

Position Title: Climate-Ready Agricultural Systems CE Specialist

Developed and proposed by: This position was developed collaboratively by faculty and leadership from UC Merced, UC ANR, and the Research and Extension Centers (RECs), including faculty from UC Merced's Schools of Engineering and Natural Sciences, researchers with the UC Merced Experimental Smart Farm (ESF), affiliated CE Specialists, and co-leaders of the UC ANR Climate Science and Ecosystem Impacts Program Team. Program team input highlighted the need for stronger integration of climate science, field-based experimentation, and practical decision-support to guide agricultural adaptation under growing environmental uncertainty. Emerging constituencies, including the California Agave Council, identified the absence of California-based expertise as a principal factor limiting establishment of novel and legacy/heritage crops. Because evaluation alone is insufficient, the position must remedy the factors constraining diversification while ensuring that small-scale and socially disadvantaged growers can participate in emerging, climate-ready value chains.

Headquarters & Coverage: Headquartered at UC Merced with statewide responsibilities, the position benefits from the campus's established strengths in climate science, environmental systems, agroecology, engineering, data analytics, and sustainability science, and is in a uniquely interdisciplinary setting for addressing agricultural adaptation. The UCM ESF combines controlled experimentation, advanced sensing, and specialty-crop production systems. The campus sits within the San Joaquin Valley, where water uncertainty, heat stress, shifting weather patterns, and changing crop suitability create some of California's most pressing adaptation challenges, and it maintains strong relationships with UCCE, RECs, growers, irrigation districts, and regional stakeholders.

Position Overview: The position will focus on climate-resilient agricultural systems and the interactions among crop physiology, environmental stress, water management, climate variability, and agricultural decision-making. It will integrate field experimentation, crop modeling, and stakeholder engagement to develop practical strategies for resilience under future climate conditions. A central emphasis is a field-to-model continuum: field experiments at the Smart Farm and growers' fields evaluate adaptation strategies, and the resulting data build and validate process-based models that support grower decision-making. Activities will address the performance of existing and emerging crops under changing conditions and evaluate management practices that improve productivity, resource-use efficiency, and long-term resilience. Beyond evaluating crop performance, the Specialist will identify and help remedy factors that limit adoption of novel and legacy/heritage crops (i.e., gaps in locally adapted genetics and planting material, immature seed and nursery systems, limited harvest mechanization, and missing processing, offtake, and market linkages) by co-developing solutions with UCCE specialists and advisors for the full range of California producers and processors. *Educational and Professional Background:* A Ph.D. in Agronomy, Agroecology, Plant Sciences, Climate Science, Biological Systems or Environmental Engineering, or a closely related discipline is required. Preference will be given to candidates with demonstrated expertise in field experimentation, crop and climate modeling, climate adaptation, and stakeholder-engaged research, and additional preference to those with agronomic expertise in plant breeding, cultivar/germplasm evaluation, or seed-system development; experience with novel, alternative, or legacy/heritage cropping systems; and inclusive, community-engaged (participatory) research. *Reporting Structure:* The Specialist will hold an adjunct faculty appointment at UC Merced (Department of Life & Environmental Sciences) and work closely with UCM faculty, statewide programs, the RECs, and UCCE Advisors, serving as a connecting point between campus-based climate and agricultural systems research and the practical needs of California producers and processors.

Justification: California agriculture is entering a period of unprecedented transition. Rising temperatures, prolonged drought, groundwater limitations, extreme precipitation, and greater weather variability are challenging long-standing assumptions about crop selection, irrigation, and production planning. At the same time, advances in climate science, environmental monitoring, and agricultural modeling create new opportunities

to anticipate risks and test adaptation strategies before they become urgent. Yet a substantial gap persists between climate projections, agricultural systems research, and operational decision-making. Existing programs typically address single components (i.e., crop production, climate science, water management, or modeling) and no current UC ANR position integrates field experimentation, climate-risk assessment, crop-system evaluation, and decision-support into a unified statewide program. **Reliable adaptation strategies must be grounded in field-based evidence collected under California conditions.** Many current models lack calibration and validation against contemporary field observations, so integrating experimental data with crop, hydrologic, and climate models offers significant gains in forecasting and decision support. Growers, commodity groups, and agencies increasingly need credible information on future crop opportunities, alternative production systems, and management strategies that maintain economic viability while reducing environmental risk.

Critically, the barriers to diversification are not merely a lack of evaluation; they are structural. For most novel crops (e.g., agave, guayule, jujube, moringa, tea) and many legacy/heritage crops (e.g., tepary bean, cowpea, safflower), the binding constraints are the absence of locally adapted genetics and reliable planting material, underdeveloped seed and nursery systems, limited harvest mechanization, and missing processing, offtake, and market infrastructure. Addressing them requires expertise not only in crop and climate modeling but in plant sciences and in the value-chain analysis that links production to processing and markets. It also requires inclusive innovation: many of the highest-value opportunities are tied to heritage and specialty crops whose benefits should reach small-scale, socially disadvantaged, beginning, and tribal growers, not only large operations. Coupling agronomic expertise and participatory innovation ensures that California-adapted varieties, seed systems, and grower-ready knowledge are developed locally rather than imported piecemeal or left undeveloped. The position aligns with UC ANR Strategic Vision 2040, advancing climate resilience, sustainable food systems, water security, environmental stewardship, healthy working landscapes, and community well-being while translating research into practical solutions for California's agricultural sustainability and economic vitality.

Extension: The Specialist will develop and lead a comprehensive extension program on climate adaptation and agricultural resilience, including on-farm demonstrations of adaptation strategies, decision-support tools for growers and agricultural professionals, and climate-risk assessments for major California cropping systems. Activities will feature field days, workshops, webinars, grower trainings, educational materials, factsheets, and digital resources, along with technical support for advisors and consultants. Primary clientele will include growers and ranchers, irrigation and water districts, agricultural consultants, commodity boards, conservation organizations, Resource Conservation Districts, state and local agencies, UCCE Advisors, and agricultural technology providers. The program will emphasize co-development of practical solutions with stakeholders and rapid translation of research into actionable practice. It will also pursue inclusive innovation (i.e., using community-engaged methods such as participatory variety selection and farmer-led on-farm trials) so that novel and legacy/heritage crop options are accessible to small-scale and socially disadvantaged growers.

Research: The Specialist will lead an innovative, nationally recognized research program on the impacts of climate change on agricultural systems. Research will investigate field-based crop responses to heat stress, drought, flooding, and other extreme events, along with shifts in crop phenology, and will include field experimentation and the calibration and validation of crop simulation models. It will evaluate future cropping opportunities (e.g., drought- and heat-tolerant crops, alternative cropping systems, and diversified, regenerative production approaches) with emphasis on water-use efficiency, drought tolerance, and on-farm evaluation of climate-smart technologies. This work will move beyond assessment to address the factors limiting climate-ready diversification directly: selection of locally adapted germplasm and cultivars for novel and legacy/heritage crops; development of seed and planting-material systems; and value-chain analysis linking field performance to harvest, processing, offtake, and markets. Where appropriate, the field-to-model continuum will extend to a

field-to-model-to-value-chain continuum, so that agronomic and physiological data inform not only crop and climate models but also the technoeconomic and portfolio analyses that determine which options remain viable under climate constraints. Participatory, grower-informed approaches will ensure that varieties and practices fit diverse operations. Over the next two decades, the program is expected to expand into coupled climate–agricultural systems, digital agriculture, adaptation to water scarcity, and long-term resilience planning.

UC ANR Network: This position directly supports UC ANR priorities in Climate Science and Ecosystem Impacts, Water Resources, Cropping Systems, Sustainable Agriculture, and Environmental Stewardship. The Specialist will collaborate with: UCM faculty in environmental systems, engineering, ecology, and data science; scientists within SAREP and OAI and at the Kearney, West Side, and Lindcove RECs, which together with the UCM ESF provide sites for multi-environment variety trials and common-garden evaluation; local UCCE Advisors in agronomy, water management, orchard systems, specialty crops, and sustainable agriculture; AES researchers in climate and agricultural systems; plant breeders and germplasm/seed-systems specialists (e.g., USDA-ARS); and agricultural and value-chain economists. **Network External to UC ANR:** The Specialist will engage emerging-crop constituencies (e.g., the California Agave Council) and organizations serving socially disadvantaged producers to align innovation priorities with grower needs, with early involvement anticipated in ongoing statewide climate adaptation, water management, and sustainable agriculture initiatives.

Support: UC Merced is a strategic location where the incoming hire can leverage ongoing efforts to build a successful research and extension program. The Experimental Smart Farm offers a unique opportunity to develop the field-to-model continuum central to this position, combining controlled experimentation, advanced sensing and crop phenotyping, and specialty-, novel-, and legacy-crop production systems, and it enables cross-disciplinary work with faculty across the Schools of Natural Sciences (SNS) and Engineering in climate science, agroecology, ecology, environmental systems, and data analytics. Dedicated office space will be provided, with access to shared computational and cyberinfrastructure (high-performance computing, cloud allocations, software licenses, data storage, and field instrumentation) through UC Merced VISTA and AES. Plant-tissue, soil, and water sample processing will be met through VISTA and SNS shared resources and REC facilities, with greenhouse, headhouse, and seed-handling access at the RECs supporting germplasm and variety work. Transportation is available through VISTA and UC Merced fleet services, and administrative support through SNS and VISTA. While the candidate is expected to develop an extramurally funded program, programmatic support is provided by ANR. The position will also draw on West Side REC (replicated field plots, deficit- and precision-irrigation infrastructure, salinity- and water-stress trial capacity, and weather, soil-moisture, and evapotranspiration monitoring) for variety trials, germplasm evaluation, and cropping-systems experiments under San Joaquin Valley conditions, and on Kearney REC (extensive plots, orchard and specialty-crop systems, and environmental monitoring) for multi-environment and climate-adaptation trials. Both RECs are about 1.25 hours from UCM; Lindcove REC (tree and perennial systems) and other RECs are available as programmatic needs require. **Other support:** The Specialist will be expected to develop a robust, extramurally funded applied research and extension program. Likely sources include state (e.g., CDFA, including the Office of Environmental Farming and Innovation, and DOC's Multibenefit Land Repurposing Program), federal (USDA NIFA/AFRI, the Specialty Crop Research Initiative, SARE, and the Climate Hubs), and private funders focused on agriculture, food, water, and climate resilience (e.g., the Foundation for Food & Agriculture Research and the Walton and Clif family foundations), along with commodity boards, water agencies and irrigation districts, seed, nursery, and agricultural-technology partners, emerging-crop constituencies (e.g., the California Agave Council), and programs supporting underserved and beginning producers.