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Keynote Abstract

Can future biorefineries drive the transition to a circular and sustainable bioeconomy?

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Biorefineries are designed to use renewable biomass into a variety of products such as fuels, chemicals and materials by mimicking petroleum refinery. Sustainable biorefineries are primarily focused on growing and harvesting biomass from sustainable forest and agricultural sources to produce biofuels and other coproducts. However, sustainable biorefineries can be a future hub for producing diverse bioproducts beyond biofuels. Recently, the demand for bio-based or bio-derived products has grown significantly due to their lower carbon footprints and potential to replace several fossil-derived products such as plastics, packages, and other consumer products. For example, the current forest products such as packaging and biomaterials are biodegradable, the increased use of these products can lead to significant waste generation due to linear economic mindset of take-make-waste. Therefore, the future biorefineries and forest industries must implement sustainable circular bioeconomy principles such as keeping materials and products in use longer, regenerating natural resources, increasing use efficiency, generating economic growth, and minimizing/eliminating waste. To keep the lifecycle of materials and products, the quality of the biomass should be considered through cascading use while regenerating natural resources and building diverse forest and agriculture ecosystems. This presentation will explore the challenges and opportunities of applying circularity principles to future biorefineries to build a sustainable bioeconomy in the U.S. Examples of circular forest products in the market and in developments will be discussed, emphasizing circular mindsets.

Speaker Bio:

Sudhagar Mani is a Professor of Engineering from the School of Chemical, Materials, and Biomedical Engineering, College of Engineering, University of Georgia (UGA). He received his Ph.D. in Chemical and Biological Engineering from the University of British Columbia, Canada. His primary research focus is on applying circular bioeconomy principles to Agriculture, food, forestry, and bioenergy systems to design, evaluate and produce sustainable biofuels, biochemicals, and bioproducts. His research is also focused on machine learning modeling of biomass preprocessing and conversion technologies such as biomass densification, torrefaction, and pyrolysis pathways to produce biofuels and biochemicals. His team applies GIS-based supply chain modeling, techno-economic analysis (TEA), and life cycle assessment (LCA) tools to evaluate the sustainability and circularity of bioenergy systems. His team applies a life cycle assessment framework to various circular agricultural systems with regenerative practices to evaluate the carbon intensity of climate-smart commodities. His recent projects include

application of machine learning tools for predicting biorefinery performances, investigation on climate-smart, carbon-neutral agriculture systems, biodegradation mechanism of biopolymers such as PLA, PHA and natural polymers such as nanocellulose and chitosan, and hydrophobic coating of packaging films. He and his research team have published more than 70 referred journal articles, 9 book chapters, and 2 patents and presented more than 200 international and national conference presentations. He is also an elected fellow of the American Society of Agricultural and Biological Engineers (ASABE) and the Editor-in-Chief of ASABE Professional Society Publications. He is a member of TAPPI and the Conference Chair of TAPPI's International Bioenergy & Bioproducts Conference (IBBC) – (2021-2023).