Centralisation VS Decentralisation of Processing Facility: A Biomass Supply Chain Perspective

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Abstract

Converting biomass into value-added products (i.e. biofuel, biochemical and other related bio-products), this waste-to-wealth strategy is no doubt highly beneficial to modern societies as an alternative renewable source of energy. Numerous research works have been done to develop methods and technologies in converting biomass into respective green products. Nevertheless, implementation of these technologies at industrial scale is not yet feasible. This is mainly because logistic occupies a major portion of total production cost. Thus, a well-planned logistic of the entire biomass supply chain is essential. Biomass is usually locally available, which defines it as a distributed resource, and requires extensive infrastructure networks for harvest, transportation, storage, and processing. The logistic network and infrastructure are greatly affected by:

1. The characteristics of biomass such as availability, transport density and shelf life.
2. Economic factors such as cost of logistic and processing facility.

Depending on these factors, the processing facility/facilities may be:

1. Centralised as a single processing hub (for biomass with long shelf life and high density).
2. Decentralised and located locally in the farms (for biomass with short shelf life and low density).
3. A mixture of centralized and decentralized processing hubs.

The decision is very critical to ensure the optimum performance of the supply chain. Therefore, this paper presents a framework which aids the decision and choice of centralising versus decentralising processing facility for biomass supply chain. To elucidate the proposed framework, a case study is performed. The proposed framework is expected to be a decision making tool in the biomass industry which helps to synthesise an optimum logistic network of the supply chain.