Project No: 22-1312

Developing Tools and Information on Irrigation and Nitrogen Best Management Practices in California's Low Desert Lettuce Production Systems

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Abstract

Lettuce is usually among the ten top commodities produced in Imperial County. In the low desert region, sprinklers are often used until the seedlings emerge in lettuce. The fields are then furrow irrigated for the remainder of the season. There are growers who adopted drip irrigation in lettuce and broccoli. Drip can potentially distribute water and nutrients more uniformly than furrow irrigation, and consequently helps growers to attain uniform growth within fields with variable soil texture by maintaining soil moisture at desired levels. Besides that, drip may enhance water-nutrient use efficiency and as a result conserve water-fertilizer and reduce leaching of nitrate in the fields. Currently, lack of accurate information and tools on optimal N and irrigation management in lettuce cropping systems and environment hinder the achievement of resource-efficient lettuce production. The goal of this project is to develop science-based information and tools on N and water best management practices for lettuce in the low desert of California.

Project Objectives

- Quantify and fully understand lettuce production issues under current management practices in the region from different aspects of N and water applications, N uptake curve, N removal, crop water use, yield production and quality, N and water use efficiency, and a viability assessment of drip irrigation versus furrow irrigation.
- Fill knowledge gaps for N and water management in lettuce through conducting experimental trials at the UC Desert Research and Extension Center (DREC) and in 12 commercial fields in the Imperial and Coachella Valleys
- Develop strategies to reduce N losses and optimize N and irrigation water use in iceberg, romaine, and leaf lettuces.
- Provide data and demonstration trials to adapt the CropManage (CM) web-based tool (https://cropmanage.ucanr.edu) for water and N management of lettuce produced in the desert.

Project No: 22-1454

The Role of Irrigation Management for Improving Nitrogen Use Efficiency for Broccoli Grown with Nitrate-Contaminated Irrigation Water

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Abstract

To reduce nitrogen (N) pollution of ground and surface waters, growers in California's Central Coast region are subjected to increasingly stringent regulation. The most recent Central Coast Regional Water Quality Control Board's Agricultural Order 4.0 limits the amount of N that can be applied relative to the amount of N removed by harvest. Attempts by commercial broccoli growers to produce broccoli with nitrate contaminated irrigation water without supplemental fertilizer N have led to severe crop failure, even though the total N input from irrigation water exceeded expected crop N uptake. For N contained in irrigation water to be available to the crop, it is imperative that the irrigation water stays within the root zone. Therefore, any efforts to increase N use efficiency (NUE) will be affected by irrigation management. While growers are encouraged to base irrigation rates on projected evapotranspiration and crop coefficients guided by data from soil moisture sensors, adopting an irrigation practice that keeps water in the root zone can be challenging. Installing soil moisture sensors and the use of decision support tools to guide irrigation practices can be expensive or time consuming. In addition, irrigation water may be applied in excess of crop requirements to address salinity issues. Therefore, there is an urgent need to assess the impact of irrigation management on N dynamics and better quantify the fraction of N contained in irrigation water that is available to the crop.

Project Objectives

- Quantify the N credit from irrigation water in broccoli production under contrasting irrigation management and soil characteristics in on-farm trials
- Assess barriers to PAF through questionnaires and workshops
- Demonstrate and promote potential gains in N and water use efficiency associated with implementing PAF through outreach and education

Project No: 22-1455

Development of Precision Yield Monitor for Almond and Pistachio

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Abstract

This project addresses the funding area 'Management practices to optimize irrigation water use'. Boron toxicity limits the utility of a significant amount of the underutilized irrigation resources in CA, our understanding of the management of irrigation B is however inadequate. California continues to experience water shortages as a consequence of climate change and water competition. Many underutilized water resources and drainage waters are contaminated with B. Methods and practices that optimize the utility of these water sources water will have a lasting benefit to agriculture. The ability to remediate B, especially in drought years, could thus significantly enhance Ag productivity. Here we will determine the acute, chronic, and phenology-critical impact of B in irrigation water on Almond performance. This information will assist growers, water district managers and regulators with strategies for the management of B in irrigation and drainage waters by providing specific information on the B rate and B timing that results in negative crop impact. While this project is made possible by the availability of a new B removal technology, irrigation B reduction can also be achieved by blending irrigation sources or by selecting the time of year when the B compromised irrigation source is used. The project will establish the critical rates and times of B exposure that impact crops and inform management of B in irrigation waters.

Project Objectives

- Identifying the short-term critical stages at which almond is most susceptible to B and determine the long-term maximal tolerance to high B water.

- Determining the best practices for the use of higher price, low B water and establish the cost: return of investments in B mitigation strategies including water purchase and B removal onsite by filtration processes.