QUALITY OF STUMP WOOD HARVESTING AND FOREST REGENERATION ON STUMP HARVESTING SITES

Risto Rönkkö, Essi Ulander & Tiina Sauvula-Seppälä*
Seinäjoki University of Applied Sciences, School of Agriculture and Forestry

Introduction

Stump harvesting for renewable energy production has become more common during the last decade in Finland. It is estimated that in the near future the total area of stump extraction will rise to 25 000 hectares annually.

Forest regeneration is altered by stump and slash removal, that can increase the work productivity of site preparation, improve its quality and result in more even seedling regeneration. Furthermore, more planting places may be on patches created by stump harvesting rather than on mounds created during site preparation compared to clear-cuts with site preparation only.

Stump harvesting intensifies forest management. It can lead to increased soil compaction and significant increases in soil disruption. Removal of stumps leads to losses of organic matter as well as losses in the pools of carbon and nitrogen. Together these can lead to changes in soil conditions and nutrient cycling.

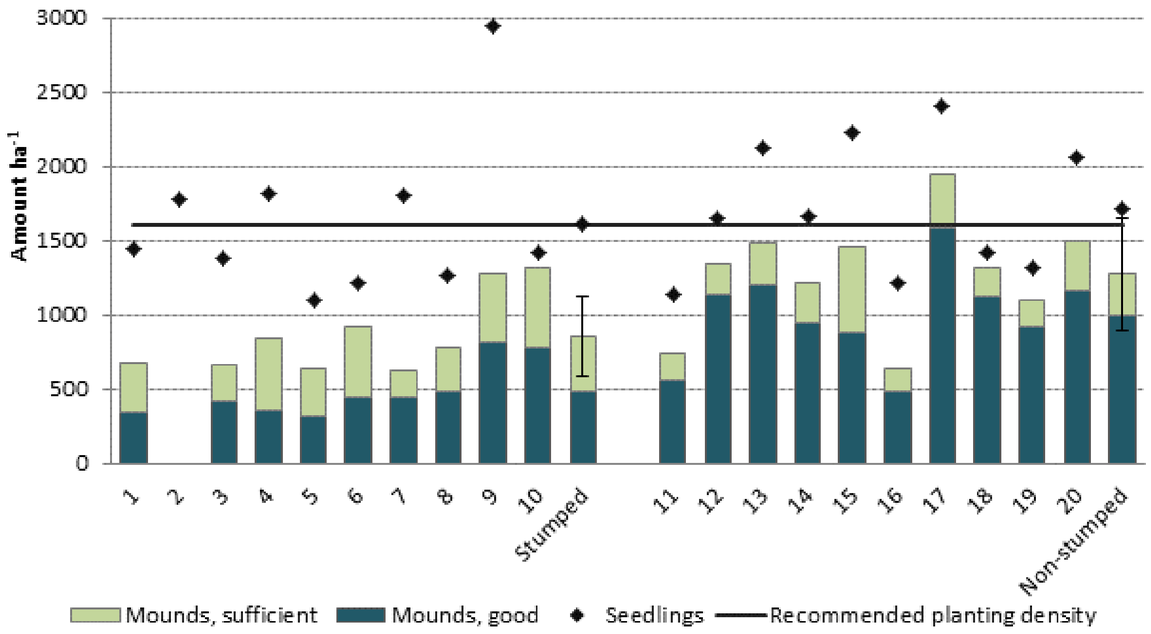
The objective of this research was to study the quality of stump harvesting. The indicators of quality are defined in the recommendations for energy wood harvesting and are closely linked to issues of sustainability of stump harvesting. **Furthermore, this research aimed at studying the quality of forest regeneration on stump harvesting sites.** Successful forest regeneration after clear-cutting is the basis for sustainable forest management.

Material & Methods

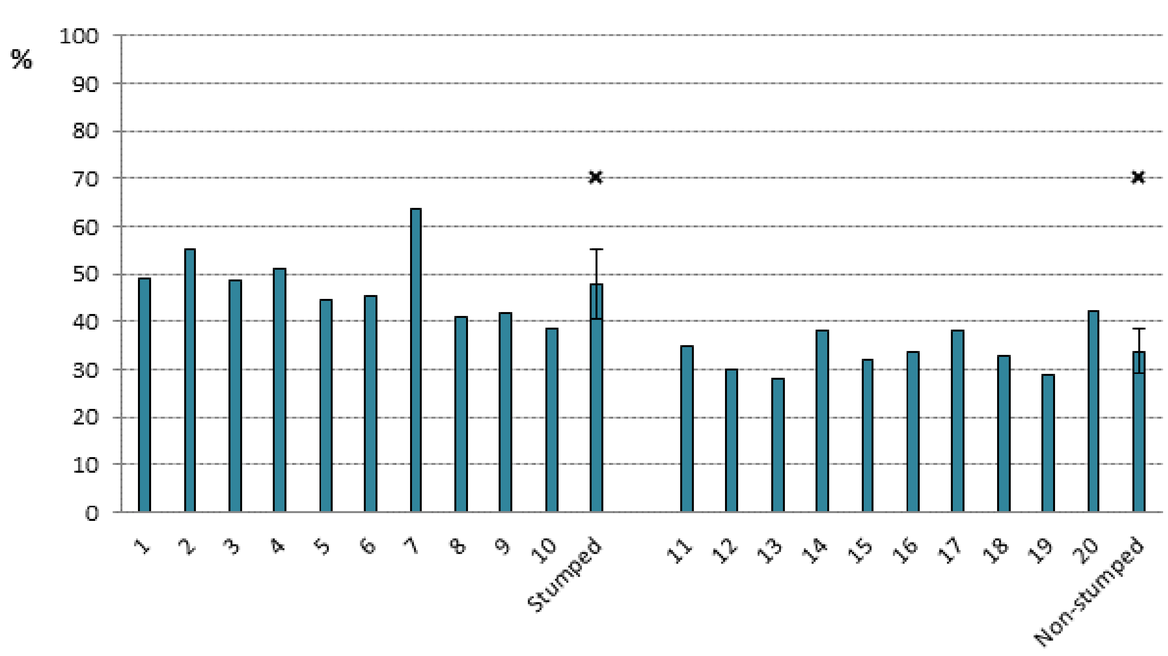
The 20 spruce dominated study sites were located in western Finland. Stumps and slash were harvested from half of the sites, on the other half only site preparation by mounding was conducted post clear-cutting. Stumps had been harvested between 2006 and 2009.

The quality indicators for stump harvesting included the number of pits over 25 cm in depth, the number of undisturbed stumps, the area of exposed mineral soil, the depth of the humus layer as well as the exclusion areas.

To estimate the quality of forest regeneration, the amount and quality of mounds and the number of planted tree seedlings were inventoried.



The amount of good and sufficient mounds per hectare and the amount of planted seedlings per hectare on the stumped sites (1-10) and the non-stumped sites (11-20). The columns stumped and non-stumped represent the averages derived from the inventoried sites. The error bars represent ±1 SD of the total amount of mounds (good and sufficient). The dark gray line marks the lower limit of the recommended planting density for Norway spruce (1600 seedlings/ha).



The area of exposed mineral soil on the stumped sites (1-10) and on the non-stumped sites (11-20). The columns for stumped and non-stumped represent the average area of the exposed mineral soil on stumped and non-stumped sites.

Results & Discussion

Quality of Stump Harvesting

- Overall, the quality of stump harvesting was mostly in accordance with the guidelines set in the recommendations for energy wood harvesting.
- Deep pits were observed on all of the stumped sites and on less than half of the non-stumped sites. Both stump harvesting and site preparation can result in pit formation.
- At the minimum, the number of undisturbed stumps exceeded the recommended amount twofold. This contributes to the soil organic matter pool and benefits species dependent on coarse woody debris, but lowers the profitability of stump harvesting.
- The area of exposed mineral soil was 48 % on the stumped sites being 14 percentage units higher than on the non-stumped sites. The observed difference was statistically significant.
- No significant differences were observed in the depth of the humus layer.

Quality of Forest Regeneration

- On average there were 860 mounds per hectare on the stumped sites and 1270 mounds per hectare on the non-stumped sites. The difference was significant. The recommended planting density for spruce is 1600-1800 seedlings per hectare.
- Also differences in the quality of the mounds (number of good mounds and share of patch-mounds with a double humus layer) were significant.
- On six stumped and four non-stumped sites the amount of planted seedlings was below the recommended level.
- About half of the tree seedlings were not planted on mounds on the stumped sites. On the non-stumped sites 25 % of the seedlings were not planted on mounds.
- Long term results of the effects of the observed differences on soil properties, forest regeneration and ecological factors are required.

Euroopan maaseudun kehittämisen maatalousrahasto: Eurooppa investoi maaseutualueisiin.
metsäkeskus etelä-pohjanmaa
Seinäjoen ammattikorkeakoulu SEINÄJOKI UNIVERSITY OF APPLIED SCIENCES

*essi.ulander@seamk.fi

www.kehittyvametsaenergia.fi