

ENERGY YIELD AND THE RELATED ENVIRONMENTAL IMPACT OF HARVESTING FOREST ENERGY

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Abstract: *In Sweden, about 43 % of the energy used is already from renewable sources with wood fuel contributing 23 % of the total. Despite this, there is a large potential source of forest biomass that is not being used, namely residues left after forest logging. Nevertheless, if the purpose of increasing the use of bioenergy is to reduce pressure on the environment, it is important that the production system is designed in a way that minimizes the total environmental burden. In a case study seven different procurement chains of forest energy in Sweden was modelled and the environmental performance was calculated from a Life Cycle Assessment (LCA) perspective. The energy requirements and emissions related to significant processes, from raw material acquisition and processing through to distribution to energy plant were quantified. The systems differed with respect to geographical location, the technology employed and resource use (stumps or logging residues). The energy output/input ratio of chips from residues and stumps was in the range 21-49 and the greenhouse gas emissions were 1.5 - 3.5 g CO₂-eq per MJ chips. Systems with harvesting of stump, bundles and/or originated in northern Sweden stood for less output/input ratio or higher contribution to GWP. Reasons for this are the systems in southern Sweden were generally more efficient than similar systems in northern Sweden, which suffer from the longer transportation distances; terminals are used for processing and transfer; higher moisture content of residues and lower load factor. The systems for stump harvesting used considerably more input energy than those for collection of tops and branches. The forest energy systems based on bundles and stumps rely on immature technologies which have the potential to be improved should there be technical developments of the systems.*

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