

## **Applied Weed Control Specialist with a Focus on Sustainability and Technology**

**Developed and proposed by:** This position was identified as the top priority for the Weed Management Program Team and the 2<sup>nd</sup> priority of the Agroecology, Organic and Regenerative Systems Program Team. The UC Davis Department of Plant Sciences recognized this position as a key collaborator for cropping systems researchers, and crop and non-crop weed science researchers. The Vegetable Crops Program Team prioritized a separate weed science position focused solely on annual cropping systems as their top priority; all of which clearly illustrates the critical need for additional statewide weed management expertise in the UCCE network.

**Position title:** Applied Weed Control Specialist with a Focus on Sustainability and Technology (UCCE Specialist)

**Headquarter location and coverage area:** The preferred location for this position is in the Department of Plant Sciences at UC Davis, with statewide responsibility. UC Davis has a long history and tradition of weed science leadership in California and the western US. The campus location would facilitate strong connections to cropping systems researchers and extension specialists, crop and noncrop weed science colleagues, as well as engineering and sensor technology researchers, all of which would enhance the impact of this weed control technology specialist. Additionally, the UC Davis location is strategically connected to the UCANR Weed Research and Information Center that is the hub for the Weed Program Team, the other crop-focused Research and Information Centers, and the UCANR Organic Agriculture Institute.

**Position overview, briefly describe:** A statewide weed management specialist focused on weed control technologies would support both cropping system and natural resource advisors, other specialist and faculty programs, while providing critical expertise to a broad range of stakeholder groups. This position will provide statewide leadership on weed control methods that are in line with the State's Sustainable pest management roadmap, to achieve weed control economically while also reducing overall pesticide use. There is a large need across various cropping systems and non-cropping systems to test and develop emerging weed control technologies (smart weeders, electric, flame, see/spray, drones AI). This is especially important for organic systems where approved pesticides are less effective, and current options are limited.

The candidate should have a Ph.D. in weed science, agronomy, crop science, agroecology, plant sciences, or a closely related field, with demonstrated capacity to lead field-based applied research on weed control technologies and develop effective and collaborative extension programs. The position will be based in the UC Davis Department of Plant Sciences and will work closely with county-based UCCE academics, Program Teams, Research and Extension Centers, Research and Information Centers, the Organic Agriculture Initiative, and technology industry partners.

**Justification:** Weeds and weed management practices are among the top economic, environmental, and sustainability challenges for crop production and natural area management in both conventional and organic systems across the state. As technology improves and becomes more accessible, and as California moves towards very ambitious sustainable pest management goals, there is a critical need for a UC weed specialist focused on emerging weed control technologies in a range of agricultural and non-ag systems. A specialist with expertise and research interests in weed control technologies could support

conventional agricultural producers with research on chemical and non-chemical weed control technologies and also support the growing organic agriculture sector with weed control technologies utilizing physical, thermal, or approved chemistries. Importantly, as this position would be focused on the emerging weed control technology rather than a specific production system, the specialist could collaborate across crop sectors and across a range of agricultural scales depending on the specific technologies. As many technologies and non-chemical strategies for weed management could be utilized equally well in conventional and organic systems, this position will fill a void in the university system providing tools to organic producers, who list weeds as their number one pest management challenge across all production systems. Whether using pesticides more effectively and efficiently or replacing them altogether with emerging technologies, this position supports the state's stated goal to reduce total pesticide use while continuing to support agricultural productivity across scales in California and contributes to numerous UCANR condition changes: from community health, to food security and safety, to environmental quality and sustainability, to economic stability and sustainability of our working landscapes and food systems.

**Extension:** The weed specialist would lead statewide extension programming for weed control technologies that would support UCCE academics, farmers and ranchers, agricultural industry partners, and the burgeoning agricultural technology sector. Core activities would include: 1) leadership in the California Weed Science Society, the UCANR VINE project, visibility and participation in agtechnology platforms such as the forum for agricultural robotics; 2) contributing to field days, grower meetings, REC demonstrations, and providing training for consultants and agricultural professionals on weed control technologies; 2) maintaining and expanding web-based resources through the UC Weed Research and Information Center and related platforms; 3) producing practical publications, field trial reports, decision support tools, and management guidelines; and 4) developing extension approaches that connect UC weed management research to weed managers and allied industry groups across a range of agricultural and natural resource systems.

**Research:** The specialist will develop an applied, field-based research program focused on emerging weed control technologies in a range of agricultural and non-ag systems in California. With machine learning, AI, and autonomous systems becoming more commonplace, and farm labor becoming more expensive and less available, there are many opportunities for these technologies to make weed control more effective, economical, and safer for humans and the environment. A few potential focus areas include weed control technologies such as smart cultivators, smart sprayers, robotic weeders, and energy-based weeders that are being developed at the intersection of Silicon Valley and specialty crop agriculture. Some of these exist already and need evaluation and extension in California systems while others are in earlier-stage development and could be accelerated in key California systems with collaborations and partnerships with UC weed researchers. Ultimately, a UC weed management specialist would be well positioned to work at this leading edge of technology in partnership with growers, the technology industry, and regulatory agencies to accelerate the rate of technology development and adoption while addressing the state's sustainable pest management goals and UC science-driven research impacts.

Over the next 20 years, weed management will move away from broadcast chemical treatments and physical weed control utilizing whole field tillage and hand labor. As technology solutions such as UAV-based weed sensing and treatment, robotics and autonomy, machine vision and hyper-precise management interventions, to name only a few, become increasingly effective, adopted and utilized in

agricultural weed management, UC must have expertise in this area to remain relevant and impactful. This specialist will work across disciplines and across agricultural and natural resource management sectors with UCCE Advisors, farmers and ranchers, traditional agricultural industry partners, and especially with ag technology partners who can accelerate development and adoption of tech-driven weed management solutions for all clientele in California.

**UC ANR network:** This position provides much needed statewide weed science leadership to the UC ANR network of Advisors, Specialists, and AES faculty. In particular, this technology-focused weed specialist can increase capacity beyond a crop sector or production system focused specialist by centering their research on methods of weed control, weed detection, or precision implementation of conventional or organic control practices. A critical gap that this specialist would bridge is between those developing and testing specific technologies (robotics, vision systems, machine learning algorithms) and those applied crop and weed management academics who directly support our various agricultural and natural resource management clientele. A specialist with both weed management and technology evaluation expertise could help steer weed technology development while breaking down barriers to adoption of technologies in both organic and conventional systems.

**Network external to UC ANR:** The specialist would be a key resource and collaborator for state agencies implementing the sustainable pest management roadmap, with crop commodity groups interested in improving grower economic and environmental sustainability, public land management agencies who seek to reduce or eliminate pesticide use, and with the diverse agricultural technology sector developing non-chemical approaches to weed control (e.g. physical, thermal, laser, or directed energy-based systems) or a broad range of “smart” weed control implements (smart sprayers, smart cultivators, autonomous platforms, etc.).

**Support:** The Department of Plant Sciences and UC Davis College of Agricultural and Environmental Sciences will provide office and laboratory space, as well as access to field and greenhouse facilities, administrative support, communication, and information technology services. The statewide system of UC Research and Extension Centers provide additional opportunities for subsidized access to a broad range of California crop production systems for research and demonstration projects.

**Other support:** Programmatic funding for this statewide specialist position would largely be from external sources. Competitive federal and state grant programs such as USDA-NIFA, USDA-OREI, USDA-SCRI, CDFA Specialty Crop Block Grants, CDFA Sustainable Pest Management Program; commodity boards and groups including various fruit and nut crops, annual vegetables, leafy greens, agronomic crops; direct support from ag technology companies and startups, and traditional crop protection industry sources are all likely sources of funding for an applied weed management specialist.