Linking Microbial Activity and Fertilizer Management to Potential Greenhouse Gas Emissions from Rooftop Farms in Urban Areas

Angela Yin Yee Kong
Associate Research Scientist
NASA-GISS, Center for Climate Systems Research, Earth Institute

Abstract.
There is a growing movement in cities to utilize rooftops for urban agriculture as a potential solution to urban food insecurity. Unfortunately, it is unclear how rooftop farm fertilizer management practices will impact urban environments that are already challenged with elevated greenhouse gas emissions and the effects of climate change. To expand our understanding of the relationship between N_2O and NO emissions and fertilizer inputs to rooftop farms, I propose to link nitrogen (N) processes in rooftop farming systems to ammonia-oxidizing and denitrifying bacteria communities, whose byproducts (N_2O and NO) contribute to global warming. First, I will quantify the pools of N (availability and losses) associated with a range of fertilizer amendments to rooftop growing media in a greenhouse study. Second, the measurements of the N pools in the greenhouse study will be coupled to functional gene assays that quantify the abundance of ammonia-oxidizing and denitrifying bacteria associated with the fertilizer inputs. The latter aspect of this study has been designed to be appropriate for an undergraduate summer intern to execute. Results from this study will ultimately lead to a better understanding how rooftop farming practices may affect trace gas emissions and climate change in urban areas. Furthermore, this work is aimed at leveraging an NSF research grant to study the role of rooftop farming systems in mitigating and adapting to climate change in urban areas.