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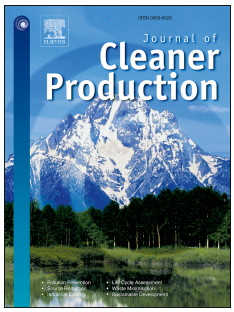

A multi-objective robust possibilistic programming approach to sustainable switchgrass-based bioethanol supply chain network design

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A multi-objective robust possibilistic programming approach to sustainable switchgrass-based bioethanol supply chain network design

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Abstract

This paper proposes a multi-objective robust possibilistic programming model for the design of a sustainable switchgrass-based bioethanol supply chain network under the epistemic uncertainty of input data considering conflicting economic, environmental and social objectives. The newest and most effective environmental and social life cycle assessment-based methods are applied to the proposed model to measure the relevant environmental and social impacts. To deal with uncertain parameters effectively, a novel multi-objective robust possibilistic programming approach is developed which is able to maximize the mean value of supply chain performance and control the optimality as well as feasibility robustness. Computational analysis is also provided by using a real case study in Iran to show the performance and validity of the proposed model. The results show that with an increase of 2.43% in the economic objective function, a desirable level of environmental and social protection is achieved. Additionally, the mean value of supply chain performance will enjoy more desirable values if the influence of optimality robustness and feasibility robustness decreases. The results also demonstrate that the proposed robust model outperforms the deterministic model in terms of the average and standard deviation measures.

Keywords: Bioethanol supply chain, Switchgrass, Robust possibilistic programming, Multi-objective optimization, Sustainable development, Life cycle assessment

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