State of California
AIR RESOURCES BOARD

Characterize California-specific Cattle Feed Rations and Improve Modeling of Enteric Fermentation for California's Greenhouse Gas (GHG) Inventory

RESEARCH PROPOSAL

Resolution 15-31

July 23, 2015

Agenda Item No.: 15-6-2

WHEREAS, the Air Resources Board (ARB or 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 2795-283, titled "Characterize California-specific Cattle Feed Rations and Improve Modeling of Enteric Fermentation for California's Greenhouse Gas (GHG) Inventory," has been submitted by the University of California, Davis, for a total amount not to exceed $99,964;

WHEREAS, the Research Division staff has reviewed Proposal Number 2795-283 and finds that in accordance with Health and Safety Code section 39701, research is needed to develop a set of empirical mathematical models for improved enteric methane emissions from California's cattle using California-specific inputs; and

WHEREAS, in accordance with Health and Safety Code section 39705, the Research Screening Committee has reviewed and recommends funding the Research Proposal.

NOW, THEREFORE BE IT RESOLVED that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39700 through 39705, hereby accepts the recommendations of the Research Screening Committee and staff and approves the Research Proposal.

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 Proposal as further described in Attachment A, in an amount not to exceed $99,964.

I hereby certify that the above is a true and correct copy of Resolution 15-31 as adopted by the Air Resources Board.

Tracy Jensen

Tracy Jensen, Clerk of the Board

ATTACHMENT A

"Characterize California-specific Cattle Feed Rations and Improve Modeling of Enteric Fermentation for California's Greenhouse Gas (GHG) Inventory"

Background
Enteric emissions comprise the largest known source (30 percent) of methane (CH_4) in California. Enteric fermentation is a microbial fermentation process that occurs in the digestive tract that produces CH_4 as a byproduct and mostly eructated by ruminant animals such as cattle. The amount of CH_4 produced from enteric fermentation depends primarily on feed intake and diet composition, which can vary widely across the state depending on feed availability and cost. Due to large numbers of ruminant animals, enteric CH_4 emission estimates for GHG inventories must rely on mathematical models. The United State Environmental Protection Agency (U.S. EPA) uses the 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 enteric CH_4 emissions.

Objective
The purpose of this study is to improve the modeling methodology for estimating cattle enteric fermentation emissions in the California GHG Emission Inventory by collecting and modeling California-specific feed data.

Methods
The investigator will collect data on California cattle pertaining to animal and diet characteristics, develop and evaluate a set of models for estimating enteric methane emissions using data representative of California cattle and diet characteristics, and apply the evaluated models on distinct groups and obtain improved total enteric CH_4 emission estimates for California cattle.

Expected Results
A set of empirical mathematical models will be developed for improved enteric CH_4 emissions from California's cattle using California-specific inputs.

Significance to the Board
The improved CH_4 emissions estimate will better reflect on-farm realities, allow better tracking of other feed-related issues such as nitrogen, and better inform policy decisions for focusing sectorial greenhouse gas goals and development of short-lived climate pollutant reduction strategies.

Contractor:
The University of California, Davis

Contract Period:
18 months

Principal Investigator (PI):
Ermias Kebreab, Ph.D.

Contract Amount:
$99,964

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 University of California, Davis (UCD) as an institution is uniquely capable to perform this research, given previous experience of its researchers and the database and resources they hold. Dr. Kebreab is a well-established animal scientist at the Department of Animal Science and Deputy Director of the Agricultural Sustainability Institute at UCD. His team is well-positioned to carry out the research tasks, having authored over 50 peer-reviewed publications on animal nutrients since 2011. The team possesses a broad expertise in systematic approach to quantifying GHG emissions in agriculture, and mathematical modeling and mitigation of emissions from animals, manure and soil. The project is particularly cost-effective as it will build upon previous projects, funded by the U.S. Department of Agriculture, and other federal and state agencies.

Prior Research Division Funding to the University of California, Davis:

Year	2014	2013	2012
Funding	$ 2,249,136	$ 1,131,716	$ 4,949,363

BUDGET SUMMARY

The University of California, Davis

Characterize California-specific Cattle Feed Rations and Improve Modeling of Enteric Fermentation for California's Greenhouse Gas (GHG) Inventory

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 90,876	
2.	Subcontractors	$ 0	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 0	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 0	
9.	Analyses	$ 0	
10.	Miscellaneous	$ 0	
	Total Direct Costs		$ 90,876
INDIRECT COSTS			
1.	Overhead	$ 9,088	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$ 9,088
TOTAL PROJECT COSTS			**$ 99,964**