

Promoting the Adoption of Soil Nitrogen Quick Tests by Spanish-speaking Operators on Strawberry Ranches in Santa Cruz and Monterey Counties

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Abstract

Over-application of nitrogen fertilizer in strawberry production on the Central Coast of California reduces the profitability of the crop and results in nitrate leaching and negative effects on the environment. Studies have indicated substantial potential for nitrate leaching due to rains during winter months and during spring and summer due to over-irrigation. Local efforts have been made to educate growers on limiting fertilizer over-application, however, fertilizer application decisions are often made by Spanish-speaking operators and the management tools that have been developed target an English-speaking audience, resulting in limited adoption amongst this demographic. The project goal is to promote the adoption of management practices that optimize the use of nitrogen fertilization. Printed guidelines in Spanish and English will be produced, with ample visual representations and diagrams as well as brief explanatory text on how to collect and process a soil sample and how to perform a Nitrate Quick Test. Soil Nitrate Quick Tests have been shown to be an accessible, fast and reliable field method to assess the amount of nitrate available to the crop and to improve nitrogen management in strawberry and coastal vegetables. The main approach to encourage adoption is to provide one-on-one field assistance leveraging the long-standing relationships that the RCD of Santa Cruz County has developed with the Spanish-speaking agricultural community of the Pajaro Valley.

Project Objectives

1. Produce a printed guide for taking soil nitrate quick tests in Spanish
2. Provide in-field technical assistance to irrigators on how to perform and interpret soil nitrate test
3. Organize hands-on demonstration workshops and present at well-established grower outreach events to share grower experience and to encourage peer-to-peer learning
4. Project Evaluation

Project Cooperators: Richard Smith, Michael Cahn, University of California Cooperative Extension, Monterey County; Mark Bolda, University of California Cooperative Extension, Santa Cruz County; Whitney Haraguchi, United States Department of Agriculture, Natural Resources Conservation Service

Improving nitrate and salinity management strategies for almond grown under micro-irrigation

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Abstract

Almonds are considered salt-sensitive with a general osmotic threshold of 1.5 dS/m. This value however was developed without consideration of rootstock or cultivar and without considering advances in irrigation systems. There is limited information on the effect of salinity on N uptake and root plasticity on N uptake from root zones with non-uniform salinity levels in almond. To the best of our knowledge, this proposed research would be the first to comprehensively evaluate the effect of uniform and non-uniform salinity distribution in the root zone on N uptake and salinity responses of different almond rootstocks and soil type. We expect to improve our understanding of how irrigation/fertigation strategies can contribute to reducing nitrate leaching while maintaining the productivity under saline conditions. We will also contribute to the existing management tools by developing an integrated water and nutrient management tool in order to provide optimum irrigation/fertigation management for any given condition.

Project Objectives

1. To characterize patterns of root nitrate uptake and plant response when plants are grown with roots in soils heterogeneous salinity distribution (as typically occurs under micro-irrigation).
2. To use HYDRUS to model solute transport, plant response (water and nitrate uptake) to salinity, and specific ions (Cl and Na) under a variety of irrigation scenarios and different conditions such as soil type, environment, timing, distribution, irrigation system, and water quality.
3. To use the information in objectives 1 and 2 to develop site and cultivar specific models and guidelines for nitrate sensitive salinity management and to produce a series of written and online grower guidelines and tools for irrigation design and scheduling.
4. To produce a robust modeling platform for the advanced grower, consultant, advisor, irrigation industry representative and researcher to develop novel and site-specific irrigation design and scheduling practices for nitrate sensitive salinity management.

Project Cooperators: Daniela Reineke, Francisco Valenzuela, Department of Plant Sciences, University of California, Davis; Blake Sanden, University of California Cooperative Extension; Jiri Simunek, Department of Environmental Sciences, University of California, Riverside

Assessing Drip Irrigation and Nitrogen Management of Fresh Onions Produced in California Low Desert

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Abstract

One of the key components for economic success in the crop industry is addressing water and nutrient management. By incorporating current technologies into agricultural production, water and nutrients can be managed to maximize yields, reduce costs, and protect natural resources. Improving irrigation management in vegetable crop production reduces production costs, saves water, and reduces the risk of nutrient export. Agriculture is the largest global consumer of water (around 70 to 90 percent), but there is a lack of scientific data about agricultural water management including scheduling, as well as social, environmental, and economic impacts of irrigation in arid agro-ecosystems, such as Imperial County, CA. Studies show that most farmers do not use scientific methods for scheduling irrigation and nutrient management. Qualitative assessments are used for most farmers to decide when to irrigate and apply fertilizers. The use of technology based on plant needs along with soil moisture indicators can help create a healthy environment for crops. This project will provide critical baseline information of water and nitrogen use in onion production in arid regions using saline irrigation water. Onion growers and crop consultants in the California low desert region will increase their understanding of water conservation and nutrient management and its economic and environmental benefits. Growers and users of irrigation systems will be more aware of new technology (soil, water, and plant diagnostic tools) available for water and fertilizer management.

Project Objectives

1. Evaluate the response of onion to drip irrigation and regimes and compare onion production under different N fertilizer application rates.
2. Communicate findings directly to growers, as well as to crop advisors, academics, regulatory bodies, and agriculture industry.
3. Provide training opportunities to college students.

Efficient Water and Nitrogen Management Practices for Mixed Leafy Baby Green Vegetables in the Desert

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Abstract

Both California and Arizona have mandated Best Management Practices (BMP's) to varying degrees. These practices generally involve timing, amounts, and placement of N fertilizer and irrigation water application. Over the past decade the production of high density mixed leafy green vegetables on large beds (80 and 84-inch beds) has increased dramatically. These include various types of mixes for baby lettuce (often called spring mix), baby brassica, baby spinach, dandelions, and others. Work on the fertilizer requirements for these crops are lacking and many growers have simply utilized the fertilizer practices they currently use on full season iceberg, romaine, and leaf lettuce. While these crops are grown at a higher density than full season lettuce, they are harvested young and are shorter season (20 to 40 days) compared to the 80 to 180-day full season crops. We have no information how these factors affect fertilizer needs, no information on how irrigation interacts with N, and no information to modify N fertilizer recommendations for these crops. The objective of these studies is to evaluate various N and water management practices for mixed baby leaf conventional and organic production systems and calibrate "CropManage" as a management tool for desert production.

Project Objectives

1. Evaluate various N management practices for mixed baby leaf conventional and organic production systems.
2. Calibrate "CropManage" for desert production.
3. Monitor grower response and adoption.

Understanding Influences on Grower Decision Making and Adoption of Nitrogen Management Practices in the Southern San Joaquin Valley

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Abstract

Adoption of improved nitrogen management practices is paramount to meeting the requirement of reducing nitrogen loading to groundwater of California. However, there is inadequate information on linking adoption rates of best management practices with barriers to adoption. This project aims to quantify the current use of improved practices and characterize drivers of grower behavior in order to enhance future research, education and outreach programs, and tailor policy recommendations. This project also aims to expand our previous work (See FREP Project 16-0621-SA) conducted in the Sacramento and North San Joaquin Valleys to the Southern San Joaquin Valley (SSJV). The findings will help guide practice, policy, investment and incentives necessary to meet agricultural and environmental challenges in California. Progress toward meeting water quality mandates in California is fundamental to protecting of groundwater and sustaining agriculture in California. Thus, by understanding barriers to adoption of N management practices, this project will have substantial impact in California.

Project Objectives

1. To develop an understanding of links between adoption rates and barriers to adoption of N management practices in the coalitions of the SSJV Management Practices Evaluation Program (MPEP)
2. To distribute, collect and aggregate survey data from growers and pest control/certified crop advisors (PCA/CCAs)
3. To analyze data to determine key motivations and barriers to grower adoption and PCA/CCA recommendations of N management practices
4. To communicate these findings directly with the grower and PCA/CCA communities in which we work, as well as academic and regulatory body audiences
5. To outline key variables on linking adoption rates with barriers to adoption of N management practices within grower and PCA/CCA populations to tailor outreach, education and incentive programs

Co-Project Leaders and Cooperators: Mark Lubell, Department of Environmental Science and Policy, University of California, Davis; Sat Darshan S. Khalsa, Department of Plant Science, University of California, Davis; Doug Parker, University of California

Pima Cotton Nitrogen Management, Uptake, Removal – Impacts of Varieties, Subsurface Drip and Furrow Irrigation

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Abstract

Over the past three decades, California cotton production has shifted from nearly all acreage being planted to specialized Upland cotton varieties (the sub-group of high-quality Uplands called “Acala” cotton) to Pima cotton. For the past 10+ years, over 70% of California’s cotton acreage has been planted with Pima cotton varieties, with recent years reaching over 85% of total acreage in Pima. As a premium-quality cotton, Pima commands a significantly higher price than Acala or non-Acala Upland cotton, so Pima is likely the type of cotton most producers will plant in future years. However, it requires a 2-3 week longer growing season than most Acala varieties, and there are known differences in sensitivity to insect pests, impacts of plant water stress on fruiting, and plant responses to management practices such as use of plant growth regulators Kerby et al, 1994; Hutmacher et al, 2004). Silvertooth and Norton (2011), Unruh and Silvertooth (1996) in Arizona and some unpublished CA studies have demonstrated that petiole nitrate guideline recommendations for Pima differ greatly from those developed for Upland cotton. Due to the facts of these known differences in multiple plant characteristics between prevailing Upland versus Pima varieties, we believe separate studies are warranted. More Pima-specific information would assist in efforts to fine-tune nitrogen management practices, avoid negatives associated with inadequate or excess N applications, and provide improved N removal estimates to be used in nitrogen management plans for CA producers.

Project Objectives

1. Evaluate high-yield potential Pima cotton for impacts of N application amount, variety and irrigation method on total plant N uptake and harvest removal; and
2. Utilize 3 grower farm sites with moderate to high yield potential, using multiple Pima varieties and representing different soil types to determine total above-ground plant N uptake at early open-boll timing, and N removal with harvest (measured as N content of seed, lint, gin trash, measured separately) to better understand Pima N requirements.
3. As information is developed in the study, present information to appropriate grower groups, consultants and industry to give opportunities for feedback and to refine concepts of workable changes in N management approaches.

Project Cooperators: Lynn Sosnoskie, University of California Cooperative Extension, Merced/Madera Counties; Daniel Munk, University of California Cooperative Extension, Fresno County; Brian Marsh, University of California Cooperative Extension, Kern County