



Sustainability Management of the VHP Sugar Supply Chain: Case Study in the Transportation Stage

SENE, A. P. ^{a*}, CAMILO, R. ^a, BONFIM-ROCHA, L. ^a, MANO, T. B ^a, RAVAGNANI, M. A. S. S. ^a

a. State University of Maringá, Maringá

**ana-sene@hotmail.com*

Abstract

Concerns about the environmental impacts of sugar production in Brazil opens up space for the development of research on Supply Chain Sustainability Management (SCSM). This work report uses Life Cycle Assessment (LCA) and multi-objective optimization (MOO) methods, especially in the transport phase of very high polarization (VHP) sugar, in order to perform an environmental and economic performance evaluation, for two scenarios, using a case study involving a linear programming problem. In the first scenario, the transportation is carried out only by the road modal, in the second scenario the transportation is intermodal, where a portion of the route was a railroad. With regard to the evaluation of environmental impacts, for the case study, input data regarding the equivalent CO₂ emission were used. For the economic performance indicator, primary data from a brazilian sugar mills and background data obtained through national reports, manuals and databases were used. Based on the methodology used applying MOO to minimize cost, the model provided optimal cost and CO₂ emissions solutions for scenario one, of 5.72×10^{10} kg of CO₂ and cost of USD 33,216, respectively. Scenario two shows an improvement in environmental performance, reducing CO₂ emissions to 1.51×10^9 kg of CO₂, but increasing costs to USD 98,555. The results of the scenario showed that the railroads may bring relevant environmental benefits, such as of reducing the emission of greenhouse gases, but an alternative little explored in Brazil.

Keywords: *linear programming, multi-objective optimization, life cycle assessment, sugar cane, VHP sugar.*