Optimization-based management of biomass as a feedstock for hydrogen production considering detailed biomass characteristics and regional meteorological data

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One of the key barriers in bioenergy production is the management of quantity and quality of biomass feedstock throughout a whole supply chain (SC) system. In this paper, we aim to develop and evaluate the biomass SC model which minimizes the overall production cost of hydrogen from dedicated energy crops, considering biomass properties (e.g. availability, moisture content) and regional (land size, meteorological features) characteristics. In achieving the goal, we develop a new optimization model using a mixed integer linear programming (MILP) to determine the optimal configuration of biomass supply chain. Constraints of biomass harvesting periods, geographical locations, transport modes, facility capacity and related costs were considered for determining total production cost. To illustrate the capability of the proposed model, we conducted a case study of Jeju Island. This approach can provide guidance to decision-makers and other stakeholders to build efficient and effective manner while satisfying the needs of a sustainable energy system.