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Industrial End-Users' Preferred Characteristics for Wood Biomass Feedstocks

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BACKGROUND

Biohubs are increasingly recognized as important part in an effective raw material supply chain for pulp and paper and biomaterial industries and the energy sector. The design of biohubs and their functionality highly depends on the type, amount and quality of industrial feedstock demand, which, among other factors, are key measures to optimize raw material utilization efficiency. In order for the whole supply chain from the forest (and other bio-sources) to end product to work efficiently a good understanding of ones capabilities and others needs are necessary to establish. Availability of certain raw material assortments for the particular industrial process highly depend on e.g. geographic location of facility itself as well as surrounding industrial facilities capable to supply certain semi processed raw materials such as bark, saw dust, shavings etc. as well as industrial process applied (combustion, gasification, pyrolysis etc.). Depending on industrial process in question and location of the facility some of the raw materials may have been upgraded to improve their quality and bulk density or/and their supply streams may be needed to split up to optimize profitability of biomass unit by delivering the best suited biomass assortment for the right industry for the best price. In such a manner not only the extra value can be added to the biomass itself but a long distance transportation from biohubs to industry can be improved over railroads, waterways or high payload trucks and reduction of traffic intensity and air and noise pollution in populated places can be reduced. Today most large forest industry terminals are specialized for either industrial roundwood supplies or biomass for energy deliveries. However along with advances in production processes and upscaling of existing forest industry facilities (mainly pulp and paper mills) and by adding adjacent biorefinery units to them, a number of biomass assortments such as roundwood, logging residues, bark, chips, preprocessed biomass etc. can be stored, their quality and bulk density can be modified and delivered from one joint biohub.

OBJECTIVES

The aim of this study was to describe and assess end-users' preferences regarding biomass

feedstock characteristics and to analyze the key factors that influence procurement. The goal was to determine end-users' perceptions of different wood-based industrial facilities, rank the features of business models in terms of facility location, size, and biomass storage, handling, and procurement, and determine relative weights and ranking for biomass attributes based on the opinions of experienced professionals from bioenergy facilities across different countries.

M&M

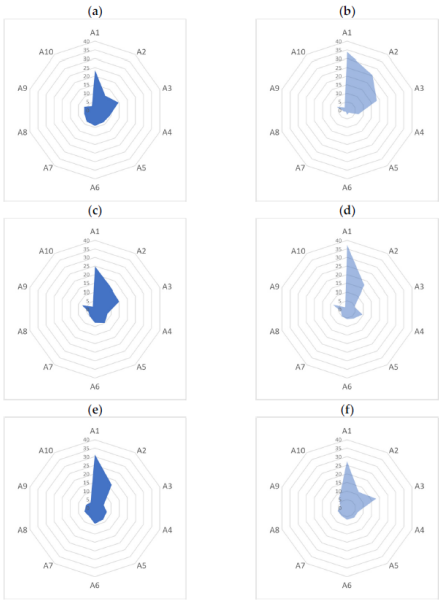
An online, two-part survey generated responses from 27 experienced professionals, representing a portfolio of facilities varying in size, technology, and biomass types, across Australia, Canada, Finland, and Sweden. A PAPRIKA conjoint analysis approach was used to analyze the data so that the attributes that influenced procurement decisions could be weighted and ranked.

RESULTS

The results provided an insight into end-users' views on factors including facility location, size, and biomass storage, handling, and procurement for different wood-based industrial services. The most important decision-making attribute appeared to be the type of biomass assortment, at individual, national, and aggregated levels. Of seven sub-categories of biomass assortments, sawdust (35%) was the most preferred type followed by stem wood chips (20%) and energy wood (15%).

Below you see definitions of the attributes and the country profiles for biomass feedstock preferences based on the attributes considered and the size of the facility (combustion). The estimated weights for the attributes are expressed as percentages. (Canada n = 4, n = 1, Finland n = 1, n = 3, Sweden n = 2, n = 5, values for ≤ 5 MW and > 5 MW, respectively). (a) Canada (≤5 MW), (b) Canada (>5 MW), (c) Finland (≤5 MW), (d) Finland (>5 MW), (e) Sweden (≤5 MW), (f) Sweden

	Attribute		Attribute Level
A1	Type of biomass assortment you prefer	L1 L2 L3 L4 L5 L6 L7	Agricultural residues and by-products Logging residue and tree part chips Bark Energy wood (low-quality roundwood) Stem wood chips Pulpwood Sawdust
A2	Assortment availability in the supply region	L1 L2 L3 L4	Low: <25% of your facility's production needs Medium: 50% of your facility's production needs High: 75% of your facility's production needs Very high: 100% of your facility's production needs
A3	Price	L1 L2 L3	Higher than the market average Market average Lower than the market average
A4	Supply security/accessibility of an assortment	L1 L2 L3	Low: access can regularly be disturbed Medium: seasonal variation can affect access High: access is all year round
A5	Average range in particle size	L1 L2 L3	The higher end of your maximum acceptable range The lower end of your minimum acceptable range Middle of your acceptable range
A6	Variation in moisture or dry content between deliveries	L1 L2	High variation Low variation
A7	Variation in particle size between deliveries	L1 L2	High variation Low variation
A8	Variation in ash content between deliveries	L1 L2	High variation Low variation
A9	Percentage moisture content (not dry content)	L1 L2 L3	The higher end of your maximum acceptable range The lower end of your minimum acceptable range Middle of your acceptable range
A10	Percentage ash content	L1 L2	Your maximum accepted level Your expected level or lower



CONCLUSIONS

From the end-user's perspective, a pre-defined biomass assortment is the most important

factor when deciding on feedstock procurement at a bioenergy facility. These results help us better understand end-users' perceptions of biomass properties in relation to their conversion processes and supply preferences and can inform product development and the securement of new niches in alternative business environments by existing and future biohubs.