Center for Regenerative Agriculture & Resilient Systems

Annual Report 2019

Cynthia Daley, PhD, executive director, professor
Tim LaSalle, PhD, director of Research and Development, adjunct professor
David Johnson, PhD, program specialist for Research and Development, director of the Institute for Sustainable Agriculture at New Mexico State University, adjunct professor
Priya Tuvell, M Agr, program coordinator

California State University, Chico
“Regenerative Agriculture is not only the good news and major food trend of 2019; it is the most promising strategy to turn around the planet and atmosphere’s degradation as well as our own health.”—Tim LaSalle, PhD, CRARS co-founder

The Future of Agriculture

In the face of global climate change, we at the CSU, Chico Center for Regenerative Agriculture and Resilient Systems (CRARS) seek to promote regenerative farming practices to reduce greenhouse gasses, restore soil resiliency, increase the sustainability of farms and ranches, and address food and water insecurity.
Announcements:

The Center for Regenerative Agriculture & Resilient Systems (CRARS) is now official! Our application was approved by the Ancillary Unit Review Committee (AURC) in February 2019 (fall approval was postponed due to the Camp Fire); approved by Subcommittee of the Academic Senate (EPPC) in March 2019; approved unanimously by the Academic Senate in April 2019; and signed off by President Gayle Hutchinson in May 2019.

Our Co-Founders

Cynthia Daley, CRARS Executive Director, Selected as the Rawlins Endowed Professor in Environmental Literacy for CSU, Chico

The Rawlins Endowed Professor in Environmental Literacy was made possible through a generous donation from Jack Rawlins, a Chico resident, successful local businessman and rancher, who knew that environmental problems are not only complex but also require an informed citizenry to work toward solutions. The overarching goal of the Rawlins Professorship is to promote environmental literacy and sustainability across campus and beyond. Daley will lead a task force to strengthen sustainability across the CSU Chico curriculum.

Cynthia Daley, PhD—CRARS co-founder and director, Organic Dairy Program Supervisor; professor, College of Agriculture

Tim LaSalle, PhD—CRARS co-founder, director of Research and Development, adjunct professor

Garrett Liles, PhD—CRARS co-founder, Faculty Affiliate, Soil Scientist

Lee Altier, PhD—CRARS co-founder, Faculty Affiliate, Organic Vegetable Cropping Systems

Personnel

David Johnson, PhD—program specialist in Research and Development, adjunct professor

Betsy Boyd, PhD—professor, College of Agriculture, Entomology; CRARS Faculty Affiliate

Maria Giovannini, PhD—professor, College of Natural Sciences in Food Science; CRARS Faculty Affiliate

Jake Brimlow, PhD—professor, College of Agriculture, Agricultural Economics, CRARS Faculty Affiliate

Logan Smith, PhD—Assistant Professor; CRARS Faculty Affiliate

Priya Tuvell, MAgr—program coordinator and manager, lead on the nutrient density lab and online certificate program

Jude Malin, PhD

Aundrea Asbell—Soil Lab Technician

Chidimma Oluwaseun, MS—staff research associate

Seth Myrick—staff research associate

A. Michelle Auzenne, MS—grant writer

Kyle Brasier, PhD—postdoctoral researcher

Breanna Owens—project development specialist

Sheryl Karas, MA—communications, designer for Regenerate Magazine, website and blog support

Scott Gelat—Organic Vegetable Project manager, CSA management and hands-on student training support

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Website Updates

Significant additions have been made to the website, including: 12 mentor farmer case studies, many with farmer-narrated videos of their operations, transitions, and thoughts on regenerative agriculture (RA); the Resource page is filled with archived seminars and presentations from our events; scientific literature about RA is posted; and educational videos that explain RA to beginners are now available online. Visit: www.csuchico.edu/regenerativeagriculture

Social Media

Facebook, Instagram, Twitter: @CSUCHicoRegenAg
Blog: www.csuchico.edu/regenerativeagriculture/blog

Mentor Farmer Series

The following farmers have now joined our list of mentors willing to help others in transitioning to regenerative methods:

• Paul Muller, Full Belly Farms: organic vegetables
• Phil Foster, Pinnacle Farms: organic vegetables
• Allen Williams: holistic grazing management and diversified farming
• Daniel Unruh: conventional nuts, diverse cover crops
• Frog Hollow Farm: diversified farming
• Singing Frogs Farm: organic vegetables
• Tom Newmark, Finca Luna Nueva: diversified farming
• Will Harris, White Oak Pastures Farm: multispecies and holistically-managed grazing program
• Nathanael Siemens, Fat Uncle Farms: regenerative cotton, nuts, grains; managed grazing, cover crops

We Launched our Interdisciplinary Master’s Degree in Regenerative Agriculture!

Graduate Research:

• Irfan Ainuddin: RA in soils systems (soil survey of various production models in California)
• Clayton Handy: RA walnut systems, cover crops, termination systems, costs of production
• Matthew Housley: RA cotton systems (till vs. no-till), biologically-enhanced agricultural management (BEAM) vs. no BEAM
• Raquel Krach: RA in almond orchard systems, cover crops and compost
Regenerative Agriculture Events 2019

This Way to Sustainability Spring Conference XIV, March 28-29, 2019

“Regenerating our Ecological Systems: Impacts and Solutions to the Climate Crisis” (1,200 registered over two days).

Presenters included:
• Thomas Goreau, PhD, climate scientist, Harvard-trained biogeochemist and marine biologist, president of the Global Coral Reef Alliance and Soil Carbon Alliance.
• Wenonah Hauter, founder and executive director of Food & Water Watch and Food & Water Action Fund.
• Alice Julier, PhD, associate professor and director of the food studies graduate program at Chatham University.
• Larry Kopald, founder and president of The Carbon Underground.

Soil Intensive Workshops Hosted for Industry

• Nicole Masters and the Natural Resource Conservation Service (NRCS), May 6—7, 2019
• Christine Jones, PhD and David Johnson, June 24—25, 2019
• Soil Health Academy, December 3—5, 2019

$1.2 Million in Research Funding Received!

Nutrient Density Study in No-Till Organic Vegetables, $300,000 Over 3 Years

Developing a cost/benefit analysis of a no-till organic vegetable production system by comparing soil quality, yield, nutrient density, and costs as compared to full tillage. The main effects are tillage vs no-till and BEAM vs. no BEAM.

Howard G. Buffett Foundation BEAM Corn/Bean Rotation, $300,000 Over 3 Years

Testing BEAM at commercial scale in a conventional corn/bean rotation production system to determine impact on primary plant productivity, nutrient density, economic return, and soil health as reflected in measurable soil parameters and biological diversity as well as cost analysis.

The Effect of BEAM Seed Inoculations on Rangeland Ecosystems, $250,000 Over 3 Years

California rangeland makes up 40 percent of the land mass, land that can't be farmed, suitable primarily for grazing. Decades of set-stock grazing has left our rangelands depleted of nutrients and topsoil. The goal of this research is to determine if multispecies seeding methods with and without inoculation with BEAM will have a positive effect on forage productivity, soil microbiology, and soil fertility. Recently expanded to five rangeland sites.

Conservation Innovation Grant (CIG), $158,000 Over 3 Years

Working in collaboration with UCCE and six well-established regenerative farmers in Northern California, this CIG grant will focus on assessment of conservation tillage practices, establish soil microbiology patterns and economic benefits.

NRCS Soil Survey Grant, $200,000 Over 2 Years

This soil survey funding will support the development of a Soils Demonstration Lab at the University Farm for the purposes of providing soil analysis service to the industry and to teach students about the miracles of soil as the foundation of life.
Submitted Research Grants Written (Not Yet Funded)

**Soil Health Management Systems for Cropping, Orchard, and Rangeland/Pasture Operations in Northern California: Conservation Innovation Grant**

On-Farm Trials

To support the Center as a hub for designing Comprehensive Conservation Planning and Carbon Farm Planning for 12 farms a year for the next five years with Research Conservation Districts (RCDs) and Point Blue Conservation Science. Each farm/ranch would receive education and one-on-one support for the Environmental Quality Incentives Program (EQIP) or California Department of Food and Agriculture Healthy Soils Initiative (CDFA HSI) grant funding to implement regenerative/conservation practices and monitor progress through soil testing and analysis. Funding: $300,000 over five years.

**Management Practices for Increased Carbon Sequestration, Productivity and Economic Return in California Cotton Systems.**

Western Sustainable Agriculture Research & Education (WSARE) proposal together with the non-profit organization Fibershed. Funding: $350,000 over three years.

**Effect of Biologically Enhanced Agricultural Management (BEAM) on Fallow Ground in Blythe, California with Metropolitan Water District.**

This interdisciplinary education project would help the Regenerative Agriculture Demonstration Lab (RAD Lab) and its growing suite of services. USDA Tribal College Research Grant with Nueta Hidatsa Sahnish College (NHSC) in New Town, North Dakota. Working together with staff and students at NHSC, we are developing a two-year research project to study the implementation of regenerative practices in a rotational vegetable production system on their campus. Funding: $300,000 over three years (a subcontract, the grant goes to NHSC).

**California Agriculture Soil Health Management Systems**

This Regional Conservation Partnership Program (RCPP) will support farmers and ranchers in the state to adopt practices scientifically proven to mitigate effects of climate change, increase resilience to extreme weather events, and improve nutrient density. Program funding is through the U.S. Department of Agriculture Natural Resource Conservation Service. It will be managed by CRARS and implemented in partnership with Resource Conservation Districts and other conservation partners.

**Development of an On-Line Professional Course Series (PCS) in Regenerative Agriculture**

Objectives: 1) develop an on-line series for producers, extension agents, and National Resource Conservation Service and Resource Conservation District professionals; 2) engage California producer mentors that can benefit from a broader network across the west while increasing knowledge sharing of principles and practices specific to California agriculture commodities; 3) cultivate a developing Community of Practice of northern California farmers and agricultural specialists to support it. A long-term goal is to create and receive institutional approval for a 21-credit certificate in regenerative agriculture.

**Experiential Learning in Soil Carbon Laboratory Testing and Analysis**

This on-line educational series would help the Regenerative Agriculture Demonstration Lab (RAD Lab) to: (a) provide students and faculty with analytical equipment to: (a) conduct soil health assessment, (b) conduct applied research for agroecosystem health and to ensure reliable nutritious food production systems, and (c) advance the body of knowledge in conservation-regenerative agriculture; 2) (a) pilot a Soil Science Undergraduate Research Experience (SSURE) program, (b) Promote development and retention of a diverse workforce across food, agricultural natural resources, and human sciences (FANH); and (c) increase stakeholder access to the RAD Lab and its growing suite of services.

University Farm has 100 acres devoted to regenerative agriculture in eight demonstrations. A virtual tour is being developed for our website!

1. Organic Vegetable Project (3 acres): CSA project, CIG no-till nutrient density research, gardening demonstrations, 15 students contribute per year.

2. Organic, Pasture-based Dairy Project (60 acres): managed intensive grazing systems, cool season no-till polycultures, compost and BEAM inoculation study, summer annuals.


4. Dryland long-term no-till demonstration (7 acres): new addition in 2018, 3.5 acres is full tillage winter forage vs no-till dryland systems—includes 3.5 acres of winter forage seeded fall, harvested early spring, followed by summer seeding of soil building cover crops. These are rolled and crimped to cover the soil with mulch over the summer in anticipation for the fall seeding.

5. BEAM demonstration site: eight Johnson-Sui bioreactors are currently underway

6. SPA Soil Lab: soil preparation area at the Ornamental Horticulture unit


8. RAD Soil Lab on campus, in Plumas Hall 325: working to develop a soil monitoring and testing suite for producers, with dashboard for web-based analysis display.
RAD Lab is Underway and Now Expanding into Nutrient Density

Under the direction of our soils scientist Garrett Liles, PhD, assistant professor in the College of Agriculture, the soil and plant processing facility at the University Farm is now operational. This facility provides the capacity to handle, process, archive, and analyze soil and plant material. The Soil Processing Area (SPA) will also provide workforce development and training for students, managers, and stakeholders through hands-on educational workshops and experiences. It is now operational in support of the Center for Regenerative Agriculture research and a regional Soil Health project funded through the NRCS. It provides the analytical infrastructure and expertise needed to assess soil chemical, physical, and biological properties across the diverse working landscape of Northern California.

Working together with Greg Austic, with Our-Sci Laboratory in Ann Arbor Michigan, we have expanded the lab into nutrient density, taking our first food samples for polyphenol testing, antioxidant analysis (FRAP), and XRF assessment of mineral content.

“We would love to expand into PLFA analysis of soils and food—we would need additional staffing.”—Cynthia Daley

Logan Smith, PhD, professor in the College of Agriculture, is currently validating his molecular test for fungal to bacterial ratios in soil and compost and hopes that this assay will be the validation step needed to assure BEAM compost that is being made around the world becomes standardized to a 5 to 1 ratio.

Johnson-Su BEAM Research and Bioreactor Registry

Adjunct faculty member and CRA associate David Johnson, PhD has been doing breakthrough work in regards to the efficacy of biologically correct, fungal-dominated compost for carbon sequestration, improved soil health and crop yields. His method is called BEAM (Biologically Enhanced Agricultural Management) and centers around the products created using the compost creation system he devised with his wife Hui-Chun Su (called the Johnson-Su Bioreactor).

On the CRARS website visitors can now access information about Johnson’s research, instructions on how to build their own bioreactor, and how to share their results through a Bioreactor Registry. This will add to the research necessary to show how well this method works in a variety of climates and soil conditions, with specific crop types, etc. So far, 54 individuals or organizations from 14 countries and eight U.S. states have joined the effort.
Launch of the Journal of Regenerative Agriculture

The Journal of Regenerative Agriculture (JRA) is an online, peer-reviewed research journal, published by members of the regenerative agriculture community including academics, the scientific community, extension agents, governmental agencies, NGO’s, farmers and allied industries. The journal provides a platform for the dissemination of systems-based applied research and related works that will extend our knowledge and understanding of regenerative agricultural practices.

This open access journal will provide the public with unrestricted free access to scholarly research on regenerative agriculture. When submitting a manuscript, authors are asked to list potential reviewers they deem appropriate. The author is responsible for securing any rights required for publication of any included media, images, and scientific findings, and for providing appropriate citations and/or rights statements. Four submissions are currently under review. Visit: www.thejora.org

Farm Planning Session, January 16, 2020

This is the first run at a training program for RCD’s and NRCS personnel in collaboration with the Carbon Cycle Institute to provide technical advisor training in carbon farm planning and conservation planning efforts. The goal is to develop a course series and certification process over time.

Rumiano Transition Partnership Underway

This is a planned sequence of on-farm transitions for the 27 collaborating dairies in the Rumiano milkshed. We have started this process with three dairies, that have been sponsored to attend the SHA in December and are working to develop their Carbon Farm Plans (CFPs) and California Department of Food and Agriculture HIS (CDFA HIS) grants for implementation. Cynthia Daley has integrated these CFP’s into her AGRI 432 Holistic Management course, teaching her entire class about the design and development of on-farm CFP’s. They brought the producer into the classroom to discuss their operation in its entirety. The class takes it from there to redesign their management strategy to improve soil health and carbon sequestration which, inadvertently, improves net on-farm income. Daley will take on the best students in a ‘Directed Work’ class next spring to follow up with dissemination.

We are working on developing an on-going budget for these transitions with Rumiano Cheese.

Leadership Council Convened for the First Time, July 29, 2019

The Leadership Council’s purpose is to collaboratively think, plan, strategize, communicate, support, and help create productive alliances that can significantly contribute to addressing global needs. The Leadership Council helps advise and guide the work of CRARS to be relevant to the concerns of those in industry.

As leaders from the industry and aligned fields, the Council’s potential to help the Center become a significant and primary contributor to help create a more resilient and ecologically healthy food production system is without limits. The challenge is great, the need is not ambiguous, and the essential nature of bringing together leaders and thought shapers to help in this global transformation is pressing.

Members include Randy Record (past director of Metropolitan Water District), Joe Morris (holistic grazer and rancher), Rose and Ward Burroughs (RA producers), Rebecca Burgess (ED Fibershed), Scott Park (RA farmer), Tom Newmark (RA Farmer), Shannon Douglass (vice president of California Farm Bureau).

Visit: www.csuchico.edu/regenerativeagriculture/about-us/leadership-council

Regenerative Agriculture Science Convening on April 2—3, 2020

CRARS is working with Wendy Millet and her staff to host the first RA Science Convening on April 2—3, 2020 at the TomKat Ranch in Pescadero, California. Fifty universities, NGOs and organizations are invited and 100 attendees are anticipated for a focus-group style analysis of what we know, what we need to know, and how we can work together to fill the gaps.

Photos of some Leadership Council members at the top of the page from left to right: Rosie and Ward Burroughs, Rebecca Burgess (photo by Paige Greene), and Tom Newmark. Photo at right: Wendy Millet of TomKat Ranch
Roland Bunch is one of the most well-respected leaders in regenerative land management in terms of food security and addressing ecological degradation and climate disruption. He has worked as a consultant for over 40 NGOs and governments in 50 nations, including Cornell University, the Ford Foundation, Oxfam America, Save the Children, CARE, and the governments of Guatemala, Honduras, Swaziland, Laos and Vietnam. In 1983, Bunch began investigating the use of plants for regenerating the soil, which he calls “green manure/cover crops.” One of his most recent books, “Restoring the Soil: A Guide for Using Green Manure/Cover Crops to Improve the Food Security of Smallholder Farmers,” synthesizes his extensive field-based research in this area gathered from smallholder farmers around the world. Bunch now travels extensively throughout Africa, intensive field-based research in this area gathered from smallholder farmers around the world. Bunch now travels extensively throughout Africa, most recently to Ghana for a field visit related to agroforestry with farmers managed natural regeneration (FMNR). FMNR has successfully worked with thousands of farmers in Kenya, Uganda, Rwanda and Tanzania and has resulted in 24 million hectares of regenerated land.

Kofi Boa, PhD, was inspired to devote his life to regenerative conservation agriculture practices for deeply personal reasons. Slash-and-burn approaches were the norm in his region, and when he was a child his mother’s cocoa farm was completely destroyed when a neighbor’s fire burned out of control. Seeking more sustainable methods of farming, he studied agricultural science at Kwantum Wram University of Science and Technology in Kumasi, Ghana and agronomy at the University of Nebraska. Today, Boa works with the Center for No-Till Agriculture, the organization he founded with the Howard G. Buffett Foundation. The Center hosts research done by the Center on Conflict and Development at Texas A&M University, for which he serves as senior advisor. It maintains a demonstration systems with a unique opportunity to develop this proof of concept.

Tom Newmark, JD spent fourteen years in the natural vitamin and supplement industry, building New Chapter into the number one company in the industry before it was sold to Procter & Gamble. He is Chairman of the Greenpeace Fund USA, chairman of the American Botanical Council, founder of Sacred Seeds (a plant conservation project administered by United Plant Savers), and co-owner of Finca Luna Nueva, a biodynamic and regenerative farming operation in Costa Rica that administers a tropical farming systems trial. Finca Luna Nueva operates an ecolodge dedicated to providing education in regenerative farming and topics related to their location in the tropical rainforest. They plant polycultures with foliage at differing strata and are participating in the research in fungal-dominated compost via a Johnson-Su BEAM composting bioreactor.

Biologically Enhanced Regenerative Research

Farm-Scale Field Trial: The farming community’s rapid transition to regenerative agricultural techniques is critical. To make that happen, we need rigorous, scientifically designed replications of biologically enhanced regenerative practices. These must be compared to conventional high-input, fossil fuel-based farming practices demonstrated at farm scale with economic (cost/profit) analyses. The collaboration between the CSU, Chico University Farm and neighboring farmers provides the Center for Regenerative Agriculture and Resilient Systems with a unique opportunity to develop this proof of concept.

For more information on how you can support the Center for Regenerative Agriculture and Resilient Systems, please contact:

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CRARS Funding Needs

Immediate Projects for Funding Support

1) Cotton: Cotton is one of the four major crops in the United States and one of the most chemical and tillage-involved agronomic systems, with synthetic fertilizer, herbicide, pesticide, and chemical defoliation applications. Our ability to provide a regenerative model for production of a natural fiber-based crop would help show the world a better method for carbon capture, restoration of biological diversity, and healthy soil building on 32.5 million hectares globally. For our health, as well as the future of our apparel industries, we need a profitable and ecologically sound farming approach to produce natural fibers. These can replace the growing ecological disaster of microplastics from synthetic fabrics contaminating our air and waterways.

Five-year study, 20 acres: $450,000

2) Almonds: Eighty-two percent of the world’s almonds are grown in California with consumption rising as the world population grows and people look for plant-based protein alternatives. That means approximately 1 million acres are now contributing to extra water use, climate change, and diminished air quality. In preliminary research, regenerative systems indicate they can reverse ecological pressures in these critical areas. A well-designed and economically based research effort should be immediately implemented to help shift our current almond and orchard management practices. This could positively affect global orchard productivity models, introducing a much more regenerative approach that eliminates chemicals, builds soil fertility and biodiversity, and improves water utilization.

Five-year study, 30 acres: $450,000

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CRARS Funding Needs

Priority: Stabilizing Staff

A critical need of the Center for Regenerative Agriculture and Resilient Systems to accomplish its paradigm-changing goals is the ability to stabilize staffing. We need to employ and retain talented individuals to manage and administer the research projects, plan and facilitate training events and seminars, handle inquiries and communications amidst global interest in regeneration, and manage the Center’s broader public outreach. With the continual disinvestment in higher education by state and federal funding streams, essential programs like this must reach to the philanthropic sector for appropriate partnerships to create and develop this future-oriented mission.

Staffing Needs

Director: This position, which has immediately become more than full-time, is held by Center co-founder Cindy Daley, PhD, who is also a full-time professor at Chico State. Her vision, passion, and leadership, as well as her farming and scientific competency, uniquely equip her for this role. In this position, she will be mentoring other faculty for succession within a decade. Part-time funding for the Directorship has been created by cobbling together funds from grants and donations. An endowed chair would allow for full focus and stability to the position ($2.5M); annual funding of $150,000 would cover the position full time and benefits.

Assistant to the Director: The Assistant would manage the Center’s calendar; coordinate events; oversee global communications; develop materials; arrange meetings of the executive committee, leadership council, and visitors; post journal articles and distribute them to peers for review; coordinate the online journal; and act on behalf of the director as liaison to the University administration and colleges involved in this interdisciplinary commitment. $65,000 annually or $1.1M endowment.

Office Manager: This Manager would provide bookkeeping and budget management for the Center’s operation, funded research grants, and contract maintenance between consultants, researchers, students, and field technicians. This is critical to provide projections on reaching budgetary goals and research objectives. $65,000 annually or $1.1M endowment.

Research Technician: With the growing array of regenerative agriculture projects occurring on the campus farm (vegetable no-till/Biologically Enhanced Agricultural Management, no-till forage crop, bioreactor development and maintenance, pasture grazing, cotton and almonds—tentative) a full-time Research Technician is needed to oversee and manage these agricultural research efforts and ready them for farmer and student visitors. $65,000 annually or $1.1M endowment.

General Support

• Sustainable Food Systems
• Professional Course Series and Certificate Program in Regenerative Agriculture.
• REGENERATE Journal

CRARS Funding Needs

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“Why are several current US presidential candidates voicing strong support for regenerative agriculture? Why is the courageous voice of Greta Thunberg now speaking of the power of photosynthesis for carbon capture? Because regenerative agriculture is an indispensable component of any effective response to mass extinction, food and water insecurity, and climate chaos. It’s not enough to reduce or stop using fossil fuels – we absolutely must draw down a trillion tons of legacy CO2 from the atmosphere and put it back in the soil.” — Tom Newmark, CRARS Leadership Council, co-founder of Finca Luna Nueva
Special thanks to our sponsors, donors and grant partners.
With your support all things are possible.