Agronomic Cropping Systems Advisor

Developed and proposed by: This proposal was conceived and developed by the Agronomic Crops Program Team and has strong support from the local Area Director of Kings, Tulare and Kern counties.

Position title: The UCCE Advisor of Agronomic Cropping Systems will focus research and extension efforts in the area of major production sustainability issues facing field crops producers in the southern San Joaquin Valley: irrigation water scarcity; insect, pathogen and weed pest management; agricultural nutrient pollution; crop variety improvement; and increasing soil health.

Headquarter location and coverage area: This position will be headquartered in Kings County and additionally cover Tulare and Kern counties. In this region of CA, field crops are currently grown on approximately 901,000 acres with a value of $1.1B annually. A range of 3-16% agricultural value output in these counties, field crops currently occupy 42% of the crop landscape – an immense opportunity for impacting local communities through sustainable resource management. With 15 agriculture Advisors in these counties, currently only one is specifically appointed to work in agronomic cropping systems.

Position overview, briefly describe: This Agronomic Cropping Systems Advisor will conduct agronomy research and education in field crops: forages, grains, cotton, dry beans, oil seeds and biofuel. Agronomy, the integrative science of plant production for food, fuel and fiber, is a multi-disciplinary field amalgamating soil science, irrigation management, pest management, nutrient management and crop improvement. The Advisor in this position thus must have a minimum of a Master's degree in a field such as agronomy, crop science, plant science, water management, soil science, and/or pest management. The Advisor will report to the Area Director of Kings, Tulare and Kern counties and will have the administrative and physical support of the Kings County Cooperative Extension office.

Justification: This position ranked highest among the Agronomic Crops Program Team due to the glaring lack of agronomic crop academic coverage in the southern San Joaquin Valley relative to scale of production in the region coupled with significant environmental and social challenges growers face. Top issues to be addressed by the Agronomic Cropping Systems Advisor revolve around water use efficiency, pest management and nutrient pollution of air and water. A large rural and urban population in the region depends on high-quality groundwater for drinking water competing with ag irrigation.

Sustainable management of water in both quantity and quality is paramount for the coexistence of the lucrative agriculture industry and a highly diverse population in the region. Additionally, as state and federal regulations increasingly restrict the use of various pesticides, manufacturers systematically divest research and development of new active ingredients for apparently less profitable field crops, and growers become increasingly dependent on narrower profiles of pesticide modes of action leading to greater and more frequent incidences of pesticide resistance evolution among insects, pathogens and weeds in the region. Finally, irrigated agriculture, including dairy forage production near the animal production facilities, continues to be highly regulated for their role in contamination of groundwater with polluting levels of nitrate-nitrogen, a molecule of human health concern. Meanwhile, the intersection of improved water use efficiency, needed to mitigate the immediate, negative crop production impacts of decreased water availability, and crop nitrogen management represents a potential synergy of research and education efforts, as improved water use efficiency generally begets improved nitrogen use efficiency. Regardless, many advances in nutrient use efficiency technology and promotion of widely recognized fundamental best management practices needs to continue to bring more of the

industry into compliance with water quality regulations in a reasonable timeline and continue to take social responsibility for impacts within the communities they live and operate.

This Advisor will conduct research and education addressing the highly diverse needs above through creative, multi-disciplinary collaborations and partnerships. A 2021 statewide survey of field crops growers, consultants and allied industry professionals elicited a consensus that water sustainability, pest management and nutrient management were the top three management challenges faced by respondents (DOI: 10.1002/agj2.20897). Integration of pressurized micro-irrigation, water volume application monitoring and recording, utilization of various animal manure fertilizer and soil amendment products, and sustainable, regenerative pest management practices which protect healthy biodiversity and minimize the constant risk of pesticide resistance evolution are several specific areas of immediate research and education need in the region for field crop growers and their professional affiliates.

Outcomes of a successful program will be adoption of improved irrigation practices, quantifiably improved nutrient use efficiency, greater landscape-wide utilization of dairy manure products in agriculture, development of improved crop varieties with greater yield potential and added pest resistance, and development of novel pesticide uses which meet the demands of CA's sustainable pest management roadmap. Long-term impacts of these outcomes, categorized by UC ANR's public value framework of desirable condition changes, will be **Increased ecological sustainability of agriculture**, **Improved water quality**, **Improved water use efficiency and water supply security**, **Increased carbon sequestration and mitigation of greenhouse gas emissions**, **Improved air quality**, **Improved biodiversity**, and **Increased equitable access to resources vis-à-vis clean air and water**.

Extension: The Advisor will develop and deliver research-based extension programs focused on sustainable crop production systems, water and salinity management, pest and disease management, nutrient management including integrating manure use, soil conservation and water quality practices for field crops. The advisor will conduct on-farm research, individual consultations and farm visits, organize field days and educational workshops, and provide technical assistance to growers and agricultural stakeholders through digital communication such as newsletters, websites, social media, podcasts, webinars, and online learning platforms, extension fact sheets, technical reports, policy briefs, other educational materials, as well as peer-reviewed journey. Participatory research partnerships involving growers, consultants, and industry collaborators, and field demonstration. Key clientele will include crop producers, crop consultants, commodity industry representatives, conservation organizations, Federal and state agency personnel, and underserved farming communities. The advisor will collaborate with UCCE, Statewide extension specialists and UC faculty, commodity groups, community-based organizations serving diverse field crop audiences, and public and private partners to address non-vegetable field crops challenges in Kings, Tulare and Fresno counties. Through these partnerships and outreach activities, the advisor will promote the adoption of innovative practices that improve agricultural productivity, profitability, and environmental sustainability.

Research: This will be applied farm-based research focused on sustainable and resilient crop production systems, including nutrient management, water-use efficiency, irrigation-nitrogen management efficiency, climate adaptation, integrated pest, disease and weed management, varietal evaluation, and conservation agriculture. Emerging research priorities over the next 20 years will include water scarcity, drought, heat and salinity resilience, manure/dairy waste use management, carbon sequestration, greenhouse gas reduction, soil carbon management, digital agriculture technologies, artificial intelligence applications, and the integration of extreme weather-smart agricultural practices. Addressing

these complex challenges will require multidisciplinary collaboration with agronomists, soil scientists, plant breeders, entomologists, plant pathologists, agricultural engineers, economists, climate scientists, and water resource specialists including policy makers.

UC ANR network: The Agronomic Cropping Systems Advisor will fit squarely within the Agronomic Crops Program Team and will be positioned to address the priorities of sustainable crop production, crop water use efficiency, crop pest protection, nutrient use efficiency, crop variety improvement and adoption of advanced agricultural technologies to improve production input efficiency. Programmatic associations will be with Dairy Production Program Team, IPM Program Area, Soil Health and Management Program Team and Water Quality, Quantity and Security Program Team. This Advisor will have a well-established core network of agronomy-focused Advisors throughout CA with whom to collaborate from the Intermountain region, near the Oregon border, to the Desert region, near the Mexico border. Existing projects include organization of regular field days in Davis and Parlier focusing on a range of field crops, dry bean variety improvement research, manure nutrient crop utilization research, and specialty crop pest management research. AES scientists and UCCE Specialists on the UCSC (Dept. of Environmental Studies), UCB (Dept. of Plant and Microbial Biology), UCD (Depts. of Ag Resource Economics; Animal Science; Entomology and Nematology; Land, Air and Water Resources; Plant Pathology; and Plant Sciences), UCM (Dept. of Life and Environmental Sciences) and UCR (Dept. of Nematology) campuses collaborate with and provide statewide leadership with this core group of advisors on various projects ranging from grain variety improvement, grain nutrient use efficiency, forage variety improvement, bean variety improvement, field crop water use efficiency, pesticide resistance mitigation, and crop disease discovery and management. An Agronomic Cropping Systems Advisor based in the southern San Joaquin Valley will be well-positioned and have ample opportunities to fill any of several major disciplinary gaps of dire need in the region and throughout the state in the areas of water resource management, insect pest management, crop nutrient management, nutrient management, crop improvement and/or utilization of advanced agricultural technologies in the fields of automation/robotics, remote sensing, and artificial intelligence.

Network external to UC ANR: The Agronomic Cropping Systems Advisor will network with organizations such as USDA-NRCS conservationists and engineers to address soil health and dairy forage sustainability, State Water Board Region 5 water quality coalitions to address crop nutrient use efficiency, CA Dept of Water Resources to address crop water use efficiency, CA Dept. of Pesticide Regulation and county Agriculture Commissioners to address issues of crop pest management, and CA Crop Improvement Association to advance development of new crop varieties. These collaborations range from research partnerships, to developing new crops and pesticide uses, to expanding outreach networks to amplifying extension education outcomes and impacts.

Support: The Kings County office will serve as the home office for this area advisor position, providing office and dry lab space, a vehicle, secretarial support, telephone, internet, and pesticide storage.

Other support: The Agronomic Cropping Systems Advisor will find likely external sources of support via competitive extramural funding from the CA Dairy Research Foundation, CA Dry Bean Advisory Board, CA Wheat Commission, CA Cotton Growers and Ginners Association, CA Alfalfa and Forage Association, IR-4 Program, United Sorghum Checkoff Program, Western SARE, CA Dept. of Pesticide Regulation, CA Dept. of Water Resources, National Alfalfa and Forage Alliance, USDA Agriculture and Food Research Initiative, and Foundation for Food and Agriculture Research.