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## **Productivity of multi-tree cutting in thinnings and clear cuttings of downy birch (*Betula pubescens*) in the integrated harvesting of pulpwood and energywood**

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The purpose of the study was to determine the productivity of multi-tree cutting of pulpwood and energy wood in thinnings and clear cuttings of downy birch, along with the time consumption of cutting work phases performed with a medium -sized harvester. On the basis of the time study data collected, per-tree time consumption and productivity models were prepared for the multi-tree cutting of pulpwood and energywood in both thinnings and clear cuttings. In the multi-tree cutting time consumption model, productivity was explained in terms of tree volume and harvesting intensity (number of trees removed per hectare). Productivity was expressed in solid cubic metres per effective hour (m<sup>3</sup>/E0h).

Thinnings are a standard silvicultural practice in the Baltic Sea region, and are performed to guarantee a good supply of industrial roundwood, especially saw and veneer logs, for the future. An exception to the silvicultural standard seems to be downy birch (*Betula pubescens*), because recently it has been studied that both pulp and energy wood production as well as incomes are the highest in unthinned or very lightly thinned dense downy birch stands with a rather short rotation period of 30-40 years. Downy birch growing on peatlands and wet mineral soils produces rather low quality timber that is often inappropriate for veneer or sawing purposes but it is important raw material for the pulp and paper industries and as a fuel.

In order to improve the reliability of the above-mentioned silvicultural and economic analyses and especially to transfer silvicultural knowledge into practice, the Finnish Forest Institute organised a comparative time study with regard to the cutting productivity of downy birch in thinnings and clear cuttings together with the Finnish forest industry company Metsä Group. Harvested assortments in the integrated harvesting were birch pulpwood (5 m) and energywood (5 - 7 m), which consisted of undelimited tops of pulp wood stems and undersized small trees. Time studies were carried out both in winter and summer conditions and tree stands were located on drained peatlands near the geographical centre point of Finland. According to our results, the clear cutting of young downy birch stands improved the cutting productivity by 2-4 m<sup>3</sup>/E0h compared to conventional thinning from below.