Science, Technology, Research and Innovation for Development (STRIDE)

PHASE I

Life Cycle Assessment of Algal Biofuels in the Philippines (PURE)

PHASE II

Process Streamlining of the Algae Industry in the Philippines (CARWIN)

GRANTEE:	De La Salle University (DLSU)
PRINCIPAL INVESTIGATOR:	Dr. Aristotle T. Ubando
US UNIVERSITY PARTNER:	The University of Arizona (UA)
PHILIPPINE UNIVERSITY PARTNERS:	University of the Philippines–Visayas (UPV)
INDUSTRY PARTNERS:	AZtech Foodgrowers Corporation (AFC) MCPI Corporation
GRANT PERIOD:	April 16, 2015 to April 15, 2016 September 1, 2016 to November 30, 2017
CONTRACT AMOUNT:	Php 13,030,317.43 (approximately USD277,240.80)

Enhancing biofuel production

DLSU research team collects microalgae from the wild

Demand for diesel fuel in the Philippines is very high—about 50% of the market. Presently, the country produces biodiesel from coconut trees to accommodate current demand and provide steady supply as that demand increases. However, the aftermath of super typhoons like Typhoon Haiyan, which are brought about by the rapid change in weather conditions, adversely affects coconut farming plantations. In addition, the pending implementation of the Biofuels Act of 2016, which mandates the increase of fuel blend percentage from 2% to 5%; puts greater pressure on the production of biofuels. Jatropha was considered to complement biodiesel production from coconuts, however these two feedstocks require large areas of land, and thus compete with food crops.

To help find viable solutions to enhance biofuel production, researchers from DLSU, with support from USAID STRIDE and in collaboration with UA and UPV, carried out a life cycle assessment of algal biofuel production with the potential to produce nearly 20 times more oil per hectare than typical feedstocks.

Milestones

Milestones of the project are as follows:

- Setting up of the Microalgae Systematics and Applied Phycology Research (MASP) Laboratory specifically to: a) identify potential freshwater microalgae species for biofuel production and extraction of important bio-active compounds; and b) isolate and culture freshwater microalgae from rivers and water streams
- Production of 50 to 60 kg of algal biomass in an open pond culture at UPV and shipment to DLSU for experimentation
- Hosting of the Institute of Electrical and Electronics Engineers Humanitarian Technology Conference 2015 in Cebu City, a gathering of technologists, scientists, engineers, investigators, industries, and government institutions where the research team presented three papers/publications on algal biofuels entitled as follows:
  - Life Cycle Validation Study of Algal Biofuels in the Philippines via CML Impact Assessment;
  - Optimization Model in Microalgal-Based Biodiesel Supply Chain: A Case Study in the Philippines; and
  - Application of the Ant Colony Optimization on Transport Route of Algal Biofuels in the Philippines.
- Development and fabrication of a closed-type, mobile, and energy efficient cultivation/ photoreactor system that can be used to grow algae either indoors or outdoors after the training at the UA. Patents for the photoreactor are currently under application.

Moving forward

The results of the project may help policy makers and industrial stakeholders come up with decisions and legislation regarding algal biofuel production. The project should provide proof for policy makers that the production of algal biofuel can aid the country in reducing CO2 emissions and generate a sustainable source of transport fuel, as well as aid the aquaculture industry with the introduction of a viable product to the growing biofuel industry.

In view of the success of the research, a Phase II of the project was awarded in September 2016. The ongoing research focuses on addressing current issues of the algae industry, particularly regarding cultivation and the drying process to be undertaken in partnership with industry partners AZtech Foodgrowers, Inc., a leading producer of spirulina based in Cainta, Rizal, and MCPI Corporation, a leading producer of carrageenan products with branches in Cebu and Bohol.

To date, the project has established the Algae Bio-Innovation Global Hub organization, also known as the "Algae BIG Hub," which serves as an indicator of an algae science and technology innovation ecosystem in the country. The Algae BIG Hub, composed of various international and local academic institutions, the industry, and government agencies, leads the promotion and advancement of algae research and development of algae-based products. It will assist researchers, algae farmers, and algae industries in enhancing the quality and competitiveness of algae products through the introduction of innovative technologies and related literatures. It is currently assisting AZtech in streamlining product development processes by focusing on cultivation and drying with the use of a photobioreactor for product cultivation, chemical analysis, and characterization. With MCPI, the project is conducting chemical analysis of seaweeds and consulting with farmers regarding the social impact of the drying technology and the introduction of an agribusiness model.

The project is expected to strengthen the collaboration between the academic institutions and industries, serve as an initial demonstration for the Algae BIG Hub, assist partner industries in expanding production, and popularize algae-based products in the country.