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<td>June 2009</td>
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**Project Name**

National Air Emissions Monitoring Study (NAEMS): Air Emissions from California Dairies, Part I (NAEMS CA5B)

**Project Description**

Accurately assess emissions from livestock operations and compile a database for estimation of emission rates, promote a national consensus for emissions-estimation methods/procedures from livestock operations. Includes monitoring of VOCs and GHG emissions at a commercial dairy using open-path Fourier transform infrared (OP-FTIR) analyzer.

**PI 1**

F. Mitloehner

UC Davis

**Affiliation PI 1**

**Fund Source 1**

Ag Air Research Council (AARC)

**Amount 1**

$250,000

**PI 2**

**Affiliation PI 2**

**Fund Source 2**

**Amount 2**


**PI 3**

**Affiliation PI 3**

**Fund Source 3**

**Amount 3**


**Report Location**

http://www.epa.gov/airquality/agmonitoring/techdocs.html

**Related info 1**


**Related info 2**


Please provide project updates and corrections to:

Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
National Air Emissions Monitoring Study (NAEMS): Air Emissions from California Dairies, Part II (NAEMS CA5B)

Project Description
Accurately assess emissions from livestock operations and compile a database for estimation of emission rates, promote a national consensus for emissions-estimation methods/procedures from livestock operations. Includes monitoring of VOCs and GHG emissions at a commercial dairy using open-path Fourier transform infrared (OP-FTIR) analyzer.

PI 1
F. Mitloehner
UC Davis
ARB
$40,000

PI 2
Y. Zhao
UC Davis

PI 3
Affiliation PI 3
Fund Source 3
Amount 3

Report Location
http://www.epa.gov/airquality/agmonitoring/techdocs.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
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<td>National Air Emissions Monitoring Study (NAEMS): Air Emissions from California Dairies from California Dairies, Part III (NAEMS CA5B)</td>
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**Project Description**

Accurately assess emissions from livestock operations and compile a database for estimation of emission rates, promote a national consensus for emissions-estimation methods/procedures from livestock operations. Includes monitoring of VOCs and GHG emissions at a commercial dairy using open-path Fourier transform infrared (OP-FTIR) analyzer.

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<td>F. Mitloehner</td>
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<tr>
<td>Y. Zhao</td>
<td>UC Davis</td>
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**Report Location**

http://www.epa.gov/airquality/agmonitoring/techdocs.html

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project Details

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### Project Personnel

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<tr>
<td>F. Mitloehner</td>
<td>UC Davis</td>
<td>UC Davis, College of Ag and Env'l Sciences</td>
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<td>Y. Zhao</td>
<td>UC Davis</td>
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### Fund Sources

- UC Davis, College of Ag and Env'l Sciences: $40,000
- UC Davis: Fund Source 2
- UC Davis: Fund Source 3

### Report Location

http://www.epa.gov/airquality/agmonitoring/techdocs.html

### Related Info

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project Name
ARB Contract 05-344, Process-Based Farm Emission Model to Estimate Air Emissions from California Dairies

### Project Description
Using biological principles and engineering studies, develop a feed/waste stream process-based dairy farm emission model for VOC emissions.

### PI 1
- **Affiliation PI 1**: UC Davis
- **Fund Source 1**: ARB
- **Amount 1**: $299,191

### PI 2
- **Affiliation PI 2**: UC Davis
- **Fund Source 2**: UC Davis

### PI 3
- **Affiliation PI 3**: UC Berkeley
- **Fund Source 3**: UC Berkeley

### Report Location
http://www.arb.ca.gov/research/apr/past/05-344.pdf

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project Name**
Dairy Air Quality Monitoring of ROG and Ammonia in the Central Valley of California

**Project Description**
Maintain staffing and supplies for field and laboratory work to continue the ARB funded ROG project ID 55.

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<td>D. Goorahoo</td>
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<td>3</td>
<td>B. Goodrich</td>
<td>SJVAPCD</td>
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**Report Location**

**Related info 1**

**Related info 2**
http://www.epa.gov/tnn/chief/conference/ei14/session1/goorahoo_pres.pdf

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project ID** 7  
**Project Name** Evaluating Dairy Ammonia, Methane, and Hydrogen Sulfide Emissions Using Tunable Diode Lasers  
**Project Description** Develop real-time methods for evaluating process and time specific emission profiles for NH3, CH4, and H2S at dairies. A program to monitor ammonia emissions using the USEPA Emission Isolation Flux Chamber began in 2006 and continued through 2008. [No updates since 2006.]  

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<td>D. Goorahoo</td>
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<td>B. Goodrich</td>
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**Report Location**  
http://www.deq.state.or.us/aq/dairy/docs/appendix/appendix_F.pdf

**Related Info 1**  
http://www.4cleanair.org/Documents/APCODetermination.pdf

**Related Info 2**  
Abstract on page 9 at this site:  

Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
**Project ID**
8

**Project Name**

**Project Description**
Project is designed to obtain data needed to better estimate baseline dairy emissions and to estimate the emission reductions achievable with available control technologies.

**PI 1**
C. Krauter
Affiliation PI 1
CSU Fresno

**Fund Source 1**
ARB
Amount 1
$250,000

**PI 2**
D. Goorahoo
Affiliation PI 2
CSU Fresno

**Fund Source 2**
possible matching funds - CSUS Fresno Agricultural
Amount 2
$250,000

**PI 3**
B. Goodrich
Affiliation PI 3
CSU Fresno

**Fund Source 3**
Amount 3

**Report Location**
http://www.arb.ca.gov/research/apr/past/04-343.pdf

**Related info 1**

**Related info 2**
Continuation of previous work

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717

**Estimated Completion Date**
May 2009

**Status**
Completed
Air Emission Mitigation Techniques and Technologies for California Dairies

Evaluate dairy PM10, 2.5, VOC, and ammonia emission mitigation practices for potential effectiveness. Includes lagoon and corral areas.

F. Mitloehner  
UC Davis

R. Zhang  
UC Davis

P. Robinson  
UC Davis

Fund Source 1: Merced County via SWRCB and UC matching  
Amount 1: $600,000

Report Location
http://www.arb.ca.gov/ag/caf/FrankMitloehnerDairySymposiumOct06.pdf

Related info 1
Project objective described in PowerPoint at:

Related info 2
SJVAPCD Aug. 2005 VOC Emission Factors for Dairies,
http://www.4cleanair.org/Documents/APCO Determination.pdf

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project ID**
10

**Project Name**
Volatile Organic Compound (VOC) Emissions from Cows Fed Typical California Rations

**Project Description**
Measurements of alcohols, volatile fatty acids, phenols, and methane (CH4) emitted from nonlactating (dry) and lactating dairy cows and their manure under controlled conditions. The experiment was conducted in an environmental chamber that simulates commercial concrete-floored freestall cow housing conditions. The fluxes of methanol, ethanol, and CH4 were measured from cows and/or their fresh manure.

**PI 1**
F. Mitloehner
Affiliation PI 1
UC Davis

**Fund Source 1**
US EPA
**Amount 1**
$75,000

**PI 2**
B. Flocchini
Affiliation PI 2
UC Davis

**PI 3**
P. Robinson
Affiliation PI 3
UC Davis

**Report Location**
Not Available

**Related info 1**
http://www.4cleanair.org/Documents/APCODetermination.pdf

**Related info 2**
UCD Dairy Air Quality Symposium presentation 10-11-06 available at:
http://www.arb.ca.gov/ag/cal/FrankMitloehnerDairySymposiumOct06.pdf

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project Name
Effects of Liquid Dairy Manure Aeration on Air Quality and Nutrient Cycling

### Project Description
This project will evaluate the air and water emission mitigation effects of a wastewater treatment technology for California dairies to determine whether/to what extent aerobic treatment systems can cost-effectively reduce environmental impacts associated with manure storage.

### PI and Affiliation
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<td>1</td>
<td>C. Collar - UCCE - Kings County</td>
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<tr>
<td>2</td>
<td>F. Mitloehner - UC Davis</td>
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<td>3</td>
<td>J. McGarvey - USDA - ARS</td>
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### Report Location

### Related info
Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
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<td>Dairy Waste Management</td>
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**Project Name**
Characterization of Dairy Waste Management Strategies with Regard to Pathogens and Air Quality

**Project Description**
Examine the effect that aerobic and anaerobic treatments have on the microbiological and chemical properties of waste.

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<td>R. Zhang</td>
<td>UC Davis</td>
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**Report Location**
Abstract available at:
http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=195211

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
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**Project Name**

Estimating and Reducing Air Emissions from Dairy Feeding Operations

**Project Description**

Identify and measure VOC sources in dairy feed operations

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<tr>
<td>C. Krauter</td>
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**Report Location**

Several study presentations, see below; no final report located.

**Related info 1**

http://www.ag.iastate.edu/wastemgmt/Mitigation_Conference_proceedings/CD_proceedings/Animal_Housing-Treatment/Calvo-Freestall_housing.pdf

**Related info 2**


Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project Name

Nutrient Balances in California Dairy Herds

### Project Description

Data from 51 randomly selected dairy farms in Merced County, in California's Central Valley, was used to evaluate the impact of minerals in drinking water on nutrient balances and to characterize the mineral composition of manure from lactating dairy cows.

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<td>D. Bacon</td>
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### Report Location

http://californiaagriculture.ucanr.org/landingpage.cfm?article=ca.v061n02p90&abstract=yes

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
# Project Name
**Effects of Dietary Rumensin® on GHG and VOC Emissions from Lactating Dairy Cows**

# Project Description
Feed additives, like monensin sodium (monensin), have been thought to improve cattle health and productivity, and have been used for these reasons for decades. The dairy industry is the impact the dairy industry has on the environment. A main environmental concern associated with the dairy industry is the emission of volatile organic compounds (VOC) and greenhouse gases (GHG).

## PI 1
**F. Mitloehner**  
Affiliation: UC Davis  

## PI 2
**E. DePeters**  
Affiliation: USDA-ARS  

## PI 3
**J. MacGarvey**  
Affiliation: USDA-ARS  

## Fund Source 1
**Eli Lilly-Elanco**  
Amount: $50,000

## Fund Source 2
**USDA-ARS**  
Amount: $0

## Fund Source 3
**USDA-ARS**  
Amount: $0

# Report Location
http://www.extension.org/pages/Environmental_Responses_to_Dietary_Monensin_in_Lactating_Dairy_Cows

# Related info 1

# Related info 2

Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
Project Name
Western Region Dairy Odor and Air Quality Education

Project Description
The goal of this Professional Development Program grant is to reduce the environmental impacts of dairy farming in the West as a way to promote and guarantee the sustainability of the milk and cheese industries. The grant recipients plan to train agricultural professionals, selected from around the dairy producing areas of the Western region, on the best management practices available to dairy producers to mitigate the degradation of air quality. Four hands-on workshops will be conducted.

PI 1
P. Ndegwa
Affiliation PI 1
WSU
Fund Source 1
USDA - SARE
Amount 1
$89,000

PI 2
F. Mittloehner
Affiliation PI 2
UC Davis

PI 3
R. Sheffield
Affiliation PI 3
Univ. of Idaho

Report Location
No report, this was an educational effort

Related info 1
Other researchers from NM State (R. Hagevoort) and OSU (M. Gamroth)

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## California Air Resources Board

#### Emission Inventory Branch

### Summary of Agricultural Emissions Research in California

<table>
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<td>2010</td>
<td>Volatile Organic Compound and Greenhouse Gas Emissions from Growing and Finishing Feedlot Steers and Their Waste</td>
<td>To quantify volatile organic compounds (alcohols, volatile fatty acids, amines, and phenols) and greenhouse gas (methane, nitrous oxide, and carbon dioxide) emissions from receiving, growing and finishing feedlot steers (enteric fermentation) and fresh waste using environmental chambers at UC Davis.</td>
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<td>F. Mitloehner</td>
<td>UC Davis</td>
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### Report Location


### Related info 1

Costs to be split between the two funding sources

### Related info 2


Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
<table>
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<tr>
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**Project Name**
UC Equipment Matching Funds Program

**Project Description**
No description, but project cited at http://animalscience.ucdavis.edu/faculty/Mitloehner/pdf/Grants.pdf

**PI 1**
Affiliation PI 1: UC Davis
Fund Source 1: UC Davis, Chancellor for Research
Amount 1: $140,000

**PI 2**
Affiliation PI 2
Fund Source 2
Amount 2

**PI 3**
Affiliation PI 3
Fund Source 3
Amount 3

**Report Location**
Not Applicable

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project ID
20

## Project Name
Covered Lagoon Digester Emission Measurements

## Project Description
Measurements of NH3, methane, and VOCs at dairies with CEC funded dairy digester installations. Evaluates the Dairy Power Production Program (DPPP). The DPPP was initiated to encourage the development of biologically based anaerobic digestion and gasification (“iogas”) electricity generation projects on California dairies.

<table>
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<tr>
<th>PI 1</th>
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<th>Fund Source 1</th>
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<tbody>
<tr>
<td>P. Sousa</td>
<td>WURD</td>
<td></td>
<td>$500,000</td>
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<th>Fund Source 2</th>
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<tbody>
<tr>
<td>M. Summers</td>
<td>Summers Consulting</td>
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</table>

## Report Location

## Related info 1

## Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## California Air Resources Board
### Emission Inventory Branch
#### Summary of Agricultural Emissions Research in California

<table>
<thead>
<tr>
<th>Project ID</th>
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<tr>
<td>22</td>
<td>Dairy Emissions</td>
<td>Completed</td>
<td>July 2005</td>
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### Project Name
Agricultural sources of PM10 and ozone precursors

### Project Description
Compile PM10 and NH3 emission factors. Measure concentrations of VOC relevant to ozone formation upwind and downwind of dairies

<table>
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<tr>
<td>R. Flocchini</td>
<td>UC Davis</td>
<td>USDA</td>
<td>$374,145</td>
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<tr>
<td>C. Parnell</td>
<td>Texas A&amp;M</td>
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<tbody>
<tr>
<td>R. Higashi</td>
<td>UC Davis</td>
<td></td>
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</table>

### Report Location
Several publications, see Related Info

### Related info 1

### Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
<table>
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<td>23</td>
<td>Dairy Emissions Modeling</td>
<td>Completed</td>
<td>June 2007</td>
<td>F. Mitloehner</td>
<td>UC Davis</td>
<td>CEC PIER</td>
<td>$119,000</td>
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<td></td>
<td></td>
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<td>W. Salas</td>
<td>Applied Geosolutions, LLC</td>
<td>Fund Source 2</td>
<td>Amount 2</td>
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<td></td>
<td></td>
<td></td>
<td>R. Zhang</td>
<td>UC Davis</td>
<td>Fund Source 3</td>
<td>Amount 3</td>
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**Report Location**

http://www.arb.ca.gov/research/rsc/2-25-10/feb10adv.pdf

**Related info 1**

Funded with $500,000 total - $119,00 for Mitloehner portion

**Related info 2**


Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
<table>
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<tr>
<td>24</td>
<td>Livestock Ammonia Modeling</td>
<td>Completed</td>
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### Project Name

Development of a Process-Based Ammonia Model for Livestock Sources

### Project Description

Develop a process-based model of ammonia emissions from five types of animal feeding operations: dairy, beef, swine, chicken, and turkey.

### PI 1

G. Tonnesen  
**Affiliation PI 1**: UC Riverside

### PI 2

Z. Wang  
**Affiliation PI 2**: UC Riverside

### PI 3

R. Zhang  
**Affiliation PI 3**: UC Davis

### Fund Source 1

**Fund Source 1**: LADCO  
**Amount 1**: $250,000

### Report Location

http://www.epa.gov/ttnchie1/conference/ei14/session1/mansell.pdf

### Related info 1

Other researchers - J. Fadel, R. Zhang, G. Mansell, J. Haasbeek.

### Related info 2


Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
## California Air Resources Board
### Emission Inventory Branch
#### Summary of Agricultural Emissions Research in California

<table>
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<td>25</td>
<td>Dairy Emissions</td>
<td>Completed</td>
<td>March 2005</td>
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**Project Name**
Development of an Air Module Curriculum for the California Dairy Quality Assurance Program (CDQAP)

**Project Description**
Develop curriculum to assist producers in meeting the new air quality permit requirements

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<tr>
<td>F. Mitloehner</td>
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<tr>
<td>D. Meyer</td>
<td>UC Davis, CDQAP</td>
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<tr>
<td>M. Payne</td>
<td>CDQAP</td>
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**Report Location**

**Related info 1**
http://www.4cleanair.org/Documents/APCODetermination.pdf

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project ID: 26
Project Name: Laser-based Sensors for Monitoring Ammonia Emissions
Project Description:
A trace-gas sensor based on fibre-amplifier enhanced photoacoustic spectroscopy has been developed for measuring ambient ammonia in agricultural settings. Field testing was performed in environmental chambers at UC Davis where the excreta from three Holstein cows were allowed to accumulate, providing a source of ambient ammonia.

PI 1: C. Patel
Affiliation PI 1: Pranalytica, Inc.
Fund Source 1: USDA - SBIR I
Amount 1: $20,000

PI 2: F. Mitloehner
Affiliation PI 2: UC Davis

PI 3:
Affiliation PI 3:
Fund Source 3:
Amount 3:

Report Location:

Related info 1:
$79,000 total; $20,000 for Mitloehner portion

Related info 2:

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project Name
Laser-based Sensors for Monitoring Ammonia Emissions

### Project Description
A trace-gas sensor based on fibre-amplifier enhanced photoacoustic spectroscopy has been developed for measuring ambient ammonia in agricultural settings. Field testing was performed in environmental chambers at UC Davis where the excreta from three Holstein cows were allowed to accumulate, providing a source of ambient ammonia.

### PI Affiliations

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<tr>
<td>C. Patel</td>
<td>Pranalytica, Inc.</td>
<td>USDA - SBIR II</td>
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<tr>
<td>F. Mitloehner</td>
<td>UC Davis</td>
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### Report Location

### Related info 1
$350,000 ($75,000 for Mitloehner portion)

### Related info 2
Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project Name
Effect of Atmospheric Ammonia on Pig Welfare

## Project Description
Trace-gas sensor based on fibre-amplifier enhanced photoacoustic spectroscopy has been developed for measuring ambient ammonia in agricultural settings. Field testing was performed in environmental chambers at UC Davis where the excreta from three Holstein cows were allowed to accumulate, providing a source of ambient ammonia.

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<td>F. Mitloehner</td>
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<td>National Pork Board</td>
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## Report Location

## Related info 1

## Related info 2

Please provide project updates and corrections to: Janet Spencer, Air Quality Planning and Science Division jspencer@arb.ca.gov 916.324.2717
## Project Name
Respiratory Exposures and Health of Workers on California Dairies (NIOSH)

## Project Description
Monitor exposures of 200 dairy workers at large dairies to dust and ammonia to define the concentrations of any airborne pollutants highly associated with respiratory problems.

<table>
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<td>F. Mitloehner</td>
<td>UC Davis</td>
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<td>M. Schenker</td>
<td>UC Davis</td>
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<tr>
<td>D. Bennett</td>
<td>UC Davis</td>
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## Report Location
http://factsreports.revues.org/492

## Related info 1
UC Davis' program - CA Dairy Environ Health Research Initiative (Cal-DEHRI)

## Related info 2
Field phase in progress, June 2008

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717

---

**Date:** 4/21/2017
### Project ID
30

### Project Name
Investigation of Atmospheric Ozone Impacts of Selected Pesticides

### Project Description
Develop methods for estimating and quantifying ozone impacts for selected pesticide compounds for which such estimates are not currently available.

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<td>W. Carter</td>
<td>UC Riverside</td>
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<tr>
<td>I. Malkina</td>
<td>UC Riverside</td>
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### Estimated Completion Date
February 2006

### Status
Completed

### Report Location

### Related info

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
<table>
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<tr>
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<tr>
<td>31</td>
<td>Agricultural Pesticide VOC Sources and their Photochemical Ozone Formation Potential</td>
<td>Improve current understanding of the photochemical O3 formation potential of VOCs from agricultural pesticide applications in the San Joaquin Valley.</td>
<td>R. Flocchini</td>
<td>UC Davis</td>
<td>USDA</td>
<td>$400,000</td>
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<td>PI 2</td>
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<td>R. Higashi</td>
<td>UC Davis</td>
<td>Fund Source 2</td>
<td>Amount 2</td>
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<td>PI 3</td>
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<td>M. Kleeman</td>
<td>UC Davis</td>
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Report Location


Related info 1


Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project Name
Commercialization of Intermittent Water Sealing

Project Description
Identify optimal water management strategies for water sealing commercial-scale application of fumigants.

PI 1
D. Sullivan
Affiliation PI 1
Sullivan Environmental
Fund Source 1
USDA
Amount 1
$78,000

PI 2
H. Ajwa
Affiliation PI 2
UC Davis
Fund Source 2

PI 3
J. Radewald
Affiliation PI 3
UC Davis
Fund Source 3

Report Location

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project Description

Develop California specific ammonia emission factors and modeling for native soils within California.

### PI 1

**Affiliation PI 1**
CSU Fresno

**Fund Source 1**
ARB

**Amount 1**
$200,000

### PI 2

**Affiliation PI 2**
NASA Ames

**Fund Source 2**

**Amount 2**

### PI 3

**Affiliation PI 3**
CSU Monterey

**Fund Source 3**

**Amount 3**

### Related info 1

http://geo.arc.nasa.gov/sge/casa/regional/california.html

### Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project ID**: 34  
**Project Name**: Monitoring of Ammonia Emissions from Crop Production With a Tunable Diode Laser  
**Project Description**: Evaluate the use of a TDL system for the determination of ambient ammonia levels and ammonia emissions from specific agricultural operations.

**PI 1**  
**Affiliation PI 1**: CSU Fresno  
**Fund Source 1**: CSU Agricultural Research Initiative  
**Amount 1**: $296,000

**PI 2**  
**Affiliation PI 2**: CSU Fresno  
**Fund Source 2**: ARB  
**Amount 2**: $148,000

**PI 3**  
**Affiliation PI 3**: CSU Fresno  
**Fund Source 3**: Unisearch  
**Amount 3**: $148,000

**Report Location**: Partial, 2005 EPA conference.  
[http://www.epa.gov/ttn/chief/conference/ei14/index.html](http://www.epa.gov/ttn/chief/conference/ei14/index.html) (search Krauter)

**Related info 1**:  
[http://www.epa.gov/ttn/chief/conference/ei14/session1/goorahoo_pres.pdf](http://www.epa.gov/ttn/chief/conference/ei14/session1/goorahoo_pres.pdf)

**Related info 2**: 

Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
### Project ID

35

### Project Type

FRM Sampling Methodology

### Status

Completed

### Estimated Completion Date

December 2012

### Project Name

Cotton Gin PM Emissions Research, contract 09-01PM

### Project Description

Evaluate the accuracy of US EPA's sampling methods which may significantly overestimate PM emissions (CTM-039, P 2.5 Stack Sampling Method). Develop PM dispersion models for PM10, PM2.5, total suspended particulates (TSP). Characterize particle size, shape. Six test sites, 1 in CA.

### PI 1

D. Whitelock

**Affiliation PI 1**

ARS - SW Cotton Ginning Research

**Fund Source 1**

Various cotton industry and ginners associations

**Amount 1**

$147,500

### PI 2

M. Buser

**Affiliation PI 2**

OK State Univ.

**Fund Source 2**

ARB

**Amount 2**

$45,000

### PI 3

C. Boykin

**Affiliation PI 3**

Cotton Ginning Research Unit,

**Fund Source 3**

SJVAPCD

**Amount 3**

$36,000

### Report Location

See Presentations, Cotton Gin PM Study Update at:


### Date:

4/21/2017

### Related info 1


### Related info 2


Please provide project updates and corrections to:

Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### California Air Resources Board

**Emission Inventory Branch**

**Summary of Agricultural Emissions Research in California**

<table>
<thead>
<tr>
<th>Project ID</th>
<th>Project Type</th>
<th>Status</th>
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<tr>
<td>36</td>
<td>Crop PM Emissions</td>
<td>Completed</td>
<td>2011</td>
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#### Project Name

Particulate Matter Emissions from Raisin Harvest

#### Project Description

Compare PM emissions of raisin harvesting techniques: conventional tray, continuous tray, dried on vine.

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<tr>
<td>1</td>
<td>Alex Alexandrou</td>
<td>USDA-NRCS</td>
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<td>C. Krauter</td>
<td>SJVAPCD</td>
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<tr>
<td>3</td>
<td>S. Ashkan</td>
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#### Report Location

Under review by SJVAPCD, April 2012

#### Related info 1

#### Related info 2

Please provide project updates and corrections to:

Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project ID: 37  
Project Name: Testing to Determine Emissions Reductions Achieved by Lower Emitting Agricultural Practices

Project Description: Evaluation of control effectiveness of two SJVAPCD Conservation Management Practices for PM (conservation tillage and combined operations)

PI 1: US EPA RARE Study  
Affiliation PI 1:  
Fund Source 1: US EPA RARE  
Amount 1: 

PI 2:  
Affiliation PI 2:  
Fund Source 2: USDA  
Amount 2: 

PI 3:  
Affiliation PI 3:  
Fund Source 3: SJVAPCD  
Amount 3: 

Estimated Completion Date: 2010

Report Location: Available as pdf via search terms from cfpub.eap.gov

Related info 1:

Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
Project Name
DPR Round-Robin VOC Study

Project Description
Determine ways to improve VOC emission estimates for solvents in pesticide formulations by comparing the emissions under field conditions to emissions seen in traditional TGA testing. Results showed more ozone production on the downwind side, but only slightly. Most of the VOC increase after spraying is NOT from the solvent being regulated but from EtOH in fuel. To decrease ozone, NOx reduction more important than VOC reduction.

PI 1
P. Green
Affiliation PI 1
UC Davis
Fund Source 1
USDA-CSREES
Amount 1
$0

PI 2
Affiliation PI 2
Fund Source 2
Amount 2

PI 3
Affiliation PI 3
Fund Source 3
Amount 3

Report Location
presentation at CDPR, date unknown:
http://www.cdpr.ca.gov/docs/emon/vocs/vocproj/voc_regional_ozone.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project Name

ARB Contract 05-351, Reducing Emissions of VOCs from Agricultural Soil Fumigation

### Project Description

Original study plus extension: Develop estimates for cumulative and hourly emissions rates from laboratory, field plot and predictive models which will be compared to previous large-scale field experiments on several emission reduction strategies

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<td>Scott Yates</td>
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<tr>
<td>Jay Gan</td>
<td>UC Riverside</td>
<td>USDA-ARS</td>
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<tbody>
<tr>
<td>M. Majewski</td>
<td>UC Riverside</td>
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### Report Location

http://www.arb.ca.gov/research/apr/past/05-351.pdf

### Related info 1

ARB agreement 05-351

### Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project ID: 41
Project Name: Sources and Sinks of PM10 in the San Joaquin Valley

Project Description:
Evaluate on-field PM10 emissions. Evaluate PM10 and ammonia emissions for feedlots and dairies.

PI 1: R. Flocchini
Affiliation PI 1: UC Davis

PI 2: T. Cassel
Affiliation PI 2: UC Davis

PI 3
Affiliation PI 3

Fund Source 1: USDA
Amount 1

Fund Source 2
Amount 2

Fund Source 3
Amount 3

Report Location:
http://www.arb.ca.gov/research/apr/reports/l2022.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project ID
42

## Project Name
Statewide Inventory Estimates of Ammonia Emissions from Native Soils and Chemical Fertilizers in California

## Project Description

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<td>C. Krauter</td>
<td>CSU Fresno</td>
<td>ARB</td>
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<td>C. Potter</td>
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<tr>
<td>S. Klooster</td>
<td>CSU Monterey</td>
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## Report Location
http://www.cdfa.ca.gov/is/fflrs/frep/pdfs/completedprojects/00-0515Krauter2006.pdf

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project ID: 43

**Project Name:** Results of the Measurement of PM10 Precursor Compounds from Dairy Industry Livestock Waste

**Project Description:**
Using environmental flux chambers, evaluate dairy ammonia and ROG emissions.

**PI 1**
C. Schmidt
Affiliation: Consultant

**Fund Source 1:** South Coast AQMD
**Amount 1:**

**PI 2**

**Affiliation PI 2:**

**Fund Source 2:**
**Amount 2:**

**PI 3**

**Affiliation PI 3:**

**Fund Source 3:**
**Amount 3:**

**Report Location:**
http://www.epa.gov/ttn/chief/conference/ei14/session1/schmidt.pdf

**Related info 1:**
http://www.aqmd.gov/rules/proposed/pr1127.html

**Related info 2:**
http://www.epa.gov/ttn/chief/conference/ei14/session1/schmidt.pdf

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
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<td>January 1995</td>
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**Project Name**

Results of the Measurement of Volatile Organic Compounds from Livestock Wastes

**Project Description**

Evaluate process specific VOCs from dairies in the Sacramento region.

**PI 1**

- Affiliation: Consultant
- Fund Source: US EPA
- Amount: 1

**PI 2**

- Affiliation: PI 2

**PI 3**

- Affiliation: PI 3

**Report Location**

- Related info 1: http://www.4cleanair.org/Documents/APCODetermination.pdf
- Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project ID**
45

**Project Name**
Survey Current Livestock Waste Management Practices in the South Coast Air Basin

**Project Description**
Evaluate manure management practices in the SCAQMD

**PI 1**
Egigian-Nichols
Affiliation PI 1
Tetra Tech Inc

**Fund Source 1**
South Coast AQMD
Amount 1

**PI 2**
Affiliation PI 2

**Fund Source 2**
Amount 2

**PI 3**
Affiliation PI 3

**Fund Source 3**
Amount 3

**Report Location**
http://www.aqmd.gov/rules/support.html#r1127

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project Information

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<td>March 2003</td>
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### Project Name

Literature Survey and National Programs, Livestock Waste Management Practices Survey and Control Option Assessment

### Project Description

Literature survey of waste management and control options.  
http://www.aqmd.gov/rules/proposed/pr1127.html

### Project Team

- **PI 1**: Egigian-Nichols  
  - Affiliation: Tetra Tech Inc  
  - Fund Source: South Coast AQMD  
  - Amount: 1

- **PI 2**:  
  - Affiliation:  
  - Fund Source:  
  - Amount: 2

- **PI 3**:  
  - Affiliation:  
  - Fund Source:  
  - Amount: 3

### Report Location

http://www.aqmd.gov/rules/support.html

### Related info

- Related info 1:  
  -  
- Related info 2:  
  -  

Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
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**Project Description**

Identify livestock practices to reduce emissions.
http://www.aqmd.gov/rules/proposed/pr1127.html

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**Report Location**

http://www.aqmd.gov/rules/support.html

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**California Air Resources Board**  
**Emission Inventory Branch**  
**Summary of Agricultural Emissions Research in California**

<table>
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<td>December 2003</td>
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**Project Name**  
Emissions of Particulate Matter and Ammonia from Cattle Feedyards and Dairies: a Texas-California Partnership

**Project Description**  
Quantify the effects of water application and manure harvest frequency on PM and NH3 emission from dry lots housing beef or dairy animals (heifers).

<table>
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<tbody>
<tr>
<td>B. Auvermann</td>
<td>TAMU CEC</td>
<td>National Center for Manure and Animal Waste</td>
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<tr>
<td>W. Harman</td>
<td>TAMU CEC</td>
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<tr>
<td>D. Meyer</td>
<td>UC Davis</td>
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**Report Location**  
http://www.epa.gov/ttnchie1/conference/ei14/session1/sweeten_pres.pdf

**Related info 1**  

**Related info 2**  

Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
**Project Name**
Evaluating Dairy Process Emissions Using Flux Chambers

**Project Description**
Using environmental flux chambers at a working dairy, evaluate relative emission levels of individual process including lagoons, flush lanes, and corrals.

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<tr>
<td>C. Schmidt</td>
<td>Contractor</td>
<td>ARB</td>
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**Report Location**

**Related info 1**
[http://www.4cleanair.org/Documents/APCORDetermination.pdf](http://www.4cleanair.org/Documents/APCORDetermination.pdf)

**Related info 2**
[http://www.epa.gov/ttn/chief/conference/ei14/session1/schmidt.pdf](http://www.epa.gov/ttn/chief/conference/ei14/session1/schmidt.pdf)

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
<table>
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**Project Name**

Measuring Dairy Cow Emissions in an Environmental Chamber

**Project Description**

Place cows into an environmentally controlled chamber and evaluate speciated VOC emissions emitted directly from cows and from fresh waste products.

### Principal Investigators

<table>
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<tr>
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<tr>
<td>F. Mitloehner</td>
<td>UC Davis</td>
<td>US EPA</td>
<td>$75,000</td>
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<tr>
<td>R. Flocchini</td>
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<tr>
<td>J. Peters</td>
<td></td>
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**Report Location**

http://www.arb.ca.gov/ag/caf/MitloehnerDairyChamberEmissions2006.pdf

**Related info 1**

http://www.4cleanair.org/Documents/APCODetermination.pdf

**Related info 2**


Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project ID
51

## Project Name
Volatile Fatty Acids, Amine, and Phenol Emissions from Cows and their Waste

## Project Description
Compounds were measured from dry and lactating Holstein cows in an environmental chamber.

## PI 1
F. Mitloehner

**Affiliation PI 1**
UC Davis

**Fund Source 1**
ARB

**Amount 1**
$200,000

## PI 2
S. Trabue

**Affiliation PI 2**
USDA ARS

**Fund Source 2**

**Amount 2**

## PI 3
J. Koziel

**Affiliation PI 3**
iSU

**Fund Source 3**

**Amount 3**

## Report Location
http://www.arb.ca.gov/ag/caf/MitloehnerDairyChamberEmissions2006.pdf

## Related info 1
http://www.4cleanair.org/Documents/APCODetermination.pdf

## Related info 2
http://jeq.scijournals.org/cgi/content/full/37/2/615

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project ID: 52
Project Name: Improvement of PM10 emission factors for almond harvesting
Project Description: Refine existing PM10 emission factors for almond harvesting. Estimates based on measured PM10 during almond sweeping and pick up.

PI 1: R. Flocchini
Affiliation PI 1: UC Davis
Fund Source 1: Almond Board of California
Amount 1: 

PI 2: C. Parnell
Affiliation PI 2: Texas A&M

PI 3
Affiliation PI 3

Fund Source 2
Amount 2

Fund Source 3
Amount 3

Report Location:
http://caaqes.tamu.edu/Publications/Publications/PU01107.pdf

Related info 1:

Related info 2:

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project Name
Photochemical Ozone Formation Potential of Agricultural VOC Sources

Project Description
Some recent estimates predict that dairy cattle are second only to on-road vehicles as a leading source of ozone precursor emissions in California's San Joaquin Valley. The objective of this work was to directly measure the ozone formation potential from dairy housing.

PI 1
P. Green

Affiliation PI 1

Fund Source 1
USDA

Amount 1
$300,000

PI 2
F. Mitloehner

Affiliation PI 2

Fund Source 2

Amount 2

PI 3
R. Flocchini

Affiliation PI 3

Fund Source 3

Amount 3

Report Location
http://www.sciedirect.com/science?_ob=ArticleURL&_udi=B6VH3-4S0YXTM-2&_user=1928924&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_version=1&_urlVersion=0&_userid=1928924&md5=e020b1203499a23d500c0127b4460438

Related info 1
presentation at CDPR, date unknown:
http://www.cdpr.ca.gov/docs/emon/vocs/vocproj/vocRegional_ozone.pdf

Related info 2
Alternate site for report: Go to http://dx.doi.org and enter “doi:10.1016/j.atmosenv.2008.02.064”

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project Name
Measuring Broiler Emissions in Tunnel Ventilated Housing

## Project Description
Emissions of PM10, ammonia and organic gasses were measured periodically during the 55 day poultry production cycle including 45 days of production and 10 days between broods.

### PI 1
- **Affiliation PI 1**: CDFA
- **Fund Source 1**: California Poultry Federation
- **Amount 1**: $40,000

### PI 2
- **Affiliation PI 2**: Foster Farms

### PI 3
- **Affiliation PI 3**:

### Fund Source 2
- **Amount 2**:

### Fund Source 3
- **Amount 3**:

### Report Location
http://www.arb.ca.gov/ag/caf/poulemisrpt.pdf

### Related info 1

### Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project Name
Evaluating Dairy Reactive Organic Gas Emissions

Project Description
Chemically speciate ROG samples collected at dairies. Attempt to develop emission factors for dairies and some individually tested dairy processes. Further study continues in 2005-2008 (project IDs 6, 7, 8).

PI 1
C. Krauter
Affiliation PI 1
CSU Fresno
Fund Source 1
ARB
Amount 1
$100,000

PI 2
D. Goorahoo
Affiliation PI 2
CSU Fresno
Fund Source 2
CSU Foundation
Amount 2
$20,000

PI 3
B. Goodrich
Affiliation PI 3
CSU Fresno
Fund Source 3
Amount 3

Report Location

Related info 1
http://www.4cleanair.org/Documents/APCODetermination.pdf

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project Name
ARB Contract 08-279, Dairy Wastewater Treatment Feasibility Study

### Project Description
Assess the feasibility of applying standard wastewater treatment technology to the management of manure from cows in typical California dairies. EPA plans to incorporate this information into its on-going assessment of technologies for dairy manure management.

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<td>Trygve Lundquist</td>
<td>Cal-Poly SLO</td>
<td>US EPA</td>
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### Report Location
(When available) [http://www.epa.gov/region09/ag/dairy/technologies.html](http://www.epa.gov/region09/ag/dairy/technologies.html)

### Related info 1
[http://www.arb.ca.gov/ag/caf/dairypnl/dairypanel.htm](http://www.arb.ca.gov/ag/caf/dairypnl/dairypanel.htm)

### Related info 2
[http://works.bepress.com/tlundqui/2/](http://works.bepress.com/tlundqui/2/)

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project Name
Reducing Emissions of VOCs from Agricultural Soil Fumigation: Comparing Emission Estimates from Simplified Methodology, ARB contract 07-332

Project Description
For a single soil, determine the extent to which laboratory and modeling studies can simulate field emission data. Extend the range of emission reduction strategies assessable in the field using the laboratory and modeling approaches. Variables under investigation include columns/furrows, with tarped/untarped, VIF vs. HPDE covered beds/furrows.

PI 1
Scott Yates
Affiliation PI 1
USDA-ARS-Riverside
Fund Source 1
ARB
Amount 1
$100,000

PI 2
Daniel Ashworth
Affiliation PI 2
USDA-ARS
Fund Source 2
DPR
Amount 2
$50,000

PI 3
Affiliation PI 3
Fund Source 3
Amount 3
$0

Report Location
http://www.arb.ca.gov/research/rsc/10-28-11/item4dfr07-332.pdf

Related info 1
ARB agreement 07-332

Related info 2
USDA project 5310-12130-008-05

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project ID
58

## Project Name
Emission of GHGs Resulting from Greenwaste Composting (09-01 CCOS)

## Project Description
Construct 5 windrows, monitor oxygen, pH, ammonia, nitrate, nitrite, nitric oxide, methane, hydrogen sulfide and moisture at the core of the windrows; collect emission flux samples using an isolation flux chamber and analyze samples for methane, carbon dioxide, nitrous oxide, and IVMNEOC for 100 days

## PI 1
Fatih Buyuksonmez

### Affiliation PI 1
UC San Diego

### Fund Source 1
SJVAPCD

### Amount 1
$198,000

## PI 2

### Affiliation PI 2

### Fund Source 2

### Amount 2
$0

## PI 3

### Affiliation PI 3

### Fund Source 3

### Amount 3
$0

## Estimated Completion Date
January 2010

## Status
Completed

## Fund Source 1
SJVAPCD

## Amount 1
$198,000

## Report Location

## Related info 1

## Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project ID
59

## Project Type
NAEMS: Layer Emissions

## Project Name
NAEMS Project: Air Emissions from California Layer Farms (NAEMS CA2B)

## Project Description
This project is for conducting a two-year measurement and monitoring of air emissions from a layer farm in CA. The emissions from two mechanically ventilated layer houses are measured. The houses have approximately 68,000 hens in cages. The measured emissions include ammonia, hydrogen sulfide, carbon dioxide, volatile organic compounds, total suspended particulates, PM2.5 and PM10. In addition, the detailed information and data are collected on ventilation, indoor and outdoor environmental conditions.

## PI 1
- **Affiliation**: UC Davis
- **Fund Source**: Ag Air Research Council
- **Amount**: $199,000

## PI 2
- **Affiliation**: PI 2
- **Fund Source**: Amount 2
- **Amount**: $0

## PI 3
- **Affiliation**: PI 3
- **Fund Source**: Amount 3
- **Amount**: $0

## Report Location
Interim site data: [http://www.epa.gov/airquality/agmonitoring/data.html](http://www.epa.gov/airquality/agmonitoring/data.html)

## Related info 1
Data under review/compilation by US EPA

## Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project ID: 60
#### Project Name:
NAEMS Project: Air Emissions from California Broiler Farms (NAEMS CA1B)

#### Project Description:
This project is for conducting a two-year measurement and monitoring of air emissions from a broiler farm in CA. The emissions from two mechanically ventilated broiler barns are measured. The two broiler barns house about 42,000 broilers in each chicken production cycle. The measured emissions include ammonia, hydrogen sulfide, carbon dioxide, methane, nitrous oxide, ethanol, volatile organic compounds, total suspended particulates, PM2.5 and PM10. In addition, the detailed information...

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<tr>
<td>PI 1</td>
<td>R. Zhang</td>
<td>Ag Air Research Council</td>
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#### Estimated Completion Date: July 2010

#### Report Location:
http://www.epa.gov/airquality/agmonitoring/techdocs.html

---

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project Name**
ARB Contract 09-325, Assessment of Baseline Nitrous Oxide Emissions in California Dairy Systems

**Project Description**
N2O emissions will be measured in silage corn systems of three dairy farms in Stanislaus County. The N2O flux will be measured intensively, using static chamber techniques. Annual N2O emissions will be calculated. The annual N inputs in the form of solid manure, lagoon water, and synthetic fertilizer will be accounted for to enable calculation of the fraction of applied N that was emitted as N2O, i.e., the system specific emission factor.

**PI 1**
William Horwath
Affiliation - UC Davis

**PI 2**
Affiliation -

**PI 3**
Affiliation -

**Fund Source 1**
ARB
Amount - $82,000

**Fund Source 2**
EDF
Amount - $100,000

**Fund Source 3**

Amount - $0

**Report Location**
http://arb.ca.gov/research/apr/past/09-325.pdf

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project ID: 62
### Project Name:
ARB Contract 09-329, Determining Nox Emissions from Soil in California Cropping Systems to Improve Ozone Modeling

### Project Description:
This is an add-on component to the three on-going baseline nitrous oxide (N2O) monitoring efforts. The results of the study are expected to provide an estimate of NOx emissions from California’s agricultural soils and ozone modeling input by including NOx emissions from the soil. See Project IDs 77, 78, 79, & 81.

### PI 1
William Horwath  
UC Davis

### PI 2
M. Burger  
UC Davis

### PI 3
Affiliation PI 3

### Fund Source 1
ARB  
$83,500

### Fund Source 2

### Fund Source 3

$0

### Estimated Completion Date
November 2013

### Status
Completed

### Estimated Completion Date
November 2013

### Report Location
https://www.arb.ca.gov/research/apr/past/09-329.pdf

### Project Type
Soil NOx Emissions Assessment

### Fund Source 2
Amount 2

### Fund Source 3
Amount 3

$0

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717

Date: 4/21/2017
## Project ID
63

## Project Name
**ARB Contract 06-329, Flux Measurements of Biogenic Precursors to Ozone and Particulate Matter in the Central Valley**

## Project Description
Develop BVOC simulation platform for central valley agricultural operations and test the modeling performance through ozone and aerosol nucleation event measurements. Micro-meteorological to landscape level emission flux measurement program for certain selected crops identified during the screening phase.

## PI 1
**Allen Goldstein**<br>**Affiliation PI 1**<br>UC Berkeley

### Fund Source 1
**Fund Source 1**<br>ARB<br>**Amount 1**<br>$400,003

## PI 2
**John Karlik**<br>**Affiliation PI 2**<br>UC Berkeley, Ag Extension

### Fund Source 2
**Fund Source 2**<br>**Amount 2**<br>$0

## PI 3
**Affiliation PI 3**

### Fund Source 3
**Fund Source 3**<br>**Amount 3**<br>$0

## Report Location
http://www.arb.ca.gov/research/rsc/06-09-11/agenda3_contract%2006-329_dfr_ash.pdf

## Related info 1

## Related info 2

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Please provide project updates and corrections to:<br>Janet Spencer, Air Quality Planning and Science Division<br>jspencer@arb.ca.gov<br>916.324.2717

---

**Project Type**<br>Biogenic VOC Emissions

**Status**<br>Completed

**Estimated Completion Date**<br>May 2011
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**Project Name**
ARB Contract 09-339, Improving Regional Biogenic VOC Emissions Estimate Using an Airborne PTR MS Eddy Flux Measurement System

**Project Description**
Collect regional concentrations data for the full suite of BVOC species, develop new land cover databases, with proper scaling methodology. The results of this project would strengthen ARB BVOC inventory and improve the modeling of ozone and aerosols in ARB SIP.

**PI 1**
Allen Goldstein
Affiliation: UC Berkeley
Fund Source 1: ARB
Amount 1: $400,000

**PI 2**
Alex Guenther
Affiliation PI 2: Natl Center Atm Research
Fund Source 2: 
Amount 2: $0

**PI 3**
Halfidi Jonsson
Affiliation PI 3: CIRPAS
Fund Source 3: 
Amount 3: $0

**Report Location**

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project ID
65

## Project Name
Removal of H2S from Biogas and NOx from Engine Exhaust at a Dairy Digester Using Microwave Technology, contract #ICAT 0803

## Project Description
The project will monitor the performance of the H2S removal system and the NOx removal system on the biogas powered engine at the Tollenaar Holsteins Dairy Farm. Anaerobic digester gas (biogas) is captured from a heated, mixed digester and used to fuel a 212 kW Guascor engine-generator. H2S is currently removed from the biogas using an aerated water bubbler system (Soloscrub).

## PI 1
**Mark Rawson**
Affiliation: SMUD

**Fund Source 1**
SMUD
**Amount 1**
$246,309

## PI 2
**Chang Cha**
Affiliation: Cha Corporation

**Fund Source 2**
**Amount 2**
$0

## PI 3
**Dan Greenberg**
Affiliation: Applied Filter Technology

**Fund Source 3**
**Amount 3**
$0

## Report Location

## Related info 1

## Related info 2

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Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
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**Project Name**
Reductions of Fumigant Emissions using Irrigation and Virtually Impenetrable Film (VIF)

**Project Description**
Reductions of Fumigant Emissions using Irrigation and Virtually Impenetrable Film (VIF) for 1,3-D, chloropicrin, methyl bromide

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**Report Location**

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
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Report Location

http://www.epa.gov/osp/hstl/AgCon.proceedings_print.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project Information

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**Project Name**
Reductions of Fumigant Emissions using Irrigation and Virtually Impermeable Films (VIF)

**Project Description**
Reductions of Fumigant Emissions using Irrigation and Virtually Impermeable Films (VIF) for 1,3-D, Chloropicrin and methyl bromide

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**Report Location**
http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=185286

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
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**Project Name**
Reductions of Fumigant Emissions using Irrigation

**Project Description**
Evaluation of reductions in fumigant emissions using tarps; focus on 1,3-D.

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**Report Location**

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project Name
ARB Contract 10-309, Calibrating, validating, and implementing process models for CA agriculture greenhouse gas emission estimation, ARB contract #10-309

Project Description
Improve earlier attempts of companion projects to calibrate & validate N2O models for CA conditions and estimate N2O emissions for CA crop specific fertilizer levels, measure N2O flux and physical variables

PI 1
Changsheng Li
Affiliation PI 1
Univ New Hampshire

Fund Source 1
ARB
Amount 1
$250,000

PI 2
William Salas
Affiliation PI 2
Applied GeoSolutions, LLC

Fund Source 2
Amount 2
$0

PI 3
Affiliation PI 3

Fund Source 3
Amount 3
$0

Report Location
http://www.arb.ca.gov/research/rsc/1-31-14/item11dfr10-309.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project ID
71

### Project Name
ARB Contract 11-313, Evaluating Mitigation Options of Nitrous Oxide Emissions in California Cropping Systems

### Project Description
Evaluate alternative management practices with greatest promise of reducing annual N2O emissions while maintaining productivity in lettuce, corn and tomatoes. Proposed strategies are: targeting fertilizer types and timing of their application, delaying nitrification by using urease and nitrification inhibitors, spatially decreasing the concentration of applied N fertilizer, and modifying irrigation methods.

### PI 1
**Affiliation PI 1**
UC Davis

### Fund Source 1
**Fund Source 1**
ARB
**Amount 1**
$400,000

### PI 2
**Affiliation PI 2**
UC Davis

### Fund Source 2
**Fund Source 2**
**Amount 2**
$0

### PI 3
**Affiliation PI 3**
UC Davis

### Fund Source 3
**Fund Source 3**
**Amount 3**
$0

### Report Location
https://www.arb.ca.gov/research/apr/past/11-313.pdf

### Related info 1
http://www.arb.ca.gov/research/single-project.php?row_id=65096

### Related info 2
www.arb.ca.gov/ag/fertilizer/meetings/Proposal11-313.pdf

---

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
# MISTING: A Viable Conservation Management Practice For Reducing PM10 Generated by Disking

## Project Description
Quantify and substantiate PM-reducing potential of an existing DCU misting apparatus attached to a common agricultural disk, as well as other variables such as temperature reduction of dust plume, emission factors, night farming

### PI 1
**Alex Alexandrou**
Affiliation: CSU Fresno

### PI 2
**C. Krauter**
Affiliation: CSU Fresno

### PI 3
**S. Ashkan**
Affiliation: CSU Fresno

## Report Location

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project Summary

**Project ID** 73  
**Project Name** Effects of sweeping depth on particulate matter emissions from almond harvest operations  
**Project Description** Evaluate the effects of sweeper depth on particulate matter (PM) emissions from sweeping and pickup operations

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**Report Location**


Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
### Project ID
74

### Project Name
Improving PM10 Emission Factors for Almond Sweeping and Harvesting

### Project Description
Update almond sweeping and harvesting emission factors using dispersion modeling

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### Fund Source 3

### Estimated Completion Date
2009

### Status
Completed

### Estimated Completion Date
2009

### Project Type
Almond Harvest Emissions

### Project Type
Almond Harvest

### Project Type
Emissions

### Fund Source 1

### Fund Source 2

### Fund Source 3

### Report Location
http://www.almonds.com/growers/resources/research-database

### Related info 1
http://betalab.tamu.edu/Papers/Almond/AnnualReport2010.pdf

### Related info 2

### Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717

### Date
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**Project Name**
Particulate matter emission factors for almond harvest as a function of harvester speed

**Project Description**
Evaluate reduction in almond harvesting PM for reducing harvester ground speed from 5 mph to 2.5 mph using ISCST3 and AERMOD to back calculate emission rates

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**Report Location**

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project ID**: 76  
**Project Name**: Harvesting Equipment to Reduce PM Emissions from Almond Harvest Operations  
**Project Description**: Compare emissions from new almond harvesting systems and retrofit abatement devices to emissions from a conventional harvester.

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**Report Location**: Not available

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
### Project Name
ARB Contract No. 08-324, Fertilizer N2O Research, Assessment of Baseline Nitrous Oxide and Nitric Oxide Emissions in California Cropping Systems

### Project Description
Researchers are coordinating study goals and methods on 4 separate studies to evaluate flux emissions of N2O using typical fertilizer practices for each crop. Work began in June 2009. Measuring nitrous oxide flux in tomato, wheat, lettuce, rice, vineyard, orchard and alfalfa systems to develop emission factors. See also Project IDs 62, 78, 79 & 81.

<table>
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<td>ARB</td>
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**Report Location**
http://www.arb.ca.gov/research/rsc/05-11-12/item4dfr08-324.pdf

**Related info 1**
See Project ID 62, contract 09-329, which is an add-on to study nitric acid

**Related info 2**
Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
<table>
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<td>2013</td>
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**Project Name**
Fertilizer N2O Research, Assessment of Baseline Nitrous Oxide and Nitric Oxide Emissions in California Cropping Systems (CEC Contract)

**Project Description**
Researchers are coordinating study goals and methods on 4 separate studies to evaluate flux emissions of N2O using typical fertilizer practices for each crop. Work began in June 2009. Measuring nitrous oxide flux in tomato, wheat, lettuce, rice, vineyard, orchard and alfalfa systems to develop emission factors. See also Project IDs 62, 77, 79 & 81.

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**Report Location**
http://www.arb.ca.gov/research/rsc/05-11-12/item4dfr08-324.pdf

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
Project Name
Measuring and Modeling Nitrous Oxide Emissions from California Cotton (CDFA Contract)

Project Description
Researchers are coordinating study goals and methods on 4 separate studies to evaluate flux emissions of N2O using typical fertilizer practices for each crop. Work began in June 2009. Measuring nitrous oxide flux in tomato, wheat, lettuce, rice, vineyard, orchard and alfalfa systems to develop emission factors. See also Project IDs 62, 77, 78 & 81.

PI 1
Affiliation PI 1
Fund Source 1
Amount 1
$150,000

PI 2
Affiliation PI 2
Fund Source 2
Amount 2
$0

PI 3
Affiliation PI 3
Fund Source 3
Amount 3
$0

Report Location
Results incorporated into DNDC model; preliminary report site: https://www.arb.ca.gov/research/seminars/n2o/goorahoo.pdf

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
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<td>March 2016</td>
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**Project Description**
Silage emissions include criteria pollutants (e.g. VOCs, NOx) and greenhouse gases. This project aims to quantify and model the effectiveness of various mitigation practices (such as maintaining a smooth pile face, storing silage in ag bags, etc.) on the various emissions species. Factors such as silage exposure surface area, temperature, air velocity, etc. will also be measured and analyzed.

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**Report Location**
http://www.arb.ca.gov/research/single-project.php?row_id=65102

**Related info 1**

**Related info 2**
Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project ID** 81  
**Project Name** Assessment of Baseline Nitrous Oxide Emission in Response to a Range of Nitrogen Fertilizer Application Rates in Corn Systems (CDFA Contract)  
**Project Description** Researchers are coordinating study goals and methods on 4 separate studies to evaluate flux emissions of N2O using typical fertilizer practices for each crop. Work began in June 2009. Measuring nitrous oxide flux in tomato, wheat, lettuce, rice, vineyard, orchard and alfalfa systems to develop emission factors. See also Project IDs 62, 77, 78 & 79.

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**Report Location**
http://www.cdfa.ca.gov/is/ffldrs/frep/pdfs/completedprojects/12-0453-SA113-615FRBurgerHorwath.pdf

**Related info 1**
www.cdfa.ca.gov/is/docs/12-0453-SABurger.pdf

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
**Project ID** 82  
**Project Name** Assessing practices and influencing policy to mitigate nitrous oxide (N2O) emissions from California Agriculture  
**Project Description** Evaluate N2O mitigation potential of nitrogen management practices and N use efficiencies in important CA cropping systems.

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**Report Location** Not Available

**Related info 1**  
http://nitrogen.ucdavis.edu/research/nitrogen/documents  

**Related info 2**  

Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717
Use of Walnut Biochar to improve soil properties and reduce N2O emissions

Researchers are investigating the influence of biochar on the soil N cycle and carbon sequestration in a variety of crops. This study evaluates biochar from walnut shells applied to the walnuts orchards as compost.

PI 1
Johan Six
Affiliation PI 1
UC Davis

Fund Source 1
CEC
Amount 1
$80,834

PI 2
Affiliation PI 2

Fund Source 2
Amount 2
$0

PI 3
Affiliation PI 3

Fund Source 3
Amount 3
$0

Report Location
Preliminary: http://www.plantsciences.ucdavis.edu/Agroecology/Outreach/Walnut.html

Related info 1

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
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## Project Name
Compost Life Cycle Analysis

## Project Description
Evaluate N2O and CH4 emissions in compost production and from applications of finished compost to almonds, tomatoes and row crops.

### PI 1
- **Affiliation PI 1**: UC Davis
- **Fund Source 1**: CalRecycle
- **Amount 1**: $450,000

### PI 2
- **Affiliation PI 2**: 
- **Fund Source 2**: 
- **Amount 2**: $0

### PI 3
- **Affiliation PI 3**: 
- **Fund Source 3**: 
- **Amount 3**: $0

## Report Location
http://www.calrecycle.ca.gov/Publications/Documents/1544%5C201501544.pdf

## Related info 1

## Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
## Project Name

## Project Description
Develop screening methodology to assess the VOC emissions potential of silage piles. Validate the methodology with measurements at different stages from ensiling to delivery to feed lanes. Assess reductions associated with various mitigation measures.

## PI 1
**Deeane Meyer**

**Affiliation PI 1:** UC Davis

**Fund Source 1:** CDFA

**Amount 1:** $219,000

## PI 2
**Peter Robinson**

**Affiliation PI 2:** UC Davis

**Fund Source 2:** Dairy CARES

**Amount 2:** $0

## PI 3
**Jennifer Heguy**

**Affiliation PI 3:** UCCE Stanislaus County

**Fund Source 3:** Amount 3

**Amount 3:** $0

## Report Location

## Related info 1
See project 93

## Related info 2

---

Please provide project updates and corrections to:

Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project ID
86

### Project Name
NOx emissions from a Central California dairy

### Project Description
NOx and ozone were measured at a commercial dairy in Central California during 2011–12. Ambient and flux chamber measurements assessed the potential contribution of dairy feed to NOx emissions. Additional flux chamber measurements were also made using fresh silage from the dairy on the Fresno State campus.

### PI 1
Alam Hasson

### Affiliation PI 1
CSU Fresno

### Fund Source 1
USDA AFRI

### Amount 1

### PI 2
Shawn Ashkan

### Affiliation PI 2
CSU Fresno

### Fund Source 2
Nat'l Science Foundation

### Amount 2
$0

### PI 3
Steven Trabue

### Affiliation PI 3
Nat'l Lab for Ag & Environ

### Fund Source 3

### Amount 3
$0

### Report Location

### Related info 1

### Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
### Project ID
87

### Project Name
Air Curtain Burner Evaluation

### Project Description
SJVAPCD demonstration project: Modify and test Burn Boss Air Curtain Burner to burn paper harvesting trays in the field. Modified unit with PTO for tractor use, portability.

### PI 1
Sun-Maid Growers

### Affiliation PI 1
Sun-Maid Growers

### Fund Source 1
Amount 1
$10,000

### PI 2
Nisei Farmers

### Affiliation PI 2

### Fund Source 2
Amount 2
$0

### PI 3
Kfar Equipment Co.

### Affiliation PI 3

### Fund Source 3
Amount 3
$0

### Related info 1
http://www.valleyair.org/Workshops/postings/2012/12-20-12PM25/FinalVersion/07%20Chapter%20Technology%20Advancement.pdf

### Related info 2
Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
# Project ID
88

# Project Name
Optimizing the Use of Groundwater Nitrogen for Nut Crops

# Project Description
Nitrate nitrogen research on advance grower practice using the "pump and fertilize" method in vulnerable groundwater areas for almond and pistachios. The research will evaluate whether the "pump and fertilize" method is effective in reducing use of nitrogen fertilizer based on the nitrates available in the ground water, and subsequently reduces nitrate levels in groundwater aquifers.

## Fund Sources

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<td>Jan Hopmans</td>
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# Report Location

Related info 1
http://www.cdfa.ca.gov/is/ffldrs/frep/index.html

Related info 2

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project ID**

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<td>September 2016</td>
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**Project Name**

ARB Contract 14-306, Improving DNDC Modeling Capability to Quantify Mitigation Potential of Nitrous Oxide from California Agricultural Soils

**Project Description**

This project will develop and deliver a modeling tool that will allow for the quantification of the emission reduction potentials from various N2O mitigation strategies that have been identified through previous ARB research. Previous studies have delivered to ARB a validated California-specific modeling tool based on DeNitrification-DeComposition (DNDC), incorporating largely business as usual management practices for baseline emission assessment. However, the model needs further

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**Related info 1**

See Project ID 70

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
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**Project Name**
Assessment of Control Methods for PM10 Emissions from Dairy and Feedlot Corrals

**Project Description**
Particulate matter testing at four dairies and feedlots was conducted to determine emission rates and assess the efficacy of various PM10 emission control methods. The control measures tested included: no control, sprinklers, scrape and remove, modified feed time, and scrape/remove/replace.

**PI 1**
- **Affiliation PI 1**: Winegar Air Sciences
- **Fund Source 1**: CDFA
- **Amount 1**: $120,000

**PI 2**
- **Affiliation PI 2**:        
- **Fund Source 2**: SJVAPSA
- **Amount 2**: $19,000

**PI 3**
- **Affiliation PI 3**:        
- **Fund Source 3**: $0

**Report Location**
https://docs.google.com/file/d/0B8uymxkFP0nwemRUZTdjejFqb2c/edit?usp=drive_web&pli=1

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project Name**

**Project Description**
Evaluate emissions using flux chambers to test a screening method to quantify VOC, GHG and select N compounds from dairy silage and Total Mixed Ration (TMR).

**PI 1**
C. Schmidt
Affiliation PI 1
Independent

**Fund Source 1**
SJV Study Agency
Amount 1
$89,600

**PI 2**
Affiliation PI 2

**Fund Source 2**
CDFA
Amount 2
$9,600

**PI 3**
Affiliation PI 3

**Fund Source 3**
Amount 3
$0

**Report Location**
https://drive.google.com/file/d/0B3X7LDg6i_haTlpFbDNBSndSUms/view?usp=sharing

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project Name**
ARB Contract 16RD001, Characterize California-specific Cattle Feed Rations and Improve Modeling of Enteric Fermentation for California’s Greenhouse Gas (GHG) Inventory

**Project Description**
The U.S. EPA uses Cattle Enteric Fermentation Model (CEFM), which is a spreadsheet-based mathematical model and the basis of California’s inventory, to estimate enteric methane emissions from cattle. However, some values that the model assigns are single values applied nationwide and thus do not represent the variability by state or region for estimating the enteric CH4 emissions. This study is intended to develop a set of empirical mathematical models for estimating enteric CH4 emissions.

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**Report Location**

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**Related info 2**

Please provide project updates and corrections to:
Janet Spencer, Air Quality Planning and Science Division
jspencer@arb.ca.gov
916.324.2717
**Project ID** 93  
**Project Name** ARB Contract 16RD002, Characterize Physical and Chemical Properties of Manure in California Dairy Systems to Improve Greenhouse Gas (GHG) Emission Estimates

**Project Description**
Dairy farms will be selected to represent the various types of manure management systems, including scraping, flushing, solids separation, lagoon storage, covered lagoon digestion, and solids digestion, etc. Representative samples of manure will be taken from each manure pathway to determine the nutrient flow at each stage of management. Results will be compared to U.S. EPA assumptions about VS in manure management systems modeled according to farm-size, temperature, and other.

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**Report Location**

**Related info 1**

**Related info 2**

Please provide project updates and corrections to:  
Janet Spencer, Air Quality Planning and Science Division  
jspencer@arb.ca.gov  
916.324.2717