Mitigation of Reactive *N* Mobilization (N_2O and NO_3^-) Using Injected, High Frequency Low Nitrogen Fertigation (HFLN) and Nitrification Inhibitors in Almond

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PROJECT SUMMARY

Objectives:

- Compare soil nitrous oxide (N_2O) emissions in almonds using two forms of nitrogen (N) fertilizer application: advanced grower practice and injected high frequency low nitrogen.
- Evaluate nitrification inhibitors for limiting N_2O forming N transformations.
- Identify microbial factors that control soil N_2O emissions; namely, nitrification and denitrification.
- Develop 3-D models over short term time scales for linking soil N_2O emissions to the Hydrus model.
- Use isotopic tracers to help estimate orchard fluxes of nitrogen (NH_4^+, NO_3^-, HN_3, and N_2O).
- Assist with parameterization of the DeNitrification DeComposition (DNDC) and Hydrus models for use in a decision support framework.

Background:

Offsite transport of reactive N from agriculture is facing increased regulatory scrutiny. Thus, one critical challenge facing California almond growers can be summed up in a two-word question: "Whither nitrogen?"

In a perfect world, the answer would be that N is fully taken up from soils by the tree, where it contributes to both growth and nut production.

In the real world, almond orchards are somewhat leaky. Some of the N is released in various gaseous forms to the atmosphere and some leached beyond the root zone—into subsurface waters.

"Whither nitrogen?" and how much N represents one of a range of interlocking questions being examined collaboratively by several research teams trying to unlock the complexities of what happens when water, nitrogen, and microbes interact in the orchard under varying conditions.

Their collective ultimate goal is to improve nutrient-use efficiency (NUE) in almond production, and thereby both maximize yield economically and minimize the offsite loss of reactive forms of nitrogen — especially N_2O, a known greenhouse gas (GHG), as well as nitrate (NO_3^-) contamination of groundwater.

Discussion:

This ongoing project, being coordinated with several other researchers, is focused on a comparative study of soil N_2O emissions and NO_3^- leaching using two methods of applying N fertilizer: comparing advanced grower practice (N targeted to tree demand) versus applying small concentrations of N with each irrigation. Nitrogen use efficiency (NUE) by the tree is also monitored. It is also documenting the absorption of another potent GHG, methane.

The results are expected to provide practical management tools for growers to improve NUE for both almonds and pistachio. Another important aspect of the project is to provide reliable information for regulators rather than unreliable assumptions.

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For More Details, Visit

- Poster location 28, Exhibit Hall A & B during conference; or on the web (after January 2013) at www.almondboard.com/researchreports
- 2011.2012 Annual Report CD (11.AIR2.Smart); or on the web (after January 2013) at www.almondboard.com/researchreports
- Related Reports: 12.PREC2.Brown, 12.PREC5.Brown, 12.PREC4.Hopmans, 12.HORT11A.Sanden/Shackel