EXECUTIVE SUMMARY: *(State in layman's terms the application's broad, long-term objectives and specific aims, making reference to the potential public benefits of the project for California.)*

Greenhouse gas emissions have been implicated as the cause of a recent increase in the global temperature of the planet. Agricultural processes involve bacterial processes and are responsible for about 14% of global emissions of these greenhouse gases; an amount larger than emitted by the transportation industry. The gases released by agriculture are primarily nitrogen-oxide compounds (NO, NO_2, N_2O) and can, in the case of N_2O, absorb approximately 300 times more heat energy from the sun than carbon dioxide, making their presence in the atmosphere that much more damaging. Strategies for limiting greenhouse gas emissions on a global scale require an accurate assessment of the gases released. In this work, Fourier-transform infrared spectroscopy will be used to determine both the type and amount of gases emitted in a mock-agricultural system. In addition, experimental factors such as local oxygen content, moisture level, and fertilizer type will be controlled in order to determine how each contributes to greenhouse gas production. This research will allow microbiologists to determine which bacterial strains operate most efficiently, and under what conditions in an agricultural environment. This could lead to crossbreeding of bacterial strains, leading to more efficient uptake of nutrients by plants thus lowering costs to farmers by reducing the need for fertilizers, and reducing greenhouse gas emissions.