on the SGC-funded project. This will be completed at the end of June 2018.
- Finalize the contract for the JPA project. Once finalized it will likely be a four month project, ending in the first half of 2018.
- Submit a funding proposal to California Department of Fish and Wildlife to assess the reintroduction of tule elk and pronghorn to the working landscapes of Solano County.
- Develop a manuscript for submission to a peer-reviewed publication describing the work undertaken for the SACOG and JPA projects.
- Continue as a full partner and part of the leadership team for the IC-FOODS effort and continue to build our strategic partnerships with Ohio State, Oxford, Pace University and others.
- Through these projects, the Food System Informatics team will:
  - Enhance the current information platform through integration of new sustainability issues, indicators, and other data types identified through case studies and other efforts.
  - Continue to design and focus the next phase of activity with key stakeholder collaborators.
  - Submit one or more large competitive grant proposals to fund further development of the informatics platform and case studies that demonstrate feasibility and proof of concept.
  - Continue to explore opportunities for further funding and in-kind support with corporate and philanthropic partners, and through competitive grants programs.
  - Develop a writing and publication plan to build the emerging field of food system informatics.
  - Begin to explore organizational options and possibilities to create a graduate degree program in food systems analysis at UC Davis.

## 5. INTER-INSTITUTIONAL NETWORK FOR FOOD, AGRICULTURE AND SUSTAINABILITY (INFAS)

### **2012-2017 Milestones and Highlights**

2011-2012:

- Hired first staff member and elected the Executive Committee.
- Established communications via INFAS webpage and email list.

2012-2013:

- First in-person network meeting; Executive Committee co-chairs appointed.
- First mission statement and work-plan drafted.
- First group research activity convened.

2013-2014:

- Network elects to undertake a Network Design process.
- First workshop engagement with external food systems colleagues and activists: 'Ensuring Equity: The Potential of Activist-Academic Collaborations'
- First Network-coordinated publications by members.
- Coordinator establishes ASI Committee on Racial Equity/Social Justice

2014-2015:

- Network Design completed: collaborative efforts redefined to focus on "structural equality in the food system".
- INFAS "Statement on Equity in the Food System" publicly released.
- INFAS Vision Statement revised to reflect focus on structural equality.
- First public panel: "Perspectives on race, ethnicity, class, and gender in the food system."
- First engagement at a non-traditional setting: Professional Agricultural Workers Conference (PAWC) at Tuskegee University. Members hold a stakeholder engagement and listening session.

2015-2016:

- INFAS membership expands to 26 institutions.
- INFAS sponsors special journal issue on "Labor in the Food System" in JAFSCD; publishes first INFAS-authored article (by/about INFAS).
- First INFAS fellow completes project: member interviews/write-ups.
- First Network training on structural racism convened.

2016-2017:

- Two INFAS members appointed to APLUs 2050 Commission on Food Security; network acts to engage additional INFAS members on all working groups to ensure inclusion of sustainability in agriculture, food systems.
- Members meet to craft a response (for broad dissemination) to the APLU Commission report to highlight where the report fell short in addressing inequities and to provide recommendations for Universities to consider.
- INFAS joins NSAC (National Sustainable Agriculture Coalition)

## 2017-2018 INFAS WORKPLAN

The INFAS Coordinator will continue to assist ASI in promoting the value of racial and social equity on an Institute-wide level and seek input from a variety of stakeholders within and outside of ASI. Pending final discussion and budget approval from the INFAS Executive Committee (INFAS's governing body), the following areas of activity have been prioritized:

- Coordinate completion of INFAS written responses to the APLU's 2050 Commission on Food Security and disseminate in multiple outlets (audiences under discussion: (1) short blog aimed at the public; (2) mid-length white paper for academic networks, including Deans and University administration; (3) longer-length article intended for publication in a peer reviewed journal.
- Develop pilot INFAS Graduate Fellowship Program focusing on supporting early career scholars that engage in scholarship in the context of sustainable food systems in the areas of: racial inequity; social justice; structural inequality; structural racism; and/or intersectionality of oppression. Key objectives for this activity include to recognize and encourage future leaders and contributors in food systems work, with a focus on scholars that work in areas of social sustainability, and to cultivate new, creative thinking and approaches that will give new insights and perspectives to practitioners working with, and in, institutions of higher learning.
- Coordinate INFAS engagement and cultivate relationships with food systems and/or agriculture practitioners outside of the current network and in underrepresented areas, particularly the Southeast US.
- Continue to prioritize structural racism and inequities in the food system as network activities are considered and selected for engagement.

## **6. SOCIAL EQUITY**

2012-2017 Activities are detailed within each Program's milestones, above.

### **2017-2018 WORKPLAN**

- ASI will develop a Racial Equity Improvement plan with clearly defined goals and metrics. Progress on the Improvement Plan will be reported to the EAB and ASI's senior leadership annually.
- We will develop an organization-wide training plan to expand the abilities of all ASI employees in cultural responsiveness that is revised annual by the Social Equity Team, reviewed by Executive Leadership and submitted to the EAB for feedback.

#### **Resource Allocation and Contracting Practices**

- ASI will update our annual strategic report to the External Advisory Board and list how financial resources are directed to funded partnerships with community-based organizations and how funding is allocated to reduce specific disparities. We currently write about SAREP's funded partnerships in our Strategic Snapshot, we will add a list of community groups funded through SAREP's projects and partnerships.
- ASI will review our practices of choosing vendors and contractors to see if we can do more to engage with to minority-owned businesses, women-owned businesses, and emerging small businesses. We will ask existing UCD-created resources—Communicator's Network Vendors, Approved Caterers—to include this information in their lists.

#### **Data, Metrics and Quality Improvement**

- Data collection and analysis will be done annually to document progress and accountability on the standards in the Improvement Plan; Data is reviewed and endorsed by the Social Equity Committee with the final plan submitted to the ASI Director and EAB.
- ASI will develop mechanisms to track and document the race, ethnicity, and language status of our workforce (by program and rank), program participants, and event attendees. We will assign responsibility for data collection and analysis to at least one employee, and file this report with the Social Equity Committee. The Committee reviews and analyzes the report and shares findings with the ASI Director and EAB.

#### **Organizational Climate, Culture and Communications**

- Work with the CAES Dean's Office to ensure time sheets and official University communications are available in Spanish.

#### **Service Based Equity**

- Develop a relationship with a multilingual translation service and provide translation services to non-English speaking staff and program participants, as needed. Plan for translation costs in grant proposal planning for projects with a community outreach component.

### **Workforce Composition and Quality**

- ASI HR Staff develops a plan to diversify ASI's workforce, presents it to the Social Equity Committee, the ASI Director and the EAB, and integrate their feedback into a Diversification Plan that is filed annually with the EAB.



## 7. FUNDRAISING

### 2012-2017 FUNDRAISING MILESTONES AND HIGHLIGHTS

- Continue to build ASI's Sustainable Agriculture and Food Systems Endowment. Currently the corpus of the general endowment is at \$66,000. Income from this endowment can be used at the discretion of the Director to advance ASI. There were no new major (5+ figure) gifts in 16/17 though there are regular contributions at lower levels. ASI does have other endowed funds but our goal is to build this unrestricted endowment.
- Continue moving forward with campus-wide 'Big Ideas' fundraising initiative. While ASI's two 'Big Ideas' (Living Laboratory for Agroecology and Sustainable Living & Learning Communities at UC Davis) were not selected for the campus-level fundraising initiative, they were selected as priorities for College of Agricultural & Environmental Sciences-wide fundraising.
- Bring in at least \$1 million in competitive grant funding, emphasizing pursuit of larger grant opportunities and building strategic partnerships.  
Due to delays in federal funding, an award intended for FY16/17 year was instead awarded to ASI in FY17/18. Thus our competitive grant funding for 16/17 was \$946,000, rather than the expected \$1.5M.
- Bring in at least \$500,000 in various gifts for ASI programs.  
In FY16/17 ASI programs collectively received \$177,000 in gifts for various programs. We continue to work to build philanthropic support.
- Pursue at least one 7-figure competitive grant for ASI.  
We pursued numerous 6-figure grants but did not identify any suitable and timely 7-figure calls during FY16/17.
- Secure \$500,000+ to help establish the center for food system & health informatics.  
Completed. We recently secured a \$500,000 award from the National Science Foundation to build a network of researchers and food system stakeholders who will explore how to use informatics to build smart and connected foodsheds. This project will greatly enhance our efforts to establish this center.
- Secure \$200,000+ to meet increasing student demand for hands-on agricultural training at Student Farm.  
Student Farm secured ~\$138,000 in grants in FY16/17 and \$4,300 in unrestricted gifts to the program.
- Continue to build the Russell Ranch Endowment via Adopt-an-Acre or other gifts.  
We raised \$6,500 through the Adopt-an-Acre program.
- Continue to secure philanthropic funding for Ethnic Farmer Project and identify additional SAREP programs with philanthropic funding potential.  
We secured \$22,000 for this program.

## 2017-2018 FUNDRAISING WORKPLAN

- Bring in at least \$1 million in competitive grant funding, emphasizing the pursuit of larger grant opportunities and building strategic partnerships.  
We have already raised ~\$1.7M in competitive grant funding in 17/18, including a ~\$600,000 award that came late for 16/17.
- Bring in at least \$300,000 in various gifts for ASI programs, with emphasis on unrestricted funding or ASI endowment.  
Continue to build ASI's Sustainable Agriculture and Food Systems Endowment. This endowment must eventually exceed \$1 million and may be built through a mix of gifts from individuals, industry, foundations, and estate giving.
- Bring in at least one competitive grant and/or gift for ASI's healthy soils initiative.
- Continue to build funding for ASI's food system and health informatics initiative.

## 8. COMMUNICATION

### **2012-2017 Milestones and Highlights**

- Greatly improved communications materials to reflect our programs and impact. This includes a redesign of our website, ASI program brochures, and templates to streamline the look of ASI outreach materials. ASI website page views have grown dramatically since the launch of our new website.
- Regularly produced high quality content on each of our programs highlighting research findings and impact as well as our partners and stakeholders. Content has included video production, blog posts on the ASI and UC ANR blogs, press releases, magazine articles, op-eds, and infographics. nearly 57,000 people have viewed the videos ASI has produced, our ASI Blog posts have been viewed a total of 15,000 times, and blog posts on ANR blogs have received nearly 134,000 hits. We've seen moderate growth in media attention, including national media coverage for the California Nitrogen Assessment and stories on Soil Health featuring Russell Ranch.
- Developed a strong social media presence on major social media channels (Facebook, Twitter, Instagram), but there is still lots of room to grow our presence and better engage audiences.
- Developed the Solution Center for Nutrient Management and conducted rollout campaign for the California Nitrogen Assessment, including press release and op-ed, stakeholder input on development of executive summary, stakeholder meetings, and partnership with campus and ANR communications teams.
- Developed Contact Management Database (nearly complete) to better target audiences, track the growth of our network, and communicate more frequently with our audiences. In our 2017 communications evaluation, many people stated that they did not hear from ASI enough and would like more frequent communication.
- In a project funded by the UC Global Food Initiative, UC SAREP worked with undergraduate students from different UC campuses to compile an inventory of sustainable agriculture research happening around the different campuses. The project includes a database of research centers and institutes working on sustainable agriculture, highlights of different sustainable agriculture issues and how the UC is working on them, and an interactive map for users to explore the variety of topics the together comprise sustainable agriculture. The work is in its final stages and will soon become a new landing page for our "what is sustainable agriculture" webpage, the most visited page on the ASI website receiving over 200,000 pageviews each year.

### **2017-2018 COMMUNICATIONS WORKPLAN**

- Use findings from Communications Evaluation to direct the work of the ASI communications team. Focus on building stronger presence in media by developing relationships with journalists, looking for opportunities to write op-eds and other media stories.
- Complete our contact management database and train staff to use database.

- Develop ASI newsletter to regularly communicate with our audiences. Newsletter will highlight high level research findings, opportunities to engage with ASI, and staff/faculty expertise.