Developing optimization methods for strategic planning of biofuel supply chain based on algal biorefinery

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Many studies have developed the cost minimizing design of supply chain of bioethanol from corn or lignocellulosic biomass based feedstock fields to end users. In this study, as an alternative to biomass feedstock, autotrophic microalgae is used for biodiesel production. Specially, this study aims to assess the algae-to-biodiesel strategy to identify the major cost drivers and technological bottlenecks. Toward this goal, a mathematical programming model is developed for strategic planning of the supply chain of biodiesel from feedstock fields to end users, simultaneously satisfying resource, technology, and demand constraints over a long-term planning horizon. The proposed model can help to determine where and how much feedstock to be transported and refinery to be constructed for the purpose of minimizing the expected total cost including the co-product(naphtha) benefit. The results include not only the investment strategy for the optimal feedstock supply network configuration but also the construction of algal biorefinery for the demand of biodiesel based on Korea from 2014 to 2030 as a case study.