

The Chancellor of Ghent University has the honor of inviting you to attend the public defense of the doctoral dissertation of

## **Nayaret Karina Acosta Ortiz**

Title of the doctoral dissertation:

### *Anaerobic digestion of cocoa waste within a circular economy*

The public defense will take place on August 27<sup>th</sup>, 2019 at 16:00 in the Academieraadzaal of Aula (Volderstraat 9, 9000 Ghent).

There will be a contiguous reception to which you are heartily invited.

Please confirm your attendance before August 16<sup>th</sup>, 2019 to: [nayaret.acosta@ugent.be](mailto:nayaret.acosta@ugent.be).

#### **Dissertation supervisors**

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#### **Abstract of the doctoral research**

The role of anaerobic digestion (AD) in the present bio-economy concept exceeds the boundaries of on-site electricity and heat production, as it can serve as a process for renewable energy recovery and the production of bio-based products. To apply this concept, three agricultural feedstocks were evaluated for potential biogas production: cocoa waste, pumpkin and animal manure. A case study was performed to calculate the energy potential of cocoa waste in a possible full-scale scenario in an agricultural region of Ecuador. Furthermore, two different strategies were evaluated for long-term biogas production stabilization during AD of cocoa waste, namely co-digestion with cow manure and synthetic nutrients supplementation.

To push the current boundaries in the AD process, cocoa waste was valorized by integrating slow pyrolysis with AD. The characterization of the products and energy was performed as single processes and the integration of both technologies. Integrated processes appeared to recover more energy than single technologies. Finally, the production of microbial protein (MP) from a real biogas stream was described. The separation of CO<sub>2</sub> and CH<sub>4</sub> in the biogas by electrochemical means was done with a parallel production of H<sub>2</sub> and O<sub>2</sub>. Next, the blended gasses were used as feedstock for MP production using enriched microbial cultures. The generation of microbial feed from agricultural waste is an example of an integrated valorization of waste streams towards renewable feed/food products using renewable electricity as the sole input. High-value products for agriculture were obtained from these integrated processes, confirming that cyclic valorization of feedstocks is possible.

#### **Brief Curriculum Vitae**

Nayaret was born in Quito, Ecuador on July 10<sup>th</sup>, 1986. She obtained her bachelor's in science major biotechnology at the Army Polytechnic School (Ecuador) in 2011. From 2010 to 2012, she worked as an environmental biotechnologist at ENYA Ltda., in projects related to organic waste management in small to medium farms, as well as, environmental remediation in the Amazon region. In Sept 2012, she obtained a full scholarship to sponsor the studies of Master in Environmental Sanitation at Ghent University, where she graduated in 2014. Subsequently, Nayaret received a second full-funded scholarship from SENESCYT (Ecuador) for a four-year Ph.D. at the Center for Microbial Ecology and Technology (CMET), Ghent University. Her research focused on the conversion of agricultural residues, specifically cocoa waste, into value-added products within a bio-economy context. In the second year of her Ph.D., Nayaret went back to Ecuador to make a rapid environmental assessment of affected areas from an earthquake in April 2016 in connection with B-FAST (Belgium) and the Civil Protection Mechanism of the European Union.

During her Ph.D. research, Nayaret successfully mentored four undergraduate students during their graduation research project, and guided PC-exercises for the course 'Environmental Microbiology' for two consecutive years. Nayaret followed several courses on career management, leadership, research & valorization and, communication skills. She wrote several articles for peer-reviewed scientific journals, and shared her results in platform presentations at international conferences.