Abstract

Global energy consumption is projected to grow by more than a third over the next 25 years, largely driven by fast growing world population. As a pivotal part of the solution to address such challenge, biofuel plays an increasingly important role as a substitute for fossil based energy. Biofuel supply chain design and market equilibrium analysis are essential for the successful deployment of the industry. In the first part of the talk, a supply chain design and operational planning model will be presented. We investigate the facility locations and capacities at strategic level, and production decisions at operational level. Different biomass supply and biofuel demand patterns are considered with shortage penalty and storage cost incorporated. In the second part of the talk, a bottom-up equilibrium model for analyzing the biofuel market will be presented. We explicitly formulated the interactions among farmers, biofuel producers, blenders, and consumers. As such, the model is capable of and appropriate for policy analysis related to interactions among multiple stakeholders. The results indicate that some entities can benefit greatly at the expense of others when they possess market power. Government oversight is therefore needed to safeguard the development of the sector. The talk will conclude with discussions of other on-going research projects and future research directions.
Guiping Hu is an Assistant Professor of Industrial and Manufacturing Systems Engineering and Graduate Program for Sustainable Agriculture at Iowa State University (ISU). Hu received her M.S. and Ph.D. in Industrial Engineering from the University of Pittsburgh in 2006 and 2009 respectively. She received her BS degrees in Automation (2004) and Management Science (2003) from University of Science and Technology of China. Hu’s research focuses on operations research, data analytics and mathematical modeling with application in renewable energy production systems, supply chain design, and sustainable manufacturing. She has published more than 30 journal publications. Her research is being supported by Digital Manufacturing and Design Innovation Institution (DMDII), NSF Center for E-design, Department of Energy, Midwest Transportation Center, Iowa Energy Center, Bioeconomy Institute, Plant Science Institute, Biobased Industry Center, and Leopold Center for Sustainable Agriculture. She is president-elect of the IIE Engineering Economy Division.