Applying Agricultural Practices to the Port of Baltimore

Cleaning Up the Port and Producing Sustainable Energy
Dec 20, 2017
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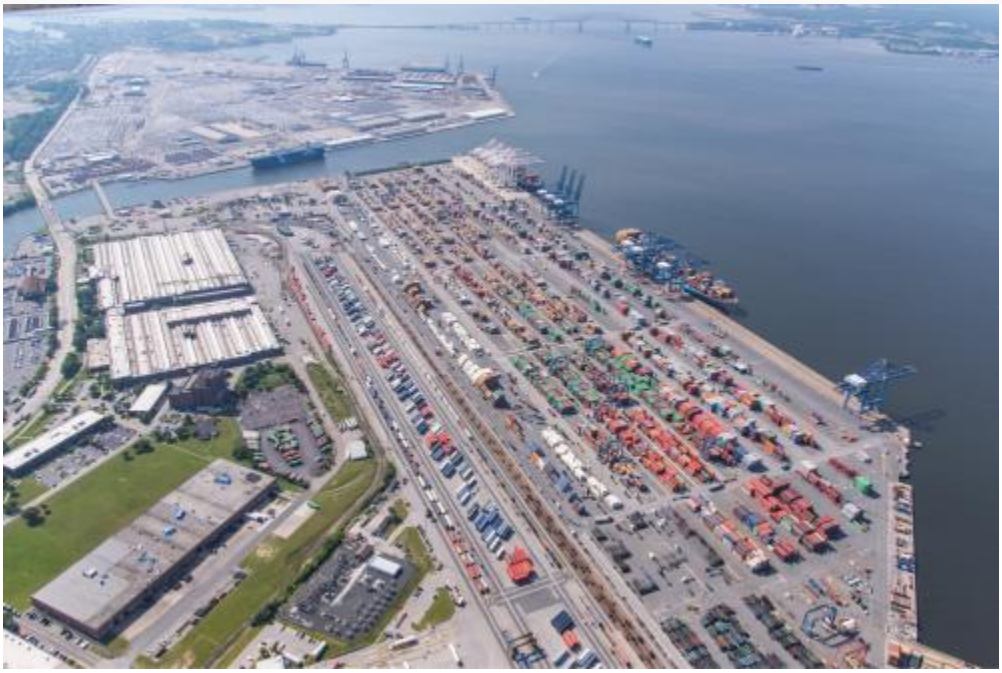

The College of Agriculture and Natural Resources is serving the state and partnering with the Maryland Department of Transportation Port Administration (MDOT MPA) and the Maritime Administration (MARAD) of the U.S. Department of Transportation to pilot innovative sustainable technology with the goal of cleaning up the Port of Baltimore.

The Port of Baltimore is actively trying to reduce pollution in the Chesapeake Bay and discover new ways to increase the overall sustainability of the Port. Dr. Stephanie Lansing, Associate Professor in the Department of Environmental Science and Technology, is leading a pilot project to explore ways to achieve this goal. Dr. Patrick Kangas and Dr. Peter May, also of Environmental Science and Technology, built a treatment system using algae as a filtration system, resulting in excess nutrients being removed from the water. Nutrient pollution causes the water to be low in oxygen, killing the wildlife and throwing off the natural ecosystem. This project not only combats this issue, but Dr. Lansing is using the algae produced from the treatment process as a sustainable energy source.

“What I love about this project is that we are taking traditional agricultural practices and water quality work and applying it to an urban setting in a unique way that hasn’t really been done before,” said Dr. Lansing. “We are cleaning up the Bay, improving water and air quality, reducing pollution, and creating renewable energy using innovative green technologies for the Port all at once.”

Growing algae as a filtration system is fast and efficient. Water from the Patapsco River next to the Port is fed into a runway that is 200 feet long and 6 feet wide. The runway is used to grow algae, pulling out the nitrates and phosphates from the water for its natural growth processes. The water

that is cycled back into the river is therefore cleared of nutrient runoff that can cause imbalances and issues in the Bay. Instead, what is returned is oxygen rich, clean water, improving water and air quality around the Port.

Algae grows quickly and is harvested by the Port once a week and fed into a series of three digesters, housed in small greenhouse-like structures that break down the algae, to produce methane-enriched biogas. The biogas can be used as a supplement to power a fuel cell that produces electricity.

“We are harvesting very high quality methane gas from the algae so far to power our fuel cell. From manure, we are used to seeing 55% or 60% methane, but we are seeing 75% methane or higher from the algae, making it very efficient,” explained Dr. Lansing. “Because the algae grows so quickly and is easy to harvest, it makes a great consistent source of biogas when fed into the digesters.”

Currently, the fuel cell is only being used to power flood lights around the digesters. The goal is that the water pump can be powered by the biogas as well, making this a completely sustainable and closed system for this small-scale pilot project.

“If we can show that this is economically feasible and determine how much space we need to clean how much water and produce how much electricity, we can hopefully scale this up from a pilot project and create something viable that we can use to improve the sustainability and environmental footprint of the Port,” said Barbara McMahon of the Port Administration. “Our partnership with MARAD and the University of Maryland has been a huge help and very rewarding. We are excited to see what the future holds.”