

Evaluation of the Multiple Benefits of Nitrogen Management Practices in Walnuts

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Abstract

Nitrate is a major contaminant in Central Valley groundwater and elevated levels are attributed primarily to leaching of nitrogen fertilizers past the root zone. Growers who belong to Central Valley Water Quality Coalitions (CV Coalitions) are under new requirements per the Irrigated Lands Regulatory Program to keep a Nitrogen Management Plan (NMP) “on farm” to track nitrogen fertilizer applications. A key component of the NMP is reporting nitrogen consumption during the growing season with the assumption that the remaining nitrogen is lost to groundwater. Determining crop consumption of nitrogen, is one of several requirements of the Management Practices Evaluation Program (MPEP) that five CV Coalitions are cooperatively implementing. The MPEP has specific objectives including identifying management practices that are protective of groundwater quality, determining whether newly implemented management practices are improving or may result in improving groundwater quality, developing an estimate of the effect of Member’s discharge of nitrate on groundwater quality and utilizing the results to determine whether practices need to be improved. There are data gaps in understanding the effectiveness of management practices on reducing the amount of nitrate transported through the root zone of walnuts. This project will document the amount of nitrogen applied and the movement and distribution of nitrate from the point of application through the root zone in 2 walnut orchards. This project will evaluate the movement of nitrogen through the root zone during rain and irrigation events over a two-year period.

Project Objectives

- 1) Identify the management practices being implemented to reduce the amount of nitrogen moving through the root zone for Orchard 1 and Orchard 2.
- 2) Determine the amount and timing of nitrogen moving through the root zone.
- 3) Identify the multiple benefits of nitrogen management practices implemented in Orchard 1 and Orchard 2 including potential cost savings (reduce water costs, reduce amount of money spent on fertilizer) and groundwater protection (reductions in the amount of nitrogen that is moving through the root zone).
- 4) Determine if additional practices could be implemented to further reduce the amount of nitrogen moving through the root zone.
- 5) Disseminate results to walnut growers.

Project Cooperators: Joseph McGahan, Westside San Joaquin River Watershed Coalition; Bruce Houdesheldt, Sacramento Valley Water Quality Coalition; Michael Wackman, San Joaquin County and Delta Water Quality Coalition

Evaluation and Demonstration of Nitrogen and Phosphorus Management in Organic Leafy Green Vegetables Production on the Central Coast

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Abstract

The focus of this project is to demonstrate fertilizer rates and more fully understand the role of mineralizable N from soils in crop production and potential loading of N and P in organic systems. To this end we will work with commercial organic growers in fields that have been under organic production for several years and demonstrate and evaluate the quantity of N made available by mineralization from soil organic matter. A survey will be conducted to understand if Coastal organic production systems have increased quantities of soil organic matter which may distinguish them from conventional production systems. Evaluation of rates of the commonly used dry and liquid organic fertilizers will be made on commercial soils and evaluation of the mineralization rate that occurs during the cropping cycle will be made. An analysis of the N and P balance of the organic production fields will be conducted (N & P inputs, nitrate mineralization and N & P removal) to have a better understanding of ways in which N and P use efficiency could be improved. The current algorithms for N mineralization that are used to predict available soil N in CropManage will be refined and updated based on these studies. These refinements will open the use of CropManage to organic production but will also improve predictions for conventionally managed soils. Outreach will be made to the organic growers through the demonstration plots and UC grower meetings, newsletters and blogs.

Project Objectives

1. Demonstrate and evaluate the proportion of crop N needs that are provided by soil organic matter mineralization in organic leafy vegetable production under coastal climate conditions
2. Demonstrate and evaluate mineralization behavior of a group of commonly used dry and liquid organic fertilizers under field conditions on the Central Coast
3. Demonstrate and evaluate the N and P balance of organic production fields (N and P inputs, mineralization and removal)
4. Refine and update algorithms of nitrate mineralization from soil organic matter in CropManage
5. Conduct outreach to growers via demonstration plots and UC nutrient management meetings, newsletters articles, blogs and scientific reports.

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