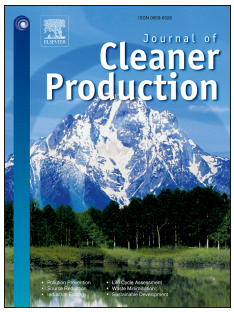
Accepted Manuscript



Integrating biomass quality variability in stochastic supply chain modeling and optimization for large-scale biofuel production

Krystel K. Castillo-Villar, Sandra Eksioglu, Milad Taherkhorsandi

PII: S0959-6526(17)30346-3

DOI: 10.1016/j.jclepro.2017.02.123

Reference: JCLP 9049

To appear in: *Journal of Cleaner Production*

Received Date: 8 September 2016

Revised Date: 26 January 2017

Accepted Date: 15 February 2017

Please cite this article as: Castillo-Villar KK, Eksioglu S, Taherkhorsandi M, Integrating biomass quality variability in stochastic supply chain modeling and optimization for large-scale biofuel production, *Journal of Cleaner Production* (2017), doi: 10.1016/j.jclepro.2017.02.123.

Integrating Biomass Quality Variability in Stochastic Supply Chain Modeling and Optimization for Large-scale Biofuel Production

Krystel K. Castillo-Villar[a,*], Sandra Eksioglu[b], Milad Taherkhorsandi[a]

[a] *Department of Mechanical Engineering, The University of Texas at San Antonio, One UTSA Circle, San Antonio, TX 78249, USA.*
[b] *Department of Industrial Engineering, Clemson University, Freeman Hall, Clemson, SC 29634 USA.*

Abstract

The production of biofuels using second-generation feedstocks has been recognized as an important alternative source of sustainable energy and its demand is expected to increase due to regulations such as the Renewable Fuel Standard. However, the pathway to biofuel industry maturity faces unique, unaddressed challenges.

To address this challenges, this paper presents an optimization model which quantifies and controls the impact of biomass quality variability on supply chain related decisions and technology selection. We propose a two-stage stochastic programming model and associated efficient solution procedures for solving large-scale problems to (1) better represent the random nature of the biomass quality (defined by moisture and ash contents) in supply chain modeling, and (2) assess the impact of these uncertainties on the supply chain design and planning.

The proposed model is then applied to a case study in the state of Tennessee. Results show that high moisture and ash contents negatively impact the unit delivery cost since poor biomass quality requires the addition of quality control activities. Experimental results indicate that supply chain cost could increase as

*Corresponding author
Email address: Krystel.Castillo@utsa.edu (Krystel K. Castillo-Villar)