

# **RE<sup>3</sup> Workshop**

## Renewable Energy & Energy Efficiency

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*UPRM-USC Center for a Sustainable Water Energy Food Nexus (SusWEF):  
From Agricultural Waste Biomass to Useful Chemicals*

The Center for a Sustainable Water, Energy and Food Nexus (SusWEF) is a research and education partnership between the University of Puerto Rico-Mayagüez (UPRM) and the University of South Carolina (USC) that is working together in forging a path to finding solutions that are crucial for a global transition to sustainable use of water, energy, and food. Specifically, we are using an integrated approach of synergistic research to study: 1) the use of agricultural waste biomass for the sustainable production of lignin and simple carbohydrates, 2) the use of an integrated set of advanced computational and experimental tools to discover improved catalytic and porous adsorbent materials, 3) the development of selective and efficient catalytic materials and processes for carbohydrates conversion to value added chemicals including biodegradable polymer building-blocks, 4) the development of advanced separation technologies for water treatment, and 5) the use of soil conditioners for improving crop production and water retention. This presentation will include preliminary results on: 1) the catalytic deconstruction using polar aprotic solvents of sugar cane bagasse, plantain peel and the spent grain from breweries into lignin and C5 and C6 sugars, 2) the use of lignin as soil amendment, and 3) the conversion of C5 and C6 sugars into useful value added products such as  $\alpha$ -hydroxy acids and 5-(hydroxymethyl)fulfural (HMF) using Lewis and Brønsted acid catalysts, respectively. Lactic acid (LA) is an example of an  $\alpha$ -hydroxy acid. It is an industrial bulk chemical that is catalogued as a platform molecule from which green solvents, biodegradable polymers and others products may be manufactured. HMF is also a platform molecule that may be used for the manufacture of renewable fuels, lubricants, resins and adhesives.