



UNIVERSITY OF CALIFORNIA, MERCED

MOBILE BIOCHAR PRODUCTION FOR METHANE EMISSION REDUCTION AND SOIL AMENDMENT

PRINCIPAL INVESTIGATOR: **Gerardo C. Diaz**, Associate Professor, School of Engineering

INNOVATION CENTER RESEARCH GRANT
\$ 3,088,188.00
Duration: 36 Months

RESEARCH INNOVATION FIELD
<input type="checkbox"/> Carbon Dioxide Removal <input checked="" type="checkbox"/> Methane Reduction <input type="checkbox"/> Heating, Cooling, and Thermal Storage

The overall goal of this proposal is to determine how biochar can be produced and used in a closed cycle agricultural application to reduce GHG emissions, ameliorate agricultural waste disposal problems, improve the quality of life in low-income and disadvantaged farming and adjacent communities, and identify means to gain acceptance among farmers of small-scale biochar production and use as a sustainable best practice for California agriculture.

PARTNERS:	<ul style="list-style-type: none"> ➤ University of California, Merced ➤ Professional Traffic Solutions ➤ Nuevo Durango ➤ California Agriculture Resource Management ➤ Green Carbon Nexus
RESEARCH ACTIVITIES	<ul style="list-style-type: none"> ➤ The research team will lead a full-system development and field demonstration of a mobile platform for at-source biochar production. A fraction of the biochar produced will be utilized to analyze optimal mixtures of biochar and animal manure with the purpose of reducing methane emission from composting facilities. The project will also determine how application of biochar and biochar and manure mixtures affects GHG fluxes from soil, using field deployed flux chambers, and it will perform a cradle-to-grave economic analysis of collection, deployment, and utilization of biochar and manure compost mixtures based on the availability of a mobile pyrolysis unit.
FACILITATES GREENHOUSE GAS EMISSIONS REDUCTIONS:	<ul style="list-style-type: none"> ➤ In 2016, agriculture generated around 8% of emissions in California, 34% from manure management. Dairy farms are the single largest contributor to California’s man-made methane production. The addition of biochar to manure composting reduces emissions from manure management by 27% to 32%. This means that a successful biochar practice has the potential to reduce methane emissions from manure management by at least 2.74 MMT CO₂ per year. In addition, a mobile platform will provide an alternative to open burning of agricultural waste that emits NO_x and PM_{2.5}, which are expected to rise despite stringent regulations from CARB.
BENEFITS DISADVANTAGED AND LOW INCOME COMMUNITIES:	<ul style="list-style-type: none"> ➤ From an air quality perspective, residents will experience relief from the chronic malodorous smells from their proximity to dairy operations. As pyrolytic biochar production is not a biomass-combustion process, air quality will accrue from reduction and elimination of open field burning and biomass-fired power plant emissions. Additionally, low-income and disadvantaged community residents will also have improved employment prospects as closed loop biochar production and use will help improve agricultural productivity and profitability, stabilizing farming operations. Also, to the extent that a surplus of biochar can be produced in the long term, additional employment prospects will materialize as the biochar industry expands.
ENGAGEMENT ACTIVITIES	<ul style="list-style-type: none"> ➤ A key element of the research effort is to engage the farming community into the design and operation of the biochar production equipment to minimize disruption to existing farming practices. In addition, an extensive outreach effort will be mounted to familiarize all stakeholder groups with the purpose, benefits, and process of biochar production and use to facilitate widespread adoption once the research effort is completed. Initial deployment will center on the low-income farming communities of Madera County and Merced County.