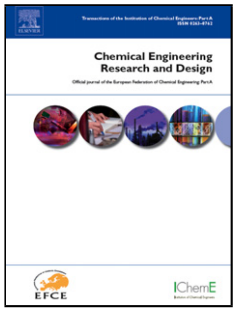

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Assessing multiple biomass-feedstock in the optimization of power and fuel supply chains for sustainable mobility

L. Ascenso[1], F. d'Amore[2], A. Carvalho[1], F. Bezzo[2]

[1]*CEG-IST, Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais, 1049-001, Lisboa, Portugal*

[2]*CAPE-Lab (Computer-Aided Process Engineering Laboratory), Department of Industrial Engineering, University of Padova, via Marzolo 9, 35131, Padova PD, Italy*

Highlights

- Multiobjective optimisation is carried out for a multi-biomass supply chain model
- Both bioethanol and bioelectricity are considered for transport energy
- Economic and environmental performances are discussed according to biomass selection
- A sensitivity analysis is performed to assess the effect of uncertainty on key parameters

Abstract

The transport sector involves high consumption of fossil fuels being a cornerstone sector to foster energy reduction. This goal can be achieved through the introduction of alternative and sustainable energy sources such bio-electricity and biofuels. To attain a viable and sustainable introduction of these energy sources into the market, the whole supply chain must be evaluated. This paper presents an extension of a multi-period and spatially explicit features, which are embodied in a mixed integer linear programming framework, in order to optimize a multi-echelon supply chain simultaneously in terms of economic (net present value) and environmental performance (greenhouse gases emissions), considering biomass cultivation, transport, conversion into bioethanol or bioelectricity, distribution and final usage in alternative vehicles. Bioethanol and bioelectricity supply chains are assessed considering corn, stover, *arundo donax*, *miscanthus*, poplar and wood residues as possible biomass feedstock, for multiple first and second generation conversion technologies. Furthermore, a sensitivity analysis is performed to assess the effect of uncertainty associated with some economic and environmental parameters. Results are also compared with those from previous studies. Results show the effectiveness of the model at providing decision makers with a quantitative analysis to optimize the economic and environmental performance of different design configurations.