ASSOCIATION OF 1890 RESEARCH DIRECTORS

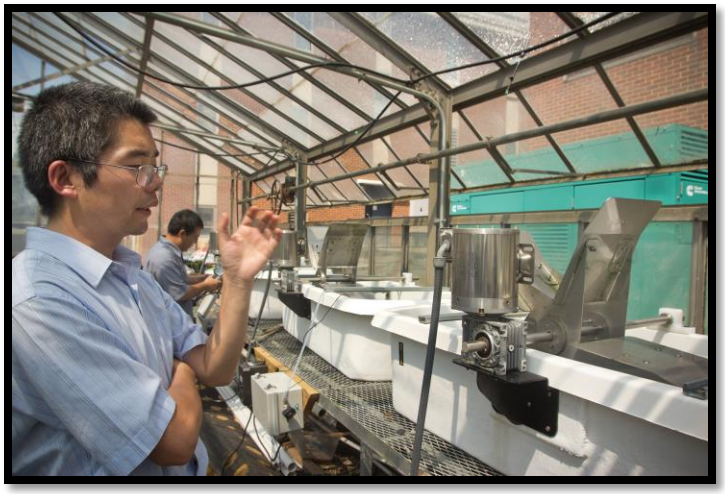
This research has contributed new findings to the science of algae cultivation with swine wastewater treatment for biofuels production.

Microalgae Cultivation for Swine Wastewater Treatment and Bioenergy

Who cares and why?

North Carolina is one of the leading producers of swine in the United States. With an estimated 10 million hogs, the daily amount of swine waste produced is more than 50,000 tons, which equates to nearly 20 million tons per year. However, current animal-waste management technologies emphasize waste treatment rather than waste utilization. Currently, the waste is stored in lagoons and the liquid portions are applied to spray fields. As a result, surface and ground waters have been negatively affected by swine waste. Farms also have no way to capture the greenhouse gases from animal waste. Algae have high fat content, making for a potentially attractive feedstock for biorefineries that produce biofuels and co-products. Furthermore, algae can be cultivated in swine wastewater. Therefore, this project aims to develop an efficient biological system that can treat swine waste with algae, and process the algae grown on wastewater into biofuels.

The findings from this project contribute new knowledge toward swine wastewater treatment and biofuel production in North Carolina, with the potential to increase economic opportunities in rural areas, reduce U.S. dependence on imported petroleum, and improve air and water quality. In addition, the capacity of our minority serving university to conduct further research and education on bioenergy and bio-based products has been substantially enhanced. The project provides training opportunities to graduate and undergraduate students who will have more chances to be hired in the bio-based industry.



What has the project done so far?

Researchers developed and optimized a process for bioremediation of swine wastewater and a potential means of biofuel production, through cultivating microalgae in the wastewater. The cultivation process they developed effectively and efficiently cleans the nutrients from the wastewater. Researchers also developed a novel process to simultaneously extract oil from algae and convert it into biodiesel without the need for a catalyst and additional chemicals.

N.C. A&T researchers contributed important new findings to the science of algae cultivation. After isolating and characterizing many algae strains from the local environment, they identified several that could be attractive candidates for use in an algae-based swine wastewater-treatment system and in

feedstock for biorefinery production of biofuels and other products. Researchers also constructed two large-scale photobioreactors for cultivating microalgae in swine wastewater and determined optimal growing conditions for algae.

What research is needed?

The next step is to develop and evaluate low-capital cost, low maintenance and highly scalable cultivation systems for the year-round production of algae. Computer modeling of the cultivation system, as well as technical and economic analyses will be conducted. A lifecycle assessment of an algae-based wastewater treatment system will also be conducted.

Impact Statement

N.C. A&T researchers contributed important new findings to the science of algae cultivation. After isolating and characterizing many algae strains from the local environment, they identified several that could be attractive candidates for use in an algae-based swine wastewater-treatment system and in feedstock for biorefinery production of biofuels and other products. Researchers also constructed two large-scale photobioreactors for cultivating microalgae in swine wastewater and determined optimal growing conditions for algae.

For more information:

Dr. Lijun Wang, lwang@ncat.edu, 285-3833

Funding for this project was provided by the Evans Allen Program within USDA's National Institute for Food and Agriculture (NIFA). It addresses the NIFA priority area, "Sustainable
Energy," which contributes to the President's goal of energy independence with a portfolio of grant programs to develop optimum biomass, forests, and crops for bioenergy production; and produce value-added, bio-based industrial products.