Summary Representative Monitoring Report

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On behalf of
Central Valley Dairy Representative Monitoring Program
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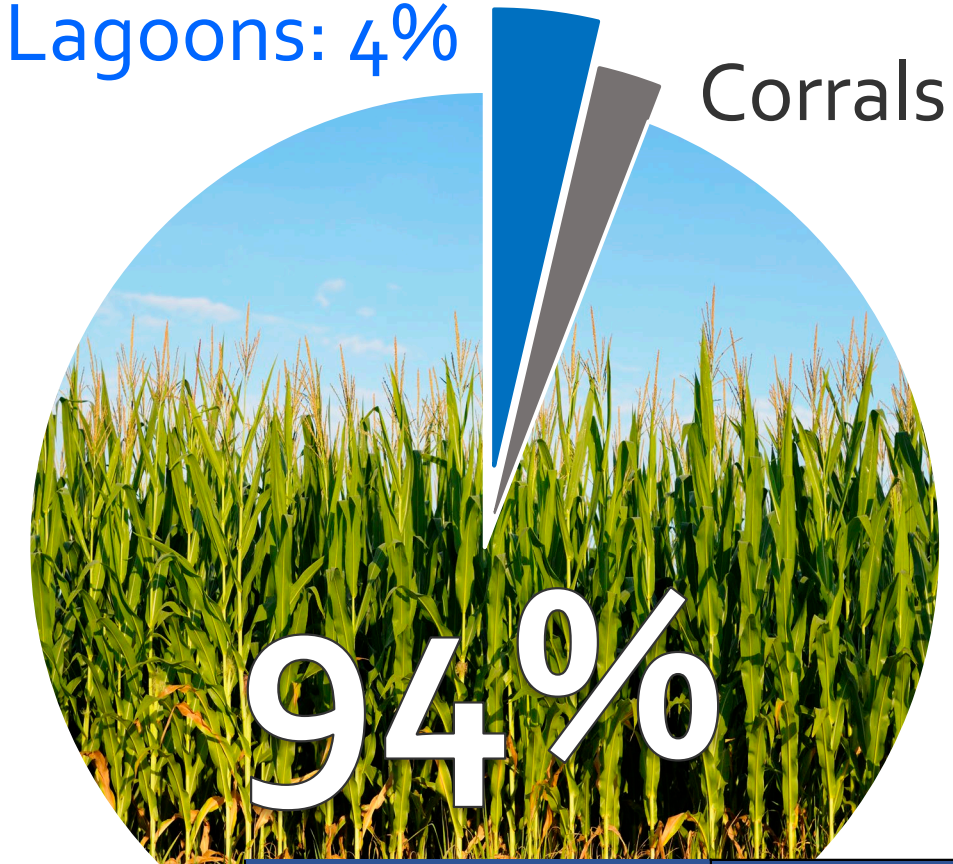
SRMR Findings

- *Nitrate water quality objectives exceeded under all monitored dairies*
- *Practices to improve (reduce nitrate leaching) must be implemented at all dairies represented by CVDRMP (not based on monitoring well levels)*
  - *This does not mean exactly the same measures performed to exactly the same degree; the extent a practice needs to be implemented, such as manure N export target, will vary depending on site-specific conditions*
- *Nitrogen impacts from dairies are heavily weighted to cropped areas (see next slide)*
- *As recognized by CV-SALTS technical studies, it is not feasible to meet nitrate WQOs within the region within 10 years*
- *Revision of the Basin Plan (complete) and General Order is needed to recognize and address this*

Recommendations

- **CENTRAL, GUIDING GOAL:** Provide drinking water where needed, while working to improve groundwater quality.
- **HOW:**
  1. Address drinking water issues (immediate)
  2. Measures to improve nutrient application precision (immediate)
  3. Develop products, markets and export capacity (address supply/demand) for excess manure N



Management Unit	Acreage (ac)
Corrals	30,254
Lagoons	5,877 (1.3% ac)
Manured Fields	429,424

Acreages from: Harter, Dzurella, Kourakos, Bell, King, Hollander. 2017. Nitrogen Fertilizer Loading to Groundwater in the Central Valley. FREP report. October 2017.

Recommendations/status

- **Address drinking water needs at local level**
  - CVDRMP to require all members to participate in Nitrate Management Zones or Alternative Compliance Projects (ACPs) ***DONE***
    - Fund nitrate-related drinking water needs/projects at local level ***DONE IN PRIORITY ONE AREAS (about 2/3 of CV dairies), PENDING IN P2***
    - Consistent with State Board policy (adopted Nitrate Control Plan, 2019)
    - Ongoing through Early Action Plans
    - Long-term solutions also required, CVDRMP participation in MZs will continue
- **Also address salinity**
  - Develop salinity mitigation measures by funding P&O study and SAMP (SAMP addresses salt and more)
    - Funding commitment already in place ***TWO YEARS OF FUNDING ALREADY PROVIDED TO CENTRAL VALLEY SALINITY COALITION TO FUND STUDY***

Recommendations/status

- **Control and reduce discharges**
  - Focus regulatory and reporting actions on achieving a whole-farm nitrogen balance
    - Revise reporting system; heavier focus on accurately calculating nitrogen generated, **stored in liquid** and solid forms, and identifying crop demands for liquid, solid and non-manure nitrogen
    - Web-based, standardized
    - Set manure N export targets
    - Focus efforts on achieving these targets at whole-farm level, not field-by-field
  - Increase nitrogen use efficiency through:
    - Achieving whole-farm balance
    - Education ***California Dairy Quality Assurance Program*** ***(some has begun, formal program pending to be linked to regulatory requirement recommendation)***
    - Better tools for precision measurements (require flowmeters, revise sampling and testing methods)

Recommendations/status

- **Control and reduce discharges (continued)**
  - Build export capacity
    - Establish a home/demand for exported manure N and market specifications (may include transformation technologies that denitrify safely)
    - Dairy industry takes responsibility, with efforts supported by government, NGOs, academia, private industry, other farmers ***CDFA Manure Recycling and Innovative Products (MRIP) Task Force***
  - Address earthen lagoons that intersect groundwater
    - We provide suggested technical solutions and considerations for establishing a timeline ***Significant regulatory/enforcement action has already been taken involving 70+ dairies and more is coming – industry has supported this process by convening experts to address technical solutions***
    - Support Regional Board with education and outreach as directives are issued and technical specifications identified
  - Additional measures to enhance lagoon performance
    - Double-liners on digester installations
    - Revised liner standards to make retrofits easier

Recommendations/status

- **Control and reduce discharges (continued)**
  - Change CVDRMP coalition duties ***IN PROGRESS***
    - Formerly monitoring and recommendations only
    - Require members to implement changes in Basin Plans ***DONE***
    - Support (including financial support) formation of Nitrate Management Zones ***P1 done, P2 in progress***
    - Future (as General Order revised): Add responsibility to track industry progress, drive BPA implementation
  - Revise dairy general order/MRP to facilitate the above recommendations

Implementation targets and milestones

Requirement	Timeline
Contribute to safe drinking water supply	**Ongoing** (via funding of and participation in Nitrate Management Zones)
Contribute to salt management	**Ongoing --** contribute share of P&O study and SAMP
New reporting template, web portal and database	Budgeted by CVDRMP, awaiting approval/direction to design and implement; old annual reporting system remains in use meanwhile
Flow meters (for liquid manure)	Recommend these are installed and operating 24 months after G.O. adoption
Education in I/NUE	Formal program to be developed and offered by CDQAP with industry funding; interim education steps already being implemented
INMP	Recommend implementation 18 months following adoption of order, couple with education
Modified sampling and testing SM, LM, harvest tissue	**Begin winter crop 2022-2023** (assumes adoption of General Order early 2022)
New/reconstructed lagoons, added liner standards	**Immediate** on G.O. adoption

Costs

- **Analyzing nitrogen control actions for effectiveness**
- Understanding costs is a part of determining what constitutes best practicable treatment or control (BPTC) to comply with Resolution 68-16 (state Antidegradation Policy)
  - Considering costs is also a requirement when adopting changes to WDRs*
    - We used 10-year annualized cost estimates to compare 'apples and oranges' (e.g. capital-intensive projects versus labor-intensive projects)
    - We considered potential savings on fertilizer or potential revenue streams
    - We analyzed treatment effectiveness for avoiding nitrogen leaching
    - We combined the approaches to determine cost-effectiveness of specific nitrogen loading avoidance strategies on a cost-per-ton-avoided basis
    - Costs are preliminary and come **with significant caveats** (markets, bedding replacement, transportation and regulatory barriers, site-specific differences compared to scenario assumptions)

*Water Code Section 13263(a) and 13241(d)

Costs (from 2019 analysis, may require updating)

- **Huge variance found in cost effectiveness**

Treatment	Cost per ton N avoided
Exporting corral solids or windrow-dried manure	No net cost
Partial diversion of liquid (flushed) manure via vacuuming and windrow drying	No net cost
Extend pipelines to allow liquid manure application on all dairy acreage	No net cost
Haul liquid manure to fields on- or off-site	$3,092 to $12,645
Line earthen lagoons with single synthetic liner	$324,617
Double-line lagoons with leachate collection (Tier 1 standard)	$476,407
Replace earthen floor corrals with concrete floors	$6.8 million

Capital costs, return on investment scenarios

- 2000-cow dairy, 10-year costs
- Scenario #1 – retrofit earthen lagoon with synthetic (single) liner
  - Cost $936,000
  - Environmental ROI - nitrogen losses avoided (assumes 8-acre lagoon) = 4.2 tons/year
  - Economic ROI - none
- Scenario #2 – divert 29% of liquid manure flushed to SM and export
  - Capital cost $467,000
    - ($667,000 when pro-rated to 10-year)
  - Environmental ROI - nitrogen losses avoided = 67 tons/year
  - Economic ROI – Potential to capture all capital costs (and labor costs)

Conclusion

- Prioritized strategy consistent with Salt and Nitrate Control Plans adopted by SWRCB; supports specific actions to implement those plans (Management Zones, salinity studies, Surveillance and Monitoring Program)
- Prioritizes early action on drinking water, improved nutrient management and education
- Addresses priority lagoon-related issues
- Creates improved reporting and tracking methods, including on-farm monitoring, to document industry progress (individual dairies and as a whole), provide transparency and inform decision-making
- Prioritizes effective actions and identifies most promising areas for additional action
- Creates stronger coalition process to facilitate, develop and implement continued improvements over time, such as developing and building infrastructure, markets and incentives for exporting manure economically

Questions/discussion