Supply chain optimization of biomass processing network for biofuel production under multiple uncertainties

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The objective of this study was to explore the designs of a biofuels network considering Fast Pyrolysis and Fischer Tropsch bio-diesel conversion processes with uncertainty represented through scenarios. An optimization model was developed that enables decision making for the infrastructure of biofuel conversion processing including processing locations, volumes, supply networks, and the logistics of transportation from forestry resources to conversion and from conversion to final markets. First, we used our optimization model to design an optimal network with single nominal scenario attaining maximum profit based on a realistic data set provided by our industrial partner. Second, we analyzed the value of the objective function for the extreme points of the range of values of the main 14 parameters for the optimized single scenario design. Based on the range analysis, we selected the 5 dominant parameters. For the next step, we optimized a new supply chain networks by considering the 33 scenarios through a two stage mixed integer stochastic program. The objective is the maximization of the expected profit over the different scenarios.