Cooperative Extension Specialist in Biologicals for Agricultural and Urban Farming

Position Description

(1) *Disciplinary focus* – The Cooperative Extension (CE) Specialist in Biologicals for Agricultural and Urban Farming will act as a statewide resource and coordinator of teams to develop novel programs that address the need for, and efficacy of, externally applied microbes or their products to facilitate growth and biological and abiotic stress tolerance of conventional and organic crops as well as such plants in home and urban gardens.

(2) *Educational and professional background* – Candidate should hold a Ph.D. in microbiology, microbial ecology, plant biology, agroecology or a closely related field and have experience with plant-microbiome interactions, phytobiome science, biological control and/or ecologically-based pest management. This is a 100% CE position and, as such, participatory research skills and a strong commitment to problem-solving research and extending results to clientele groups is expected.

(3) *Supporting Units* – Position will be in the Department of Plant and Microbial Biology at the University of California, Berkeley.

Justification. A major transition is underway in which plant productivity and pest management are being mediated by methods that do not involve synthetic chemicals. Research from many private companies, as well as academic researchers, have revealed that microorganisms or their products can play powerful roles in promoting plant growth, tolerating stresses, such as drought, and avoiding or alleviating effects of diseases and certain pests. There is also a growing appreciation that a better understanding of the phytobiome, the biological and abiotic environment in which plants grow, will yield further changes in managing plant growth. Most efforts have focused on identifying microbial agents as biostimulants, or procedures to facilitate microbiomes to benefit growth of major crops in the midwestern United States, like corn and soybeans. Much less effort has been on the unique conventional and organic crops and environmental conditions in California, and the extent to which biologicals identified elsewhere can be applicable to California situations. There is almost complete ignorance of large potential benefits of these new biologicals and strategies for small-acreage growers and urban home-owners. Thus, there is a large and growing need for research in this area in California, especially for trusted assessments of such biologicals and advice on their proper use by UC CE personnel. This information can benefit growers of the diverse conventional and organic crops in California and perhaps especially urban farmers and homeowners with interests in using more environmentally friendly and sustainable methods to manage plants and crops. Farm Advisors are increasingly asked to evaluate such materials or comment on their use without any local information on their safety or efficacy. Unfortunately, most Farm Advisors lack the background in microbiology and plant-microbe interactions needed to perform translational research and extension efforts. A CE Specialist would, in addition to their own outreach activities, conduct translational research in this area and coordinate and advise Farm Advisors and others, providing needed crop-setting and production-specific information. This Specialist would greatly increase ANR's capacity to address and facilitate adoption and proper use of biologicals in plant agriculture. This individual would also serve as a valued adviser to State agencies, like the California Department of Food and Agriculture and local agencies overseeing use of biological agents for agriculture, horticulture and the environment.

Extension. This individual will play a key role in translating science to provide solutions across diverse decision contexts. As the primary ANR CE scientist engaged in using biologicals in plant growth and production, the Specialist would interact with Farm Advisors and other ANR affiliates, like 4H and Master Gardeners, and with gardening clubs, commodity organizations, organic professionals and State and Federal Agencies. They will advise groups engaged in research or other activities to test or discover useful biologicals. They could serve as a clearinghouse for research results generated by campus-based AES faculty, county-based CE personnel and private companies. These efforts will focus on identifying knowledge gaps and generating educational materials, important in promoting safe and effective use of biologicals. The individual will be in high demand from clientele, like Farm Advisors, Master Gardeners,

garden clubs, commodity groups, county and regional agencies, to report on UC ANR activities in using biologicals.

Research. The Specialist will conduct fundamental and translational research on the phytobiome of crop and garden plants in different settings. This effort will establish the extent to which California's large climatic and soil differences influence the need for, and efficacy of, applied biologicals to stimulate growth and avoid biological and abiotic stresses in specific plant species. This could involve determining efficacy and limitations of existing plant biostimulants, and identifying novel agents and procedures for California crops and conditions. Special issues relating to use in conventional and organic urban gardens will also be addressed. Publication outlets could include peer-reviewed scientific journals, industry publications, popular press, blogs, and ANR publications. Specialist can organize topical webinars to inform target clientele.

ANR Network. This individual will work in teams to develop novel programs addressing the need for and efficacy of externally applied microbes or their products to facilitate growth and biological and abiotic stress tolerance of organic and conventional crop and garden plants. This effort will link with AES scientists, CE Specialists and Advisors across varied disciplines, i.e., microbiology, plant biology, soil science, agronomy, microclimatology, soil fertility and water relations. Many AES and CES faculty in PMB, e.g., Taylor, Traxler, Lemaux, Lindow, Martinez-Gomez, Wildermuth, and Coleman-Derr, have active programs in ecology of plant-microbe interactions, and in UCB's ESPM, e.g., Firestone, Garbelotto, Almeida, Bowles, and Pallud, plus Specialists Getz and Sowerwine, are engaged in urban agriculture, a significant thrust of this position. Other Davis and Riverside AES faculty also address some aspects of ecology and plant-associated microbes. While many ANR Farm Advisors handle issues with biologicals, e.g., Dara, Biscaro, Wang, Long, Loyd, and Aegerter, perhaps the ANR IPM program is most engaged and might welcome a leader in this area. The necessary involvement of AES, CES and Advisors in this effort exemplifies the impact that this continuum is intended to foster. The individual will be active within SAREP and WSARE.

Network External to ANR. Opportunities exist to partner with a large network of external organizations to advance the reach and impact of the position. There are opportunities for intra-campus collaborations with faculty in Integrative Biology, e.g., Koskella, and in the Joint Berkeley Initiative for Microbiome Sciences, including Brodie at Lawrence Berkeley National Labs. The Specialist will also engage with the Phytobiome Alliance, an industry-academic collaborative building a phytobiome-based foundation for accelerating sustainable production of food, feed and fiber. This will provide means to connect with the large and growing agricultural biologicals industry and state and national regulators.

Support. Required office space and lab facilities will be provided by the PMB Department in the Rausser College of Natural Resources at UC Berkeley. Campus administrative services and ANR Program Support will provide resources for research and extension programming. Field and greenhouse facilities are available at UCB's Gill and Oxford Tracts and at ANR RECs, like KARE. The Specialist will receive space and a start-up package to build an impactful research and extension program, mostly through extramural funds.

Other support. Many funding opportunities exist at the Federal level; some through USDA, like the Plant Biotic Interactions program with NSF, support phytobiome research. In addition are various State and Federal Specialty Crop Research Programs and WSARE mini-grants. Funding is also available from numerous commodity groups and companies who would benefit from research on biologicals.

Headquarters and Coverage Area. Based at UC Berkeley a center for research in plant-microbe interactions and microbial ecology, the position is ideally suited for this effort with statewide reach in agronomic and horticultural applications.

Developed and proposed by PMB faculty including Steve Lindow and Peggy Lemaux. Feedback and encouragement came from Surendra Dara, Rachel Long, Patrick Brown, Rob Bennaton, UC Organic Ag Institute, Community Alliance with Family Farms, and the majority of those surveyed for the Diversified Farming and Food Systems Program Team.