

2018 Summer Student Faculty Research Project
Improving Utilization of Biogas and Digester Effluent for Sustainability at the College Farm
Max Lee (Environmental Science, Biology '19) and **Matt Steiman** (College Farm)

This summer, Maxwell Lee worked with Matt Steiman on a diverse project to improve the productivity and efficiency of biogas systems at the College Farm. Biogas is a gaseous fuel produced from digesting food waste and manure, in an oxygen-free environment. After this fuel is captured, it can power stoves, log-splitters and generators. In addition to biogas, a nutrient-rich liquid effluent is produced which serves as crop fertilizer. Max and Matt explored mechanisms to increase production and utilization of both biogas and effluent on the farm.



First, they expanded biogas production by finishing construction of a second digester, effectively doubling the total production of gas at the farm. The collected biogas was used to process sheep fat for making soap, generate steam to sterilize potting soil, cook food, preserve pickles, mechanically split logs for the farm's pizza oven, and even power a generator. By powering all these tasks with biogas produced on-site, the college farm reduced its consumption of non-renewable fuels normally used for these tasks (gasoline, propane and purchased electricity). Additionally, Max explored how biogas effluent could be used to aide composting food waste into nutrient-rich soil and fertilize different types of seedlings. His findings showed that compost piles fed with effluent resulted in more efficient composting, and that fertilizing seedlings with biogas resulted in larger plants that produced more vegetables! The vegetables grown with high amounts of effluent also had higher levels of vitamin C. They also explored the feasibility easing gas transportation around the farm by developing a system for pressurizing and transferring gas through a small pipeline (as opposed to manual transfer in carts – the current standard). After meeting with the PADEP, local fire officials and township code agents, the process to gain permission for the pipeline project is in motion.

