CRAE
CALIFORNIA ROUNDTABLE ON
AGRICULTURE AND THE ENVIRONMENT

Policy Considerations for Managing Agricultural Nitrogen to Reduce Groundwater Contamination in California

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The California Roundtable on Agriculture and the Environment (CRAE) is an alliance of agricultural, environmental, regulatory, and social justice leaders seeking to promote an agriculture and food sector that is economically viable, environmentally sound and socially responsible.

These policy considerations are endorsed by the following members and affiliates of the California Roundtable on Agriculture and the Environment (CRAE):

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American Farmland Trust
California Association of Resource Conservation Districts
California Association of Winegrape Growers
California Climate and Agriculture Network
California Farm Bureau Federation
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California Rice Commission
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Introduction

Recent research, including "The California Nitrogen Assessment"[1] and the UC Davis Report for the SWRCB SBX2 1 Report to the Legislature[2], has produced an important collection of data about how nitrogen compounds move in the environment. Members of the California Roundtable on Agriculture and the Environment (CRAE) share an interest in meaningfully addressing water quality challenges while maintaining a healthy and prosperous agriculture sector. Because of the serious health concerns associated with nitrate in groundwater, CRAE members agree that **the immediate goal should be to find cost-effective solutions to cleaning up drinking water supplies or providing safe alternate sources of drinking water to affected communities.** We support ongoing efforts, such as the governor's Drinking Water Task Force, to address this important issue. While CRAE's ultimate interest is in addressing the full range of water quality challenges related to agriculture—from drinking water to legacy issues, groundwater to surface water, and nitrate to Total Maximum Daily Loads (TMDLs)—and supporting improved nutrient management broadly speaking, the group has chosen to focus specifically on the longer-term challenge of reducing nitrate loading in groundwater from agricultural sources.

Recognizing that a range of research and policy processes to address the harmful impacts of excess reactive nitrogen-based compounds in the environment are ongoing, CRAE stakeholders agreed that a focus on preventing further contamination of groundwater from nitrate is an area where CRAE has a unique opportunity to contribute. Furthermore, we anticipate that approaches to reduce nitrate loading that adhere to the considerations below will simultaneously improve other challenges, including air quality, energy use, and climate change.

Nitrate contamination is projected to increase in the coming years as legacy contributions work their way through the soil profile. The short-term remediation of groundwater basins is so costly as to be practically impossible. Therefore, CRAE has concentrated on intermediate and longer-term groundwater quality issues by helping to find practical solutions to groundwater quality challenges. Reflecting our membership composition, our focus is on the contribution of agricultural sources of nitrate in particular.

CRAE has compiled the following set of key facts on our state of knowledge about nitrogen management and a set of considerations to inform related policy and programs focused on improving water quality.

1 http://nitrogen.ucdavis.edu/
2 http://groundwaternitrate.ucdavis.edu/

On-Farm Nitrogen Management: Our State of Knowledge

1. **Nitrogen is an essential input for food production.** Nitrogen and nitrate, a by-product of nitrogen use, are naturally occurring substances in the environment and are biologically important for plant growth. The addition of nitrogen-based fertilizing materials is typically necessary for both production agriculture (to maximize yields) and plant nutrition (to improve human health). Nitrogen compounds are an expensive input, and growers typically seek to use them efficiently while minimizing the risk of decreased yields.

2. **Nitrate can harm human health and the environment.** Excessive amounts of nitrate can compromise groundwater quality, causing levels in drinking water to exceed established public health standards; have a negative impact on crop yields and quality; and result in undesirable environmental impacts in surface waters, such as algal blooms, low dissolved oxygen, and fish mortality.

3. **Concerted efforts can minimize contamination of air and water.** Nitrate taken up by crops does not affect the environment; however, the nitrate that is applied and not taken up is problematic. In other words, more efficient nitrogen use can reduce nitrogen loading. Therefore, it is important to minimize the presence of reactive nitrogen that is not being taken up by plants and that could leach into the environment.

4. **Management practices that improve nitrogen management are available.** A broad set of known beneficial practices is available to minimize the impact of nitrate contamination. Some are site-specific and others will have more general application. Technical assistance, which is important in aiding decisions about the most relevant and effective practices, is available from sources such as UC Cooperative Extension, local Resource Conservation Districts, the Natural Resources Conservation Service, Certified Crop Advisers, County Agricultural Commissioners, and the California Department of Food and Agriculture Fertilizer Research and Education Program (FREP).

5. **While a set of beneficial practices is available, several factors limit their applicability.** Beneficial management practices are not one-size-fits-all; their use must be tailored to site-specific conditions. Geological, hydrological, and ecological characteristics of the landscape can affect the flow of nitrogen into water, and plant uptake rates vary substantially among plants and from place to place. Therefore, the effectiveness of many beneficial management practices differs from place to place. Sound groundwater nitrate management approaches are most likely to result from a combination of application efficiency practices and efforts to minimize leaching.

6. **Minimizing nitrate may affect other resource management goals in the farm system.** Certain practices that limit nitrate contamination may have unintended consequences for other resource management goals. Any new management practice, whether for nitrate or other inputs, must be implemented with a good understanding of site-specific conditions and potential tradeoffs with other resource management challenges, such as salinity, high water tables, and invasive species.

7. **Some nitrogen loss to air or water is inevitable.** There are practical and economic limits to how efficient nitrogen applications can be. Unpredictable factors such as soil biology and chemistry, weather, and other variations at the field scale affect nitrogen uptake by plants and movement in the soil.

8. **Innovations in technologies are not keeping up with need.** We lack economical technologies to measure plant-available nitrogen and its movement in the soil at the field scale. While we do have a good general understanding of how nitrogen moves, especially at large regional scales, we are unable to predict exactly how and when nitrogen will travel from a field to groundwater and surface waterways, and our understanding of how vegetated areas and other post-application management practices mitigate nitrate leaching is limited.

Photo courtesy of Karen Preuss.

Considerations for Effective Public Policy on Long-Term Groundwater Contamination from Agriculture

1. **Policy solutions will need to distinguish between immediate needs for safe, affordable drinking water for rural communities and the need to reduce nitrate in groundwater.** The immediate focus of policy should be to ensure that rural communities have safe and affordable drinking water. Policy to address long-term nitrate contamination of groundwater must be approached distinctly.

2. **Full solutions will be long-term.** Nitrate contamination of groundwater has taken decades to develop. The results of applied solutions are likely to be long-term. Approaches will be varied and complex; there are no universal, cost-effective solutions. However, implementation of known solutions now will enable us to determine if and where early improvements in water quality may occur.

3. **Regulation must be careful to minimize risk for both food producers and rural communities.** Agriculture is rife with uncertainty due to weather, pests, market conditions, varying water supplies, and other factors. A well-designed collaborative process based on science and agronomic information can help develop and implement sound nitrogen policy and standards that encourage farmers to manage the application of fertilizing materials for long-term efficiency and reduce contamination while not adding immediate uncertainty or risk to California agriculture and rural communities.

4. **Nitrogen management should be considered hand-in-hand with other resource management challenges.** Farm nitrogen management will be most effective both in terms of outcomes and in terms of cost-effectiveness when it reflects a careful balancing of the environmental impacts and services that agriculture provides. Focusing solutions only on a specific input such as nitrogen will reinforce the current siloed approach to agricultural environmental regulations that do not evaluate the relative risks and benefits of all agricultural activities. Nitrogen management must be addressed hand-in-hand with other local resource management challenges, such as water quality, salinity, and water supply management. A broader framework is needed to address the environmental impacts of agriculture.

5. **There *are* some easy answers.** We can make immediate progress in improving nitrogen management by optimizing and expanding existing programs like FREP to focus on this issue.

6. **Growers and ranchers need support.** Adoption of beneficial management practices has been limited by lack of outreach to growers, cost, and concern about the risk of decreased yields, among other factors. Adequate funding for, coordination among, and focus from technical support agencies is critical to rapidly disseminating the menu of beneficial practices available for nitrogen management and to identifying, testing, and implementing new practices. Because of variation in nitrogen behavior from crop to crop and field to field, increasing growers' access to the broadest range of practices to increase efficiency of nitrogen use is essential.

7. **All groundwater basins are not created equal.** Regulatory efforts may consider tailored approaches to account for different types of groundwater basins, in particular those we know to be unsuitable for drinking water as a result of natural harmful constituents in the water.

8. **One-size-fits-all won't work.** Good policy reflects the understanding that farming is inherently an interaction with the environment and will have varying impacts and benefits from place to place. Sound regulatory and policy approaches will acknowledge the need for site-to-site variations in nitrogen management practices and avoid one-size-fits-all approaches. In addition, attempts to mandate changes in current best practices would be premature.

9. **Meaningful public engagement will improve outcomes.** Better outcomes will arise as the result of robust and professionally managed public input processes that do the following:

    - engage and listen to growers and affected communities at the local level;
    - invite all stakeholders to understand the full complexity of the problem;
    - recognize the farm as a managed natural system;
    - encourage shared problem solving with a time horizon that matches the issue; and
    - strategically deploy resources through coordinated efforts to maximize benefits.

10. **There is power in collaboration.** This is a classic "wicked problem" where the environmental complexity, time lags, and unintended consequences of both farming operations and regulatory actions make simple solutions unlikely. In such cases, it is helpful for leadership from both the regulated and regulatory communities to step outside of their traditionally polarized views and search for solutions that are creative and novel.

Policy responses developed with these considerations in mind will have a greater likelihood of successfully addressing nitrate contamination of groundwater over the long term while protecting and enhancing a range of other ecological and economic values. The members of CRAE look forward to engaging the broader policy community in a concerted effort to advance long-term solutions to nitrate contamination of groundwater.

For more information: http://aginnovations.org/roundtables/crae/

The California Roundtable on Agriculture and the Environment (CRAE) is a project of Ag Innovations Network, a nonprofit organization dedicated to helping stakeholders solve systemic issues through effective collaboration.