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Green Supplier Selection Using Fuzzy Group Decision Making Methods: A Case Study from the Agri-Food Industry

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Abstract

The incorporation of environmental criteria into the conventional supplier selection practices is essential for organizations seeking to promote green supply chain management. Challenges associated with green supplier selection have been broadly recognized by procurement and supplier management professionals. The development and implementation of practical decision making tools that seek to address these challenges are rapidly evolving. This article contributes to this knowledge area by comparing the application of three popular multi-criteria supplier selection methods in a fuzzy environment. The incorporation of fuzzy set theory into TOPSIS, VIKOR and GRA methods is thoroughly discussed. The methods are then utilized to complete a green supplier evaluation and selection study for an actual company from the agri-food industry. Our comparative analysis for this case study indicates that the three fuzzy methods arrive at identical supplier rankings, yet fuzzy GRA requires less computational complexity to generate the same results. Additional analyses of the numerical results are completed on the normalization functions, distance metrics, and aggregation functions that can be used for each method.

Keywords: Green Supplier Selection; Environmental Sustainability; Fuzzy Set Theory; TOPSIS; VIKOR; GRA; Agri-Food Industry.

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