

## CHAPTER ONE

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# Introducing the California Nitrogen Assessment

## Appendix 1.3 List of questions and issues raised by stakeholders

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[asi.ucdavis.edu/nitrogen](http://asi.ucdavis.edu/nitrogen).

## 1.3 List of questions and issues raised by stakeholders

Questions are grouped by topic, and have not been edited.

### Science and research questions

#### Nitrogen & climate intersects

What is the climate change impact of agricultural N application?

What does existing science say about how fertilization and irrigation interact to produce nitrous oxide?

What are the mechanisms by which N application leads to GHG emissions?

What does the science tell and not tell us about the interactions of fertilizer and water in producing nitrous oxide?

What about N trading? N credits?

In uncertain climate conditions (change), what impact would this have on N needs for different crops/regions/etc.?

Can composting processes lead to greenhouse gas emissions? What measures to prevent N emissions?

#### Organic practices

How does organic management impact how N moves through agroecosystems?

Does using compost as primary fertilizer input lead to reduced N leakages?

How do organic/sustainable systems manage nitrogen differently? With what differences in quality and quantity?

What rules to follow: organic N, commercial N, livestock N

Organic N use: research, utilization, mineralization rate

Compost as benefit to crop

What are the food safety implications with use of compost?

What potential roles can compost play in: (1) Reducing need for synthetic N, (2) Reducing N offgassing during application, (3) reducing N runoff during/after fertilization, (4) stabilizing manure?

#### Flows

How does nitrogen flow through California? Can this be graphically represented?

What parts of Calif. have too much N and what form does this N take?

Can N flows and losses be quantified?

What are the major sources of N in California? Can the N from these sources be tracked/tagged?

From a systems perspective, what parts of N fate can be controlled?

Are there ways to “tag” nitrate/nitrogen so one can identify what source it is coming from?

What are the implications for nitrogen flows based on the future scenarios of climate change and water availability?

Where in the state are the major impacts of too much N? Groundwater, coastal blooms, etc? Is there a map?

Quantification of nitrogen flows and losses: emissions from N application, groundwater migration, consumption, other.

Need total systems perspective of N fate – what can be controlled or not

NO<sub>3</sub> sources determination

What are the geographic areas with the greatest concentrations of N in the environment?

What is the role of rangelands in N cycling?

Who are the generators (sources) of N?

How will we identify if nitrogen overuse occurs?

## Nitrogen and water

Can water use/conservation practices reduce N leakages?

How can a farmer minimize movement of NO<sub>3</sub> to surface or groundwater?

What quantity of N in groundwater is “legacy” and how can nitrates in groundwater be mitigated?

What is the timing between N application and impact on groundwater?

Legacy N: cause and effect, time between use and impact.

Impact and response to legacy N pollution, mitigation strategies

What are the synergies between conservation of N and conservation of water?

What specific steps should a farmer take to minimize movement of NO<sub>3</sub> to surface water or ground water? Is appropriate guidance available for each of these steps?

## Non-agricultural

What are the non-agricultural sources of nitrogen such as vehicles and other combustion and what are their relative impacts?

What are non-ag sources of nitrogen and what is their contribution to nitrogen flows in California?

What is the N impact of motor vehicles?

How does reactive N generated by vehicles and other combustion fit into the total assessment?

What is the contribution to N pollution of Ag compared to other sources?

## Other

Are all nitrogen sources evaluated the same?

Feasibility of achieving endpoints: source-specific, long vs. short term, varied level of investment

What is the effect of N pollution on wildlife/threatened and endangered species?

What is realistic in improving efficiency, environmental performance? What’s doable?

Cost of N management: by source, by method, globally to achieve and points

Efficiency vs. capture and reuse

Crop quality: N impact on

What is the role of N in anaerobic systems?

What are the relative contributors to N loading of Livestock operations compared to crops operations?  
Crop to crop?

## Recommendations

Is it desirable for assessment to use DWR Bulletin 160-2009 scenarios?

Don’t reinvent the wheel on N use

Need to recognize existing research and extension work

Need to consult with UC Davis researchers who study N

Will the assessment include a white paper on the environmental impact of nitrogen pollution?

## **Practices and management questions**

### **Current knowledge**

What are current N application recommendations based on?

What are the most effective ways for dealing with excess nitrogen?

What are current practices that hold promise for N control?

What is the best way to measure N efficiency?

What is the best way to measure N needs?

Do N recommendations change when shifting from maximizing yield to minimizing N -use?

What are the most effective solutions demonstrated to date for dealing with excess nitrogen?

What farming and ranching practices hold promise for nitrogen control?

Are UC Davis N recommendations based on current production conditions?

What is the current state of practice in terms of BMPs with nitrogen/nutrient management? Percent of users quantified (qualified???) in California? How could policy further data collection?

Do the potential "savings" from limiting N applications outweigh the risk of reduced yields?

### **Plant health**

How does amount, form, and application timing of N impact crop yields quality, disease and pest resistance? How does it interact with plant varieties?

Do we know enough about how: (1) amount of N, (2) form of N applied, (3) how it is applied, and (4) When it is applied; affects crop yields and crop quality (e.g., keeping quality, flavor components, negative chemical profiles)

Disease and pest vulnerability with improper N application

What role does variety selection and plant improvement play in efficiently using N (either by reducing N needed or by uptaking excess N) ?

Risk management in N use – insurance

What other issues could arise from inadequate or excessive N availability? Ex. Excessive could increase foliar development - increased habitat for pests?

### **Efficiency/best management practices**

What are the most efficient ways to apply N depending on plant variety and crop type?

Can managing water differently lead to N efficiencies?

What are BMPs for reducing air and water emissions from N?

How can producers of excess N link with producers who need N?

Which crop sectors/systems are the most inefficient in terms of N fertilizer application?

Can they be made more efficient? Can you provide estimates regarding how much overfertilization?

Most efficient N use application: how do you manage field and plant variability?

Is more outreach and demo needed to convince ag industry that the benefits of fertigation outweigh the increased cost of liquid forms of N?

Process-based N model needs to be turned into a management tool

Nitrogen and water management

What are BMPs that both address reduced and direct N<sub>2</sub>O emissions and indirect N<sub>2</sub>O

Emissions via water? E.g., reduce leaching through LAND management practices

What is optimum N application for crop health and to minimize leaching to groundwater? 0.9 - 1.4 x crop uptake?!

How can producers of excess N (dairies for example) link w/ producers that could use N as a soil amendment?

Can we find ways to reduce overall use of synthetic fertilizers?

What are the ag practices most suited to conserving N? Least suited?

## Other

What gaps exist in research related to impacts on yield with respect to excess or insufficient N application?

How will current practices be assessed?

What is source of info – who does farmer trust?

Cover crops – work both ways – pull N out and put into soil

What is the role of other technological work to address N impacts?

Are there solutions to the problems raised (made apparent) by looking at N?

What is the best way to measure N efficiency rate or use to forecast needs?

How to measure changes in cultural practices and past/current nitrogen demands?

Do University recommendations reflect the N demands of current crop production?

## Policy and economics questions

### Economic incentives

Could markets be created that allow farmers to make money for reducing N impact?

N impact on global warming: opportunity to \$

How are we going to create fiscal and other incentives for the adoption of reactive nitrogen control?

What kinds of incentives, if any are needed, would speed adoption of better N management?

Is Ag getting the credit for current use of N?

What about N trading? N credits?

### Regulatory mechanisms

How can regulations be streamlined so they do not offer competing policies and so that reactive N is not simply displaced into other forms?

What are the most effective policy instruments to motivate farmers to implement BMPs for nitrogen management?

How to integrate competing regs!

How are different regulatory bodies coordinating or not to address nitrogen issues?

How might policy be used more effectively to both monitor and address non-point source N pollution from the ag sector?

Are there policy options for reducing auto-based N emissions?  
How will the work of this project tie into the implementation of AB 32 and SB 375?  
How much are policy makers/regulators coordinated on developing a cohesive N policy that will be workable for N users?  
What are the most effective policy instruments to motivate adoption of BMPs for nitrogen mgmt?  
What are the cities' roles in solving the problem of N?  
Endpoints for nitrogen management – air, water, economic impacts

### Cost analysis

What are the costs and benefits of Nitrogen Use Efficiency Practices?  
What is the cost of the health impacts of excess N in environment?  
What are the costs of N management (by source and by method)?  
Are there cost-effective treatment options for groundwater nitrate contamination?  
What is the feasibility of wellhead protection and regional treatment facilities for communities impacted by high-nitrate levels in drinking water?  
Do solutions to N problems make economic sense?  
What are cost/benefits of NUE practices? Best way to implement these?  
How might N management tools and documentation be structured so they're appropriate for a variety of production models/systems and farm sizes?  
Cost of N management: by source, by method, globally to achieve and points  
How can health impacts be integrated into evaluation of nitrate mitigation alternatives?  
Cost of N management: by source, by method, globally to achieve and points

### Other

Can NUE practices be scaled across a wide range of production models/systems and farm sizes?  
What would happen if we could no longer rely on fossil fuels as N source?  
Solutions need support/technical assistance  
Role of the "social" institutions?  
Social justice implications – emissions, jobs, etc.

### Human Health

What is the state of understanding on the link between nitrates and blue baby syndrome, kidney, spleen and bladder cancers, Alzheimer's, diabetes and Parkinson's.  
What are the food safety implications of elevated levels of N in crops?  
What are safe levels of N in crops (tissue) for humans?  
Can some crops "super-accumulate" N to reach levels that are injurious to consumers?

### Communications and outreach

How do we communicate complexity of N system and problems to public  
What is the understanding among producers & policymakers of N impacts? And what's the gap between myth and reality?  
Are there maps showing impacts of N?

## CALIFORNIA NITROGEN ASSESSMENT

Who are the stakeholders?

Are there ongoing outreach efforts to positively incentivize farmers to document their N use?

Can tools be developed for farmers to assess N-use efficiency?

What outreach is being done to farmers regarding N and greenhouse gas issues?