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Direct versus Via-Terminal Delivery of Small-Diameter Trees

Terminals secure the procurement of forest raw materials and level out the differences in supply and demand along the year. Terminals will become even more relevant in the bioeconomy, as the demand of various forest biomass qualities will increase. Small-diameter trees from early thinnings and marginal land comprise one of the assortments with the largest unutilized potentials. In order to be profitable, they require cost-efficient supply systems where terminals could play a central role.

AIM OF THE STUDY

The aim is to compare the delivery cost of chipped small-diameter trees from early thinnings and marginal land to industries, considering: 1) direct supply and supply via-terminal; 2) design of the supply system; 3) end-user's demand profile (a large energy plant, with a seasonal variation in demand / a future biorefinery mill, with a steadier demand along the year); 4) degree of supply system integration.

MAIN RESEARCH QUESTIONS

1. How is delivery cost affected by supply system (e.g. machinery, number of trucks), road transport distances, and terminal configuration (e.g. location, buffer size, storage time)?
2. What should the size of the supply system be to keep costs low, given a certain volume demand from the end-user?
3. Is cost-efficiency increased by integrating biomass supply from early thinnings (conventional forestry) and marginal lands?

MATERIALS AND METHODS

The study will be approached by modelling and simulating in ExtendSim. Several supply systems will be modelled, starting from windrows of small trees at roadsides.

Models will use representative input data for the Bothnia-Atlantica Region: machine productivities, demand curves from a case study, windrow's characteristics (size, moisture, ash contents, etc.), relocation distances between stands, distances to the end-user, etc.

Wood chips will be the final product to deliver, using trucks for both scenarios (direct and via-terminal). It will

Figure 1. Biomass terminal at Dåva combined heat and power plant in Umeå.

Figure 2. Windrow of small-diameter trees from an early thinning.

be assumed that both end-users can accept the same quality and they would sort the material out later on, if needed.

Delivery strategies will fall in two main categories:

1. Pull-oriented supply strategies (direct delivery), where machines produce on current demand and the amount of stored material is minimized.
2. Push-oriented supply strategies (via-terminal delivery), where machines produce as much as possible (according to forecasted demand), and keep large amounts of material in storage.

The first strategy is more risky, as it requires smooth work between the different links in the chain and a good ability to ramp up production during peak demand.

Conversely, the second strategy is safer and more resilient to problems in the supply chain (e.g. machine breakdowns), making it easier to meet demand on time and levelling out variations. However, larger storage costs are involved. In practice, a mix between both alternatives (a push-pull strategy) may be the best solution.

RESULTS

Results will be published in coming infosheets, and at least one scientific article will be produced.

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Figure 3. Biomass harvest in a power line corridor, an example of marginal land.

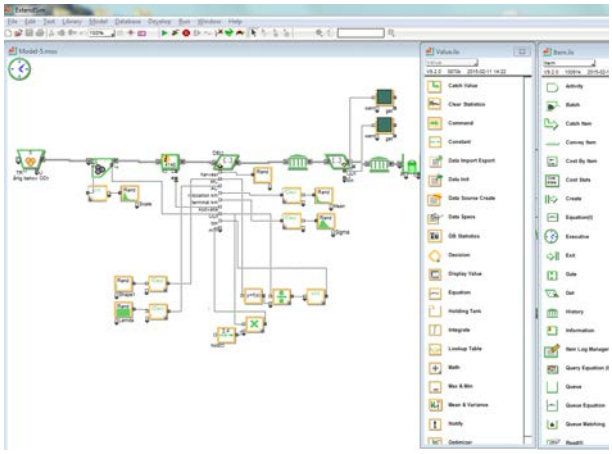

Figure 4. Simulation environment in ExtendSim.

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