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### **Performance and costs of the logging residue bundling in mature Scots Pine stands**

*Demand for energy is directly connected with the country's economy development. In Poland in the nearest future, in accordance with the forecast, will be observed tendency of higher energy consumption. On the other hand, a share of fossil fuels in total energy production is limited. Fossil fuels cause definite changes in a natural environment, connected with the global climate warming up, greenhouse effect and acid rain.*

*Regulations of the European Union target to achieve 20% of energy needs from renewables sources by year 2020. In January this year, the Commission put forward differentiated targets for each EU member state. Poland's target is 15%. For that reason have been searched new renewable energy sources. One of the alternatives is to use a biomass coming from forest areas. Depending on different utilization scenarios the possible forest biomass volume to be harvested for energy purposes is calculated from 3 to 5 mln m<sup>3</sup>. To this time relatively seldom have been utilized logging residues.*

*The main aim of this paper is to present an efficiency of logging residues harvesting process. The research was carried out in mature Scots Pine stands on the clear cuts. Residues were bundled by the Timberjack 1490D machine and forwarded to the forest road site by the Zetor 11441 Foterra tractor with the Nokka MV92 trailer. For each machine were determined a structure of work day, productivity rate and unit costs.*

*Productivity varied between 15 and 23 bundles per hour (14.4 - 22.1 m<sup>3</sup>/h) depending mainly on the stands condition and material preparing at the harvesting site. Unit costs reached adequately 2.53 – 3.89 €/m<sup>3</sup>. Forwarding productivity rate ranged between 16.3 and 32 m<sup>3</sup>/h and unit cost from 0.93 – 1.84 €/m<sup>3</sup>.*