

# ARB's Collaborative Research on N<sub>2</sub>O Emissions from Agricultural Soils

California Air Resources Board  
September 9, 2008  
Modesto, CA

# *Outline*

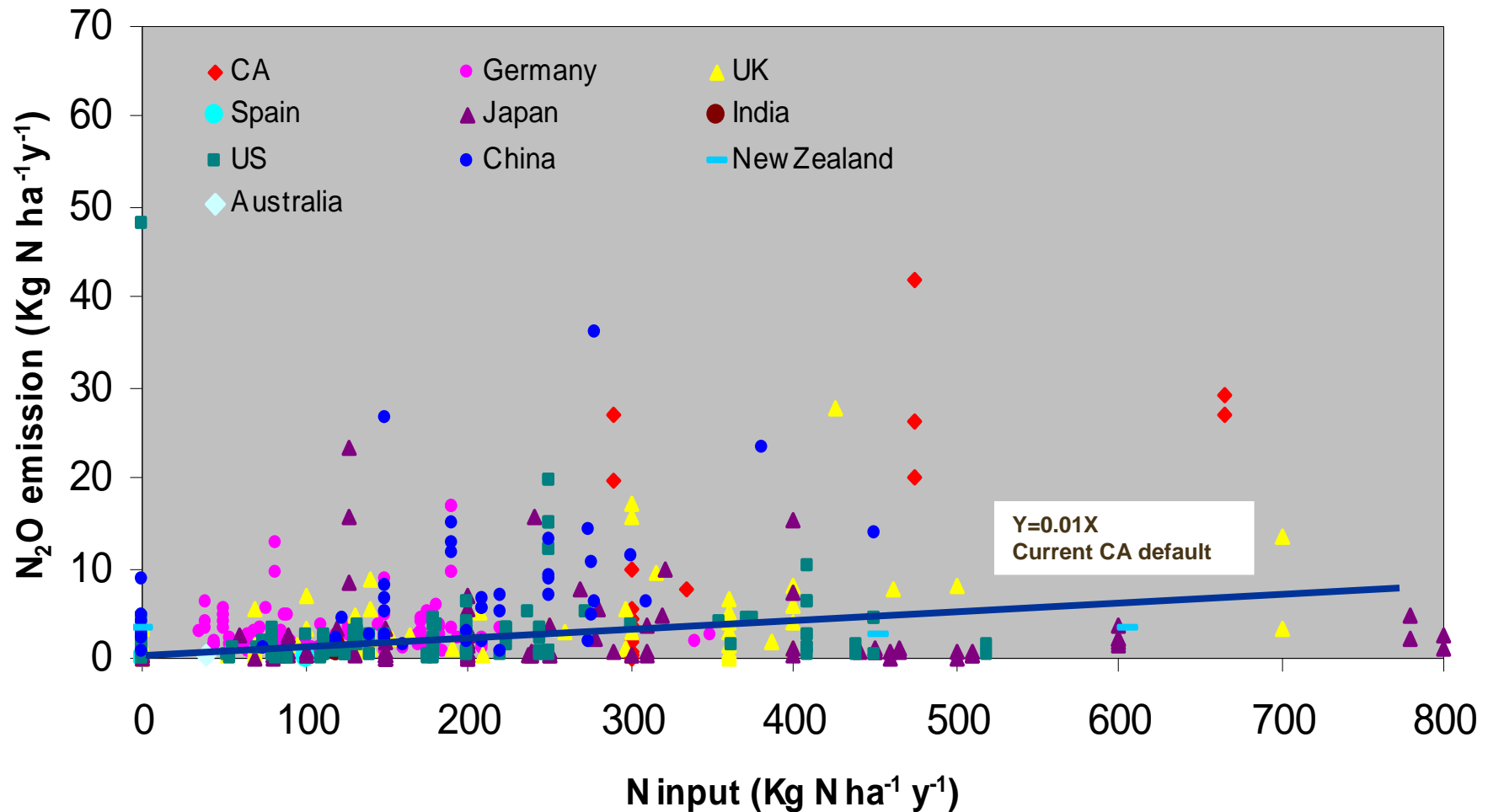
- *N<sub>2</sub>O Research Needs*
- *ARB's Research Planning Process*
- *N<sub>2</sub>O Research Proposal Review*
- *Technical Proposal (UCD)*
- *Next Steps*

# N<sub>2</sub>O Research Needs

- N<sub>2</sub>O: A potent greenhouse gas
  - The Kyoto six: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs and SF<sub>6</sub>
  - N<sub>2</sub>O Global Warming Potential 298
- AB 32 Early Action Measure
- N processes in the field highly variable
- Direct field observation on N<sub>2</sub>O emissions limited in USA, especially for California

# Summary of N<sub>2</sub>O Literature Data

## Observation of N<sub>2</sub>O Emission Rates from Field Experiments



# *ARB's Research Planning Process*

- *An annual process*
- *Anticipated budget \$6.6 million (08-09)*
- *Covering areas of*
  - *Agriculture*
  - *Exposure assessment*
  - *Global air pollution and climate change*
  - *Health and welfare effects*
  - *Technology advancement and pollution prevention*
- *Open to public*

# Research Project Timeline

- July, 2007: Research solicitation public release
- September, 2007: Research concepts due
- October, 2007 ~ March, 2008: Research concepts evaluation
  - Technical Review Teams, Executive Review Committee, Research Screening Committee (RSC)
- May, 2008: Board approval
- May ~ July, 2008: Proposal solicitation
- September, 2008: Proposal evaluation
- December, 2008: RSC review and approval
- January, 2009: Board approval
- February ~ April, 2009: Department of General Service approval
- May 2009: contract in place!

# Technical Review Teams

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- Identify major research gaps
- Identify niche areas for ARB to target funds
- Review concepts for technical merit and responsiveness to gaps
- Avoid duplicative research
- Identify collaboration and co-funding opportunities
- Technical experts from ARB, as well as state, federal, and private institutions (CEC, CDFA, CIWCB, EPA, Academia, SJV Agricultural Technical Committee)

# N<sub>2</sub>O Research

- Seven concepts received
- One approved: Baseline assessment
- Budget \$300,000
- RFP issued to UC/CSU for solicitation
- Three pre proposals received



# Pre Proposal Evaluation Criteria

- Proposal overall scope of work (15%)
- Research objectives (15%)
- The project description/products/due dates/budget (20%)
- Qualification of principal investigator/research team (25%)
- Overall technical merit and likelihood of the project to succeed (25%)
- Consistent with CEC's evaluation criteria

# Pre Proposal 1

**Collaborative Research to Understand How to Reduce N<sub>2</sub>O Emissions from Nitrogen Land Application.** *William R. Horwath, Martin Burger, Timothy K. Hartz, Johan Six, and Charles F. Krauter, UCD and CSUF*

## **ARB/CDF/CEC Comments:**

- Will collect N<sub>2</sub>O data on a number (5) of crops; project a high priority for ARB.
- Preproposal well written with well defined and achievable objectives.
- Project description straightforward with sufficient details. Deliverables/tasks appropriate and scientifically sound and project timelines realistic. Budget request reasonable .
- Competent research team with established track records. Large group of researchers to pull from.
- Excellent, well thoughtful proposal with clear objectives and benefits, but needs to mention some QA/QC. May have leveraged CDF/CEC efforts. Results expected highly valuable.

## **AgTech Committee Comments:**

- Only concern is with use of research farm for measurement of N<sub>2</sub>O from wheat and rice.
- All measurements should be from actual commercial farming operations.

# Pre Proposal 2

**Measurement of N<sub>2</sub>O Emission Rates from Soils After Fertilizer Application to Croplands in California.** *Dennis R. Fitz and John T. Pisano, UCR*

## **ARB/CDFA/CEC Comments:**

- Mainly a study on N<sub>2</sub>O monitoring methods, not a ARB RFP priority. Objectives do not reflect ARB's priority.
- Not clear on how the results of the three methods be related to each other. The DNDC work duplicates the CEC's efforts.
- The PIs don't appear to have much agricultural related research experience or necessary background in soil/cropping practices.
- Wrong project focus. Field description lacks sufficient technical detail. Modeling work overlaps CEC's efforts.

## **AgTech Committee Comments:**

- Proposal did not specify which crops and where tests would be conducted
- The open path methods may facilitate a temporal curve better, shots can be rapidly repeated.

# Pre Proposal 3

## Greenhouse Gas Measurement and Modeling in the Salinas Valley, California. *Marc Los Huertos and Fred Watson, CSUMB*

### ARB/CDF/CEC Comments:

- Limited scope of work, will test only vegetables in Salinas Valley.
- Project description and objectives too ambiguous, not clear what N<sub>2</sub>O methods/instruments they'll use.
- No timelines for deliverables. Budget is too high.
- The PIs have some experience in N<sub>2</sub>O modeling, but not in field experiments and ambient monitoring of N<sub>2</sub>O.
- Limited focus and value. Excessive parameter measurements. Project not cost-effective.

### AgTech Committee Comments:

- Limited to vegetables
- Not necessarily baseline emissions data
- Limited to Salinas Valley, which has little statewide applicability
- Need to fully categorize the compost that is used for the organic site: composting method, source, nutrient levels, C levels etc.

# Other General Comments

## **California Integrated Waste Management Board (CIWMB):**

- Research in much needed area
- Projects may help CIWMB's composting program
- May decrease use of ammonia-based fertilizers
- Need to address composting further
- Need to explore new procedures for measuring fluxes from much larger areas

## **AgTech Committee:**

- Approach oversimplified
- Need to address criteria pollutants

## **Others:**

- Area under researched
- All proposals worth funding

# Technical Proposal

## Collaborative Research to Understand How to Reduce N<sub>2</sub>O Emissions from Nitrogen Land Application

*William R. Horwath, Martin Burger, Timothy K. Hartz,  
Johan Six, and Charles F. Krauter*

# Next Steps

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# Staff Contacts

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# Discussion

# Integrated Approach: Projects under Consideration

Agency	CEC	CDFA	ARB
Funding	\$500,000	\$150,000	\$300,000
Title	N <sub>2</sub> O Emissions from the Application of Fertilizers in Agricultural Soils	Measuring and Modeling Nitrous Oxide Emissions from California Cotton, Corn and Vegetable Cropping Systems	Collaborative Research to Understand How to Reduce N <sub>2</sub> O Emissions from Nitrogen Land Application
Investigator	PI: Johan Six; Collaborators: Marc Fisher, Will Horwath, Louise Jackson, Charles Krauter, Bill Salas, Kate Scow, David Smart	PI: Dave Goorahoo, Charles Krauter, and Bill Salas; Collaborator: Will Horwath, Johan Six, and Martin Burger	PI: Will Horwath, Martin Burger; Collaborator: Johan Six, and Carles Krauter
Affiliation	UC Davis, CSU Fresno, LBNL, Applied Geosolutions	CSU Fresno, Applied Geosolutions, UC Davis	UC Davis, CSU Fresno
Crop	Wheat, tomato, alfalfa, grapes, almonds	Corn, cotton	Tomato, wheat, alfalfa, lettuce, rice
Region	Sacramento Valley (SV)	San Joaquin Valley (SJV)	SV, SJV, Coast
N source	Synthetic	Synthetic, composting	Synthetic
Approach	Field and modeling	Field and modeling	Field
Sampling technique	Chamber/GC; Eddy covariance	Chamber/photoacoustic gas monitor	Chamber/GC
Sampling frequency	Event 4/day + nonevent 10/season	Event daily + nonevent weekly	Event daily + nonevent weekly/biweekly
Modeling	Field scale (Task 3)	Field (Task 3) and regional (Task 4)	No modeling
Anncillary measurement	Soil C and N content, texture, hydraulic conductivity, moisture and temperature profile, above/underground biomass, plant C:N ratio	Soil temperature, soil moisture, soil pH, inorganic N, bulk density, N uptake and crop yield	Soil temperature and moisture, pH, soil inorganic N, bulk density, N uptake and crop yield

# Next Steps and Schedule

## **ARB:**

- September, 2008: Proposal evaluation
- December, 2008: RSC review and approval
- January, 2009: Board approval
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## **CEC:**

- September, 2008: Intention to award
- December, 2008: Commission Business Meeting for approval
- January, 2009: Project in place

## **CDFA:**

- September, 2008: Technical Advisory Sub Committee evaluation and recommendation to Fertilizer Inspection Advisory Board (FIAB)
- September, 2008: FIAB Approval
- October, 2008: Award announcement
- January, 2009: Project in place

# Follow up Meetings

- To be represented by all agencies
- Kick off meeting: January?
- Update meetings:
  - Quarterly or as needed
  - Update through Ag Tech Committee