Licentiate Seminar
in Computer and system science

A Systems View of Advancements in Biomass Supply Chains

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Abstract

Forest fuel is an important source of energy with potential for increased use in the Nordic countries. Profitable forest operations are dependent on logistics as the forest is a natural resource with varying conditions over widespread areas. In comparison to saw log and pulp wood supply, forest fuel supply has to face challenges like low product value, seasonality and irregularity of customer demand, low bulk density and the need to process the biomass prior to delivery. In order to utilize both the economic potential and societal benefits from replacing fossil-based fuels with renewable forest fuels these challenges must be managed. This requires efficient long distance transports, with changes of transport mode typically required.

This thesis examines preconditions necessary for logistic planning to achieve cost and energy efficient long distance transports within supply chains for forest fuel. The thesis has an explorative approach, including both qualitative and quantitative techniques. Paper I provides a review of the development within forestry logistics in Sweden and Finland since the beginning of the century, with focus on transports, terminal usage and storage related aspects. Paper II uses qualitative interviews to deepen the understanding of a specific forest fuel supply chain by focusing on communications and relations between the actors. Paper III is a study of the influence of a terminal before maritime transport of wood chips using simulation.

Paper I shows that forestry logistics faces challenges, primarily related to increased variations in field conditions caused by climate change. The importance of terminal storage for the supply of forest products will likely increase as an effect. Also the entrepreneurs interviewed in Paper II stressed the benefits of terminals in the supply chain, e.g. enhanced planning opportunities and a more even workflow over the year. Paper III puts cost for extra terminal handling in relation to storage costs in a port and demonstrates the importance of including variation in logistic planning. The terminal flows were not profitable in the case of a small port. In order to make a well-founded decision gains in other parts of the supply chain must also be considered, even when they are harder to quantify. This deserves attention in future research.

Date	April 26, 2022 13.00
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Supervisor	Aron Larsson, Mid Sweden University
External reviewer	Docent Daniel Nilsson, Sveriges Lantbruksuniversitet

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