Sustainable Orchard Innovation Specialist

Developed and proposed by: This position was co-developed and co-written by the Fruit & Nut Tree Crop Program Team co-chairs and the Cooperative Extension liaison of the UC Davis Department of Plant Sciences, with input from UC Davis Plant Sciences faculty and the Fruit and Nut Research and Information Center. Multiple orchard commodity boards identified research and extension priorities for their crops.

Position title: Sustainable Orchard Innovation Specialist

Headquarter location and coverage area: This position will be located at UC Davis in the Department of Plant Sciences, serving Sacramento and northern San Joaquin Valley orchard crops. The Specialist will cover walnuts, prunes and pears (95+% of the state's production of these crops are in this region), with opportunities to contribute significant research to the other fruit and nut industries. This location is important for proximity to relevant crop land and industries. Prunes and pears have not had a Specialist since 2006, and walnuts is without a Specialist since last year. There are currently two orchard specialists covering 2.5 million acres of deciduous orchard crops (3.8 times the footprint of Rhode Island) over a north-south gradient of more than 400 miles. Both these specialists focus their research and extension in the southern San Joaquin Valley, with one headquartered at the Kearney REC, meaning orchard cropping systems in the Sacramento and northern San Joaquin are being neglected. This location is additionally important for strengthening the research and extension continuum between county-based advisors and UC Davis. As faculty have moved away from crop discipline assignments in the last twenty years, this continuum has weakened, with less CAES faculty involved in applied orchard research. A fresh, strong specialist presence is needed to bring the expertise of newer and mid-career department faculty, as well as faculty in other departments, to connect field-based understanding of orchard systems with cutting-edge researchers to create practical, sustainable innovations to the production concerns of today and tomorrow.

Position overview: The general disciplinary focus will be basic and applied tree crop ecophysiology research that results in environmentally sustainable and economically feasible tree crop production practices. The specific production practices to be addressed will be those affected by increased cost of inputs and regulatory restrictions of their use (e.g. nutrients, pesticides), labor costs and scarcity (e.g. automation of tree canopy management, pesticide application), water scarcity (e.g. irrigation limitations), and climate change. A PhD in horticulture of tree crops or woody perennials, agroecology, plant physiology, botany, or similar is required, preferably with postdoctoral experience in a related area, field experience with tree crops and a broad understanding of tree crop production. A strong background in field experimental design and statistics in required, along with strong critical thinking, written and verbal skills. A demonstrated record of timely, first author and cooperative publication is required. Experience in grant writing preferred. Demonstrated experience in extending research to agricultural practitioners and/or translating scientific findings into actionable lessons in layman's terms is expected, along with a proven record of translating research outputs into outcomes and impacts. Strong cooperative interpersonal and leadership skills required, with a demonstrated ability to work independently or as a team member. As a member of the Dept. of Plant Sciences this specialist will solicit active cooperations with CAES faculty to develop the basic science that supports the applied research results.

Justification: Regulatory pressure and climate change and will result in major changes in cropping patterns in the Central Valley in the next 20 years. As a result of the Sustainable Groundwater Management Act, between 140,000 and 590,000 acres of perennial crops are projected to come out of production in the San Joaquin Valley by 2040. Furthermore, by the middle of the century, the current primary cultivars of pistachios, prunes and walnuts are unlikely to experience sufficient winter chill to produce reliably in the southern San Joaquin. These forces will combine to drive expansion of orchard crops north to the Sacramento Valley and northern parts of the San Joaquin Valley, where groundwater and winter chill are not as limiting to production. However, orchard crops face numerous challenges in the Sacramento and northern San Joaquin Valley, overlapping with ANR's Strategic Vision Challenge Areas of Agriculture & Food Systems, Regulations, Policy, & Compliance, Climate Change and Innovation. Economic sustainability of orchard systems is at its most challenged in a generation, with the cost of inputs and labor at all-time highs and crop prices at historic lows. Increased regulations around nutrient, water and pesticide use require innovative new approaches to management to sustain yields while maintaining compliance. Rising temperatures call for new tools to adapt production. Across all these challenges, increased automation, mechanization and innovation will be critical for expanding orchard crop acreage to thrive in the northern half of the Central Valley. While the UC system is replete with academic expertise, a Specialist who understands the specifc production opportunities and challenges of orchard systems in this half of the Central Valley is needed to recruit, harness and translate those expertise into lasting real world innovative solutions.

This position will serve the Sacramento and northern San Joaquin Valley orchard crops. As such they will be the specialist for walnut, prunes and pears, and have opportunities to work in almond, apple, apricot, cherry, olive and pistachio production. All told, this orchard acreage adds up to 1.3 million acres and $4 billion in farm gate value. This value is then broadly multiplied in rural communities, across on-farm and grower support jobs, input and machinery purchases and processing facility jobs. Success in this position will contribute to ANR's condition changes of increased ecological sustainability of agriculture, with opportunities to improve soil health, water quality, use efficiency and supply security, resilience to extreme weather and climate change and carbon sequestration, as well as increased stability, efficiency and profitability of agriculture. Twenty years from now, success for this position will look like increased economic vitality of orchard systems in the Sacramento and northern San Joaquin Valley, sustaining local tree crop industries, and local and state economies while protecting our shared and ecological resources of water, soil and air quality.

Extension: This Specialist will provide leadership and integration among faculty at UC campuses (Davis, Merced, Berkeley, Riverside), UCCE personnel and the UC ANR research and extension centers, as well as between the University and relevant stakeholders associated with orchard production (e.g. growers, pest control advisors, commodity boards and public agencies). The position will extend knowledge through in-person, virtual, written, and recorded media, as well as through various UC organizational structures (e.g. county-based UCCE advisor meetings, newsletters and websites, UC in-person and online learning short courses and production manuals, Fruit & Nut Research and Information Center, ANR Program Teams and Workgroups), industry events, magazines and blogs, videos and social media. This specialist will be active in the relevant state, national and international societies and develop strong international connections.

Research: This position will serve the Sacramento and northern San Joaquin Valley orchard crops, principally walnuts, prunes and pears, with opportunities in other fruit and nut crops. This position will

generate sustainable innovative approaches to address ecological and economic sustainability in the face of increased costs of inputs and labor, increased nutrient, water and pesticide use regulations, and increased climate extremes, as water regulations and climate change drive orchard production increasingly north. This specialist will be expected to develop strong research cooperations with faculty in Plant Sciences, Land, Air & Water Resources, Biological and Agricultural Engineering, Food Science and Technology and Agriculture Economics faculty to produce applied production practices and extension education materials. Topics could include using tree physiology and advancing sensor technology to guide and decrease water and nutrient inputs, biostimulants, new varieties and other strategies to increase resilience to pests and diseases, using plant growth regulators and mechanization for more efficient canopy management and harvest, and improving orchards' ecological footprint through improved soil health, pollinator habitat, and orchard grazing. There are numerous publication opportunities across these crops and disciplines that range from general agriculture and plant journals (e.g. Scientia Horticulturae, Frontiers in Plant Science) to those more focused on specific production concerns (e.g. Agricultural and Forest Meteorology, Biosystems Engineering).

UC ANR network: This position is the top priority for the Fruit & Nut Tree Crop Team, given that the regionally significant prune and pear industries have been without a specialist for 20 years, and the state's 400,000 acres of walnut currently do not have a specialist. The position will be the principal specialist for these crops while also contributing to research and extension of orchard crops shared by the two southern San Joaquin-focused orchard specialists, and the incoming climate change-focused orchards specialist. This specialist will transition academic research from faculty at Davis, Berkeley, Merced and Riverside to production applications in cooperation with UCCE Farm Advisors, building multi-disciplinary teams to address the production challenges produced by the major challenges detailed above. The Specialist would collaborate through entities including Program Teams (Agroecology, Fruit & Nut Tree Crops, Agri-Food Innovation, Entomology, Plant Pathology, Water), crop and discipline work groups, statewide programs, and individual interactions.

Network external to UC ANR: Potential non-UC partners and collaborators include researchers in the California State University (CSU) system, USDA Agricultural Research Service (ARS), and at domestic and international academic institutions, as well as USDA Natural Resource Conservation Service and Resource Conservation Districts. Other potential collaborations include national and international professional society networks, commodity boards, the CA Farm Demonstration Network, and relevant non-profits. The Specialist would also interact with California state agencies such as the Departments of Food and Agriculture, Water Resources and Pesticide Regulation.

Support: The Plant Sciences Department at UC Davis will provide office and laboratory space, as well as access to field and greenhouse facilities, administrative support, communication, and information technology services.

Other support: Multiple funding agencies could this position's research including fruit and nut crop commodity boards, water quality and conservation agencies, state and federal programs focused on interdisciplinary cooperative projects (e.g. CDFA Specialty Crop Block Grants, USDA Specialty Crop Research Initiative, etc.), and sustainability-oriented funding (e.g. Sustainable Agriculture Research and Education Program, Western Regional SARE etc.).