

State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 09-9

February 26, 2009

Agenda Item No.: 09-2-2

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2669-263, entitled "Assessment of Baseline Nitrous Oxide Emissions in California Cropping Systems," has been submitted by the University of California, Davis;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2669-263, entitled "Assessment of Baseline Nitrous Oxide Emissions in California Cropping Systems," has been submitted by the University of California, Davis for a total amount not to exceed \$300,000.

NOW, THEREFORE BE IT RESOLVED that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2669-263, entitled "Assessment of Baseline Nitrous Oxide Emissions in California Cropping Systems," has been submitted by the University of California, Davis for a total amount not to exceed \$300,000.

BE IT FURTHER RESOLVED that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$300,000.

I hereby certify that the above is a true and correct copy of Resolution 09-9, as adopted by the Air Resources Board.

/s/

Monica Vejar, Clerk of the Board

ATTACHMENT A

“Assessment of Baseline Nitrous Oxide Emissions in California Cropping Systems”

Background

Emission of nitrous oxide (N_2O) from agricultural soils is part of the natural nitrogen cycling process, driven by soil microbial activities. Due to variations of environmental conditions that affect soil microbial activities, N_2O fluxes are highly irregular both spatially and temporally. In intensively managed cropping systems, spikes of N_2O fluxes are often associated with soil management events such as application of N fertilizers, irrigation/drainage, tillage disturbance, and incorporation of plant residues. In addition, rainfall events can substantially induce N_2O fluxes.

Due to the sporadic nature of N_2O emissions from cropping systems, the estimate of N_2O emissions from agricultural soils in the California greenhouse gas inventory is subject to large uncertainty, which makes it difficult to extrapolate N_2O flux data from one location or crop to another. Given the diversity of California agriculture and climatic conditions, determining baseline N_2O emissions from California agricultural soils is extremely challenging, requiring both extensive and intensive field measurements under a wide range of agronomic management and environmental regimes. This project is part of a coordinated research effort that engages a large team of investigators under several funding sources to enable monitoring at multiple sites in different regions of California, and is intended to establish baseline N_2O emissions from agricultural soils.

Objective

The goal of this project is to establish baseline N_2O emissions from agricultural soils by monitoring N_2O emissions from California's major cropping systems. Specific objectives are to (1) determine N_2O emissions rates and economic nitrogen yields for five major crops: tomato, wheat, lettuce, alfalfa, and rice; (2) develop California-specific N_2O emission factors for these crops; and (3) identify key environmental conditions affecting N_2O fluxes.

Methods

The project is part of the coordinated effort with the California Energy Commission, California Department of Food and Agriculture, and industry stakeholders to determine baseline emissions of the greenhouse gas N_2O in California. The project will conduct field experiments to monitor N_2O fluxes from California's major cropping systems. Either PVC or stainless steel chambers will be placed in the fields of five crops, including tomato, lettuce, alfalfa, wheat, and rice, and N_2O emissions will be monitored by taking periodic air samples from the enclosures and injecting them into a gas chromatograph for analysis. The sampling frequency will vary, depending upon the expected N_2O fluxes, and will be more intensive after nitrogen fertilizer applications and during rainfall events. Short-term time series of N_2O fluxes will be monitored to characterize diurnal variation of emissions. Ancillary data on related environmental and crop parameters such as soil nitrogen availability, soil water content, soil organic carbon

content, soil and air temperatures, and crop yields will also be collected to facilitate data interpretation and determine their impacts on N₂O emissions. Finally, crop-specific emission factors will be calculated based on the N₂O emission data and will be used to develop a more realistic estimate for baseline N₂O emissions from California agricultural soils.

Expected Results

The emission rates of N₂O measured in this project and other projects will be used to develop California-specific N₂O emission factors for estimating baseline N₂O emissions from agricultural soil management in the State. These results will reduce uncertainties associated with the current N₂O inventory of California.

Significance to the Board

The California Global Warming Solutions Act of 2006 requires the state to reduce greenhouse gas emissions to 1990 levels by 2020. Agricultural soil management is recognized as the largest source of N₂O in California. However, there are large uncertainties in both the estimate of baseline N₂O emissions from agricultural soils and reductions achievable from potential mitigation measures. This project will help ARB to improve the estimate of baseline N₂O emissions and provide a basis for the development of mitigation strategies.

Contractor:

University of California, Davis

Contract Period:

36 months

Principal Investigator (PI):

William R. Horwath, Ph.D.

Contract Amount:

\$300,000

Basis for Indirect Cost Rate:

The State and the UC system have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:

The research team of this project consists of known experts in the state on nitrogen management and cycling in agricultural ecosystems. The investigators have been involved in field studies of nitrogen fate, including N₂O, in many projects. Dr. Horwath is a professor in soil biogeochemistry and has published extensively in leading journals regarding soil processes of nutrients management. He is currently engaged in two other projects involving monitoring of N₂O and other greenhouse gases from rice and tomato fields under alternative management practices of irrigation and drainage.

Prior Research Division Funding to UCD:

Year	2008	2007	2006
Funding	\$894,566	\$1,002,693	\$1,891,281

BUDGET SUMMARY

Contractor: University of California at Davis

Assessment of Baseline Nitrous Oxide Emissions in California
Cropping Systems

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$	213,884
2.	Subcontractors	\$	0
3.	Equipment	\$	0
4.	Travel and Subsistence	\$	25,644
5.	Electronic Data Processing	\$	0
6.	Reproduction/Publication	\$	298
7.	Mail and Phone	\$	1,052
8.	Supplies	\$	27,204
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>4,645</u>

Total Direct Costs \$272,727

INDIRECT COSTS

1.	Overhead	\$	27,273
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>

Total Indirect Costs \$27,273

TOTAL PROJECT COSTS **\$300,000**