

# **Dairy Manure and Environmental Quality in the San Joaquin Valley**

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Dairy Manure Collaborative**

# Overview

- **SJV has significant pollution**
- **Dairies contribute to this problem**
- **Need for comprehensive manure treatment that is environmentally and economically sound**
- **Energy production from manure can supply money and power to run additional treatment processes**

# **Pollution in the SJV**

- SJV has some of the worst air quality in the nation. Does not meet NAAQS for ozone and particulate matter.**
- Surface water, ground water and soils in many areas are polluted with nitrate and salts**



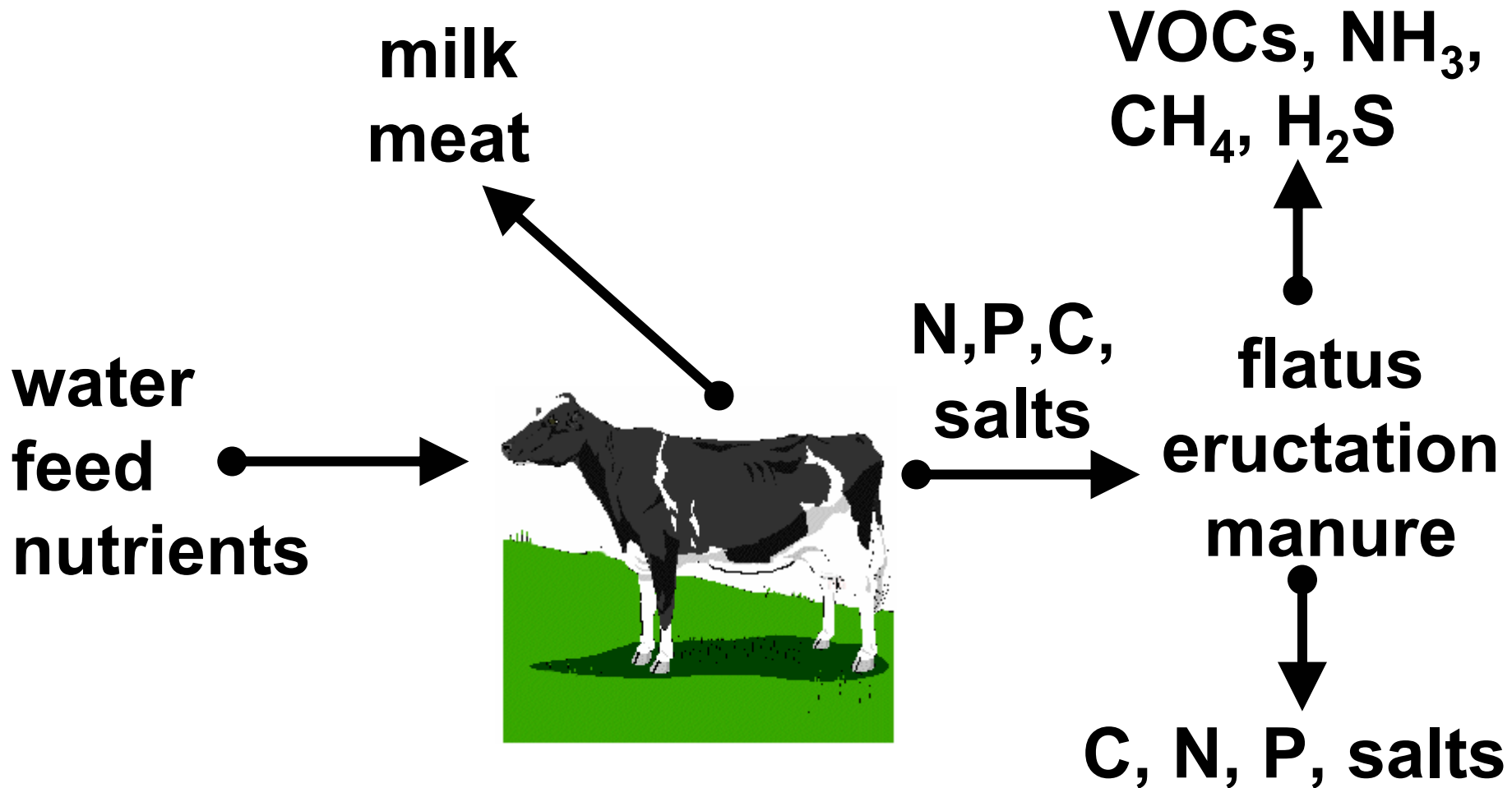
# Dairies in California

- **California leads the nation in agriculture and in dairy**
- **Dairy is California's #1 ag product (>\$4B/yr)**
- **>3/4 of CA's 1.7 million dairy cows are in the SJV**

# **Dairies Contribute to Pollution**

- **VOCs (precursors to O<sub>3</sub> & PM)**
- **ammonia (precursor to PM)**
- **methane (global warming gas)**
- **N (groundwater pollutant)**
- **salts**

# Nutrients Flow Through & Concentrate at Dairies



# **Large Amount of Cow Manure in SJV**

**1.3 million cows in SJV**

**X 120 lbs of manure / cow / day**

**160 M lbs of manure / day**

**= 60 B lbs / year**



# **Structural Change: Concentration & Intensification**

**Over past 30 years**

- Number of cows doubled**
- Number of dairies dropped by half**
- ❖ Result is more animals and more manure in a smaller area.**







1/19/2000





dairy cattle in freestalls and corrals



flushing lanes



haylage and silage

forage crop

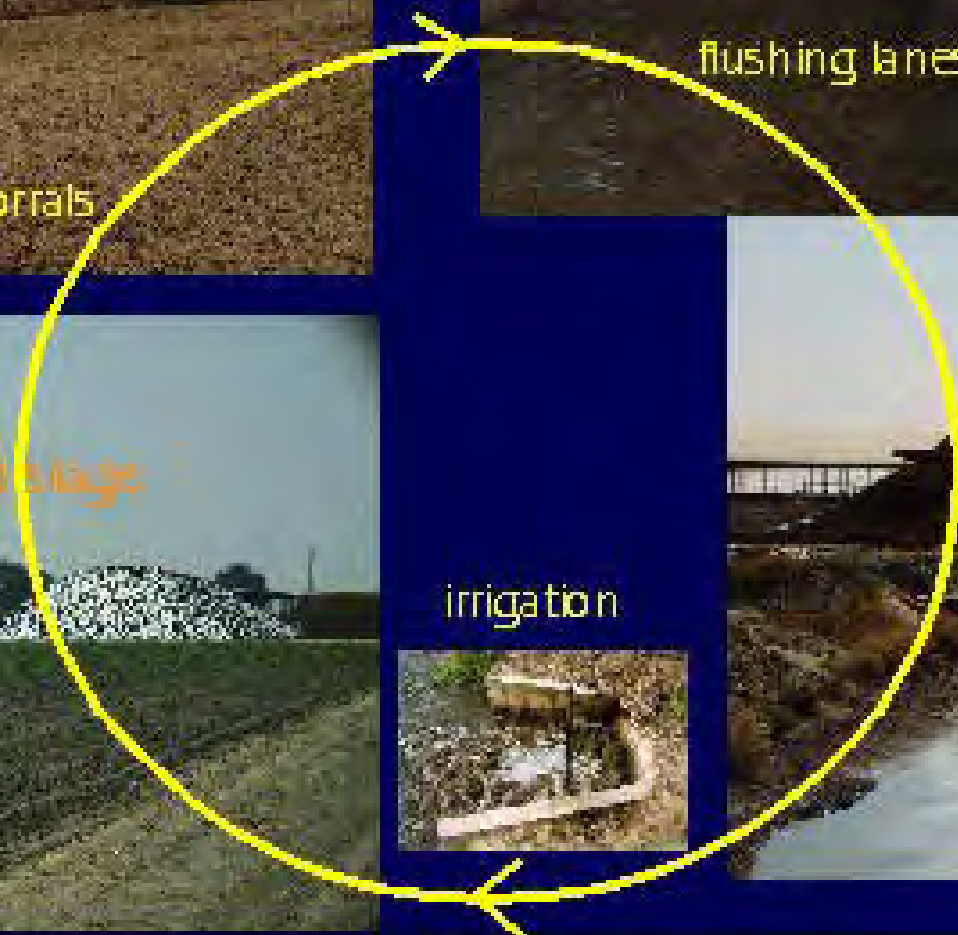


irrigation



solids separation

storage pond



# **SJV Dairy Manure Collaborative**

**Federal: USDA, DOE, EPA**

**State: CEC, CDFA, CalEPA, CARB,  
SWRCB, CIWMB**

**Dairy Industry: WUD, MPC, CDC**

**Public-Interest NGOs: SusCon, NRDC,  
CEERT, GVC, LGC**

**University researchers, Coop Extension,  
technology providers**

# Goals

**Fully utilize manure as a resource**

- fertilizer**
- compost & soil amendments**
- bedding**
- renewable energy**

**. . . while reducing emissions of pollutants**



# **SJV Dairy Manure Technology Feasibility Assessment Panel**

- **Report released Jan 2006**
- **Evaluates 10 types of technologies  
and 44 products**
- [www.arb.ca.gov/ag/caf/dairypnl/dairypanel.htm](http://www.arb.ca.gov/ag/caf/dairypnl/dairypanel.htm)

# Technologies

- **Feed management**
- **Energy production (anaerobic digestion, gasification, combustion)**
- **Composting and “wet” aerobic decomposition**
- **Dehydration to facilitate redistribution**
- **Trap aqueous N in biomass (crops, aquatic plants, algae, fish, etc.)**
- **Nitrification / denitrification**

# **Panel Conclusions & Recommendations**

## **Conclusions**

- **Insufficient scientific data**
- **Untested on California dairies**
- **Not comprehensive**

## **Recommendations**

- **Need standard test methods**
- **Research: VOCs, salts, technology verification**
- **Pilot Projects**

# **Key Elements of Pilot Projects**

- **Full-Scale**
- **Environmental monitoring**
- **Economic analysis**
- **Education & Outreach**
- **Collaboration**
- **Technology packages**

# Example of Comprehensive Treatment

## Anaerobic Digestion

- **Gas** → electricity / heat / fuel

## Solid-Liquid Separation

- **Solids** → compost
  - thermal conversion
- **Liquid** → fertilizer / irrigation
  - N / deN
  - reverse osmosis or “brine line”

# Funding

- **Farm Pilot Project Coordination**
- **USDA Rural Development**
  - Farm Bill §9006 for energy projects
- **USDA NRCS**
  - Conservation Innovation Grants
  - EQIP
- **US EPA R9 Diesel Collaborative RfP**
- **Chicago Climate Exchange**

# Conclusions

**To reduce pollution from dairies:**

- **Basic research (VOC, salts)**
- **Applied research (engineering and economics of manure treatment technologies)**
- **Demonstration & research facilities**
- **Holistic approach that addresses economics & ALL components of manure**