UC ANR Water Resources and Ornamental & Environmental Horticulture, Nurseries & Master Gardener Workgroups

Grant Ideas

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Floriculture and Nursery Workgroup

1. **Nutrient management and recirculation**
   Research needs
   - Water use physiology: can we make plants more drought tolerant?
   - Using sensor-based information for management
   - Pathogen management

   Extension needs
   - Improving efficiency
   - Scouting

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2. **Irrigation efficiency effects on IPM**
   This investigation seeks to describe the relationship between irrigation efficiency (as measured on site and based on system performance, uniformity, and crop needs) and pest/disease pressure (as measured by pest density, disease incidence/severity, pesticide application frequency, and amount of pesticide active ingredient applied) in horticultural production nurseries, and potentially in retail garden centers and/or urban landscapes. It is hypothesized that inefficient irrigation practices resulting in drought stress or excess moisture will increase specific pest/disease pressure, but this relationship has yet to be demonstrated. This project aims to introduce an economic incentive for improving irrigation efficiency, leading to reductions in overall water use and runoff volumes.

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Landscape Workgroup

1. **Online training modules for Master Gardeners**

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2. **Tree-turf interactions**

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3. **Evapotranspiration Adjustment Factor (ETAF)**
   The 'California Water Conservation in Landscaping Act'(AB 1881) resulted in the legislation of several measuress including a maximum Evapotranspiration Adjustment Factor (ETAF)of .7 for newly established landscapes larger than 2,500 square feet. Our project will identify 30 commercially or publically maintained high quality mixed landscape plantings irrigated at or below a .7 ETAF (as documented by meter readings) throughout California to showcase 'best management practices' that result in high quality functional landscapes irrigated within the new guidelines.

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4. **Bioswale**
   Bioswales have been included in landscapes as features that remediate pollutant loading, reduce surface runoff, and facilitate groundwater recharge. However there is little information on their overall effectiveness in urban landscape situations where they have been installed in response to low impact development requirements. Research needs include the effectiveness of various plants and soil types at pollutant removal, management guidelines to ensure maximum removal rates of pollutants, and the acceptance of swales as a landscape element by the urban community.

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5. **Chip and Grind**
   Uncomposted greenwastes may vector endemic and emerging diseases, pests, and weeds across wide areas. Composting prior to land application significantly reduces these concerns, however. CalRecycle is working to increase the beneficial use of lawn trimmings but composing operations face

new environmental regulations that will increase their costs. To avoid these costs, municipalities may elect to chip or grind their greenwastes and then distribute them widely at low prices, without composting, for use as mulches and soil amendments on farms and in landscapes. Although landscapes, nurseries, and farms accepting uncomposted greenwastes may be more vulnerable to endemic and invasive pests and diseases, the extent of this threat has yet to be studied. We therefore propose an interdisciplinary scientific and economic risk assessment of the pest transmission potential of uncomposted greenwastes as compared to composted materials.

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Water Resources Workgroup

1. **California Nitrogen Issues: Research and Outreach**
   Providing practical solutions to California's groundwater nitrogen contamination issues, especially in regards to manure, is complex, difficult and fraught with unforeseen impediments. This project proposes to work with a team of UC and industry representatives to identify key data gaps and promising solutions. This input will be used to design future projects that seek solutions to nitrogen problems. The project will employ a research associate to identify and develop new projects, find and enlist PIs , research outside funding sources, write grants to obtain additional funding and assist in report writing and outreach.

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2. **Development of Nitrogen Management Software for Optimized Utilization of Organic and Inorganic Nitrogen Sources**
   Most field crops in California are grown using surface irrigation with limited potential to effectively control nitrogen losses from leaching and denitrification. This project proposes to develop, validate and extend grower-friendly nitrogen management software. After considering both crop demands and possible nitrogen losses, the package will determine optimal fertilizer and/or manure application schedules. Users will be presented with an efficient real-time interface containing both numeric and graphical representations of the system being managed.
   The software suite includes recordkeeping capabilities for convenient input of irrigation and fertilizer data and calculation of application amounts. An optional dairy-oriented module compares nitrogen and salt excretion from cows with measured manure application amounts to create an in-house whole farm nitrogen budget.

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3. **Irrigation Scheduling web-based tool**
   This project will develop a web-based application that assists growers in scheduling irrigations using CIMIS evapotranspiration data, crop coefficient models, and soil and plant information. The web tool will be accessible on a range of internet platforms (smart phones, tablet, laptop and desktop computers), and will have database capabilities to maintain irrigation records of multiple fields. The project will target six to eight major annual and perennial crops grown throughout California including nut crops, stone fruits, sub-tropical crops, lettuce, broccoli, tomato, cotton, and alfalfa. Emphasis will be on crops irrigated with pressurized irrigation systems. Small teams of UC advisors and specialists will coordinate the development and testing of the irrigation tool for each of these commodities. Development of this application will be coordinated withother efforts to develop a nitrogen management tool since the efficiency of nitrogen use and fate of nitrates in the environment interact directly with irrigation management.

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4. **Fate of alfalfa N in California**

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5. **Subsurface Drip Irrigation in Alfalfa**
   Alfalfa is the largest water user crop in the state of California grown on approximately one million acres of irrigated land. Surface irrigation is the dominant form of irrigation system in most of alfalfa growing regions in the state. Subsurface drip irrigation (SDI) in alfalfa could be implemented to increase alfalfa water use efficiency and address shortages in agricultural water and the increased demand in urban areas. In addition, SDI systems could be used to implement short-term and controlled deficit irrigation practices in alfalfa production systems in southern California as an alternative to the current land fallowing practices in the Imperial and Palo Verde Valleys.

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6. **Automation of Surface Irrigation Systems**
   Surface irrigation systems (mainly furrow and border irrigation) are the primary method of irrigation for field crops in California. The majority of water losses through these systems are either by surface runoff or through leaching or a combination of both. Various irrigation cutoff methods are used by irrigators to reduce runoff, however, the cutoff time can vary from 60 to 90% of the field length depending on irrigation flow rate, crop roughness,

and field characteristics. Determining the time of irrigation to reduce surface runoff and increase irrigation efficiency could be achieved by automating surface irrigation systems. The automation involves the use of wetting front advance sensors, flumes, and electronic timing control gates to determine the irrigation time. Automation of surface irrigation systems increases irrigation efficiency and reduces the cost of labor and water to growers.

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7. **Approaches to quantify Climate Change in Integrated Regional Water Management Plans**
   As part of the Integrated Regional Water Management Plan process (IRWM Plan) promoted by DWR, it is necessary to address the effects of climate change in every of the 46 regions that California has been divided. While DWR has published a document that provides the guidelines to carry out this analysis, there is no structured method to quantify the effect of climate change in every region. This research proposes the development of a statistic and scientific based method to quantify the effects of climate change in every region.

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