EFFECT OF RAW WOOD SUPPLY SYSTEM ON THE WOOD PAYING CAPABILITY OF A KRAF PULP MILL USING SCOTS PINE

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BACKGROUND

Wood production in Finland is based on thinnings. Due to high harvesting costs, silvicultural thinnings of young stands are highly neglected. Also inferior quality of pulpwood is considered a problem. The use of forest chips in energy generation is drastically increasing, and the target set for forest chip production can not be achieved without increasing the harvesting of young stands for energy wood. The production of forest chip from small-diameter trees must be increased three- or even fourfold by 2020 (e.g. Kärhä et al. 2009). Integration of energy wood harvesting with that of pulpwood is seen as a means for reducing the procurement cost of small-diameter wood.

AIM OF THE STUDY

This study was aimed at evaluating the effects of supply system of Scots pine harvested from first thinnings on the wood paying capability (WPC) of a kraft pulp mill.

MATERIAL AND METHODS

WPC calculations were done for three first thinning stands (Fig. 1). The WPC values were calculated by using formula 1 (Diesen, M (2007)):

$$WPC = \frac{M - (V + P - R)}{W} \text{ €/m3} \qquad (1)$$

where M is sales income, €, V is manufacturing costs, €, P is capital costs, €, R is wood costs, €, W is wood consumption, m3. (Note! capital costs were not subtracted from the revenues in our calculations)

The supply systems were based either on cut-to-length harvesting (CTL) or two variants of whole-tree harvesting, i.e. the harvesting of loose whole-trees (WT) and whole-tree bundling (WTB) by the newly-developed Fixteri bundle harvester (Laitila et al. (2009)). Compacting whole-trees into bundles enables cost savings in transportation. In the case of the whole-tree alternatives, the separation of the solid energy fraction from the pulp chips takes place only when the wood reaches debarking drum. Conventional pulpwood (IMT) harvested from intermediate thinnings by the cut-to-length system was used as a reference raw material.

In the sensitivity analysis (Fig. 2), the effects of pulp (475 €/ADt +/- 20%), electricity (50 €/MWh +/- 20%) and process steam (10 €/MWh +/- 20%) prices were examined. The procedure applied in the simulations is described in Dahl et al. (2009).

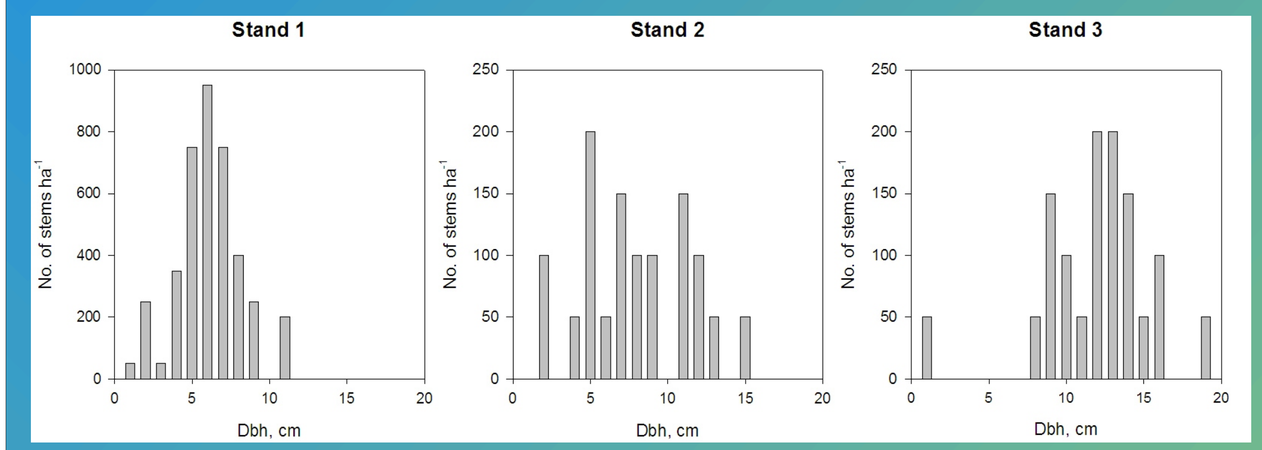

Figure 1. Breast-height diameter distributions of the removals of the first thinning stands.

RESULTS

In most cases, conventional pulpwood harvested from intermediate thinnings (IMT) gave higher WPCs than the wood originating from first thinnings. In the cases of the first thinning stands, the CTL system resulted in higher WPCs than the whole-tree systems (WT, WTB). Differences between the whole-tree systems were negligible.

Pulp price was the most important parameter affecting the WPC (Fig. 2). Decline in pulp price improved the competitiveness of whole-tree systems (WT and WTB), even tough their WPCs were slightly lower than in the case of the CTL system. Pulp production capacity had also a very strong effect, but the relationship was non-linear. Electricity and steam prices had only minor effect on WPC.

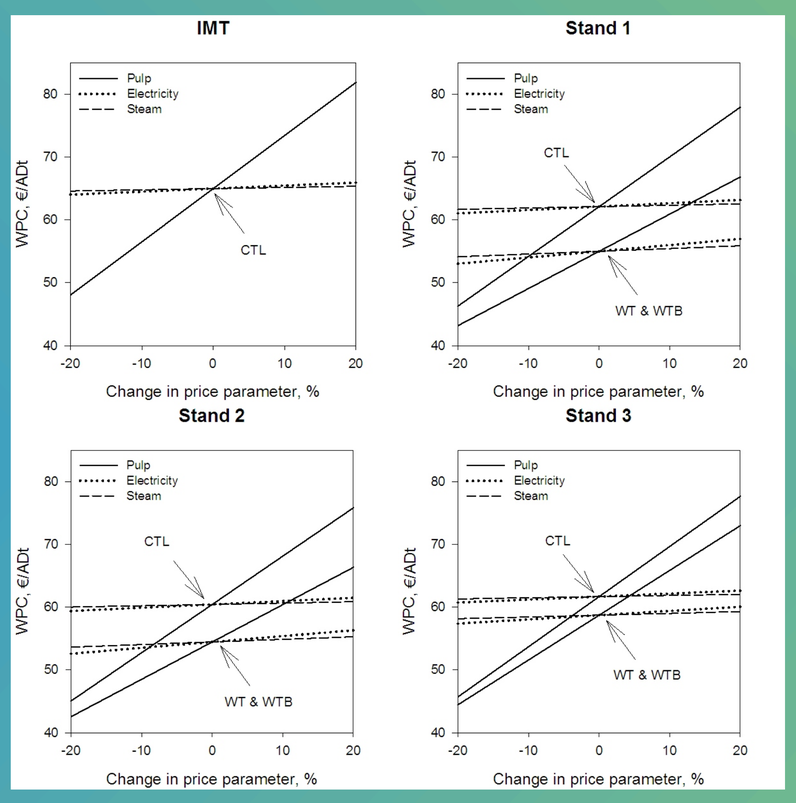

Figure 2. Effect of price parameters on the wood paying capability at mill in the cases of the first thinning stands. Note that the WPCs are higher than in reality, because capital costs were not subtracted from the revenues

CONCLUSIONS

Increase in energy price improves the competitiveness of the whole-tree options. From the pulp mill's point of view, using whole-tree material harvested close to the mill might be a more profitable raw material than conventional pulpwood with higher WPC, transported from further away. Competitiveness of the WTB system depends on the cost of cutting and compaction, which are not yet known. However, it might be possible to extend the procurement area of whole-tree material by the combination of whole-tree bundling and trail transportation sequence.

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Metsäteho

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