

# Harvesting alternatives, procurement cost and potentials of small-diameter thinning wood for fuel in Central-Finland



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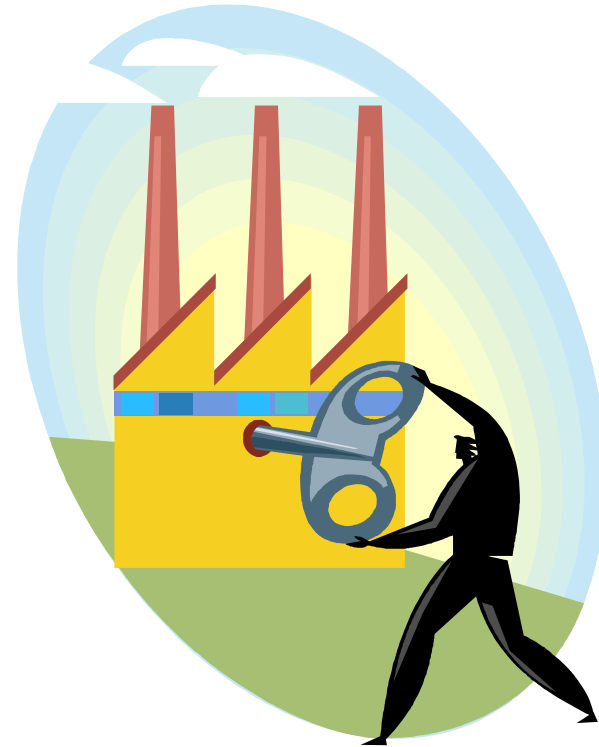
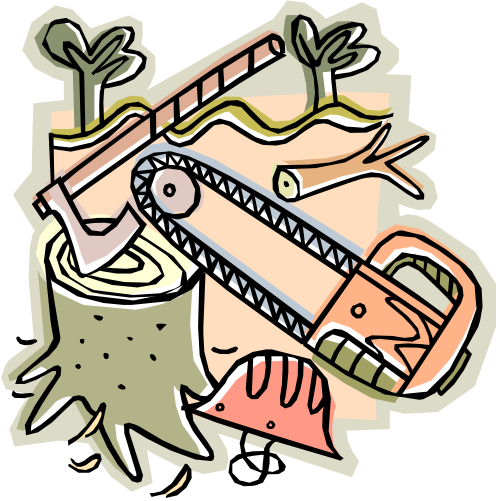
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IEA Bioenergy

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## Background



- The potential of small diameter thinning wood for fuel is about 7 million m<sup>3</sup> per year in Finland
- 50 % of the harvestable potential is located on peatland forests
- The commercial use of small diameter wood chips was 0.7 million m<sup>3</sup> in 2007
  - 86 % came from whole tree chips
  - 14 % from delimbed stemwood chips

# Background

- Forest owners are worried about the effects of energy wood harvesting on site productivity
- Whole tree harvesting increases the nutrient loss in forests and delimiting is in practice the most effective method to decrease nutrient loss in thinnings
- Whole tree harvesting is not advisable on peatland forests, spruce dominant stands or infertile mineral soil due to increment losses
- According to the guidelines, whole tree harvesting is acceptable on fertile mineral soil stands, excluding spruce dominant stands

# Background

- Presentation is based on the “Harvesting alternatives and cost factors of delimbed energy wood” project, which was funded by Tekes, Komatsu Forest Oy, Sampo-Rosenlew Oy and Waratah-OM Oy.
- Metla and TTS Institute were the research partners and project had four research topics:
  - Compare the productivity, costs and silvicultural results of cutting whole trees and delimbed trees by multi-tree-handling technique
  - Integrated harvesting of industrial roundwood and delimbed energywood using the single-tree-handling technique.
  - **The regional availability and procurement costs of delimbed energywood when using different stand selection criterias**
  - Measuring of delimbed energy wood using the harvester's measuring device in multi-tree-handling
- The results of the project were published in the Working Papers of the Finnish Forest Research Institute 10 (*Heikkilä et al. 2005*)

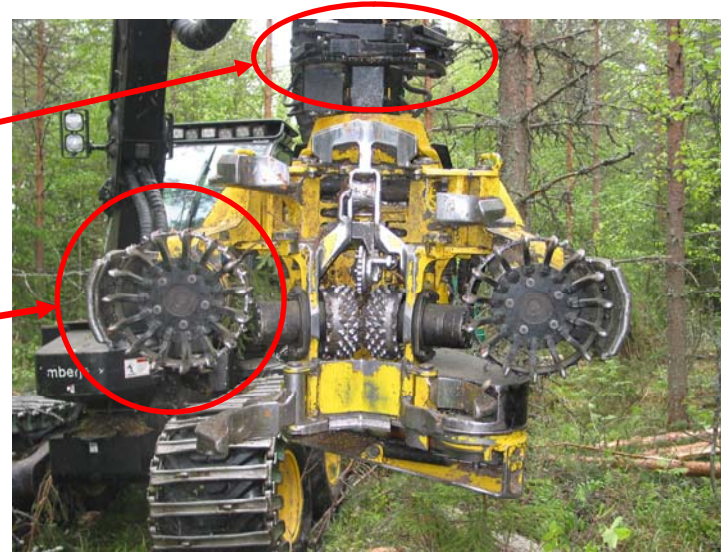


# Background

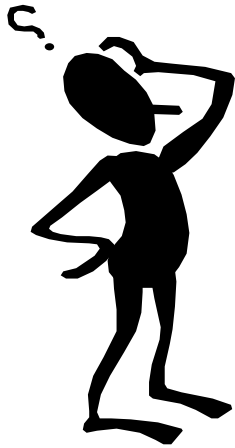
- A normal harvester head equipped with multi-tree-handling (MTH) accessories is suitable for both whole tree and delimited stemwood cutting

Accumulator arms for collecting trees

Special feed rollers for effective feeding of tree bunches



- The handling time of whole tree is equal to the handling time of delimited stemwood in MTH (*Heikkilä et al. 2005*).
- Delimiting decrease the tree volume and therefore the productivity is 10-40 % lower compared to whole tree cutting. The productivity decrease is equal to the delimiting loss

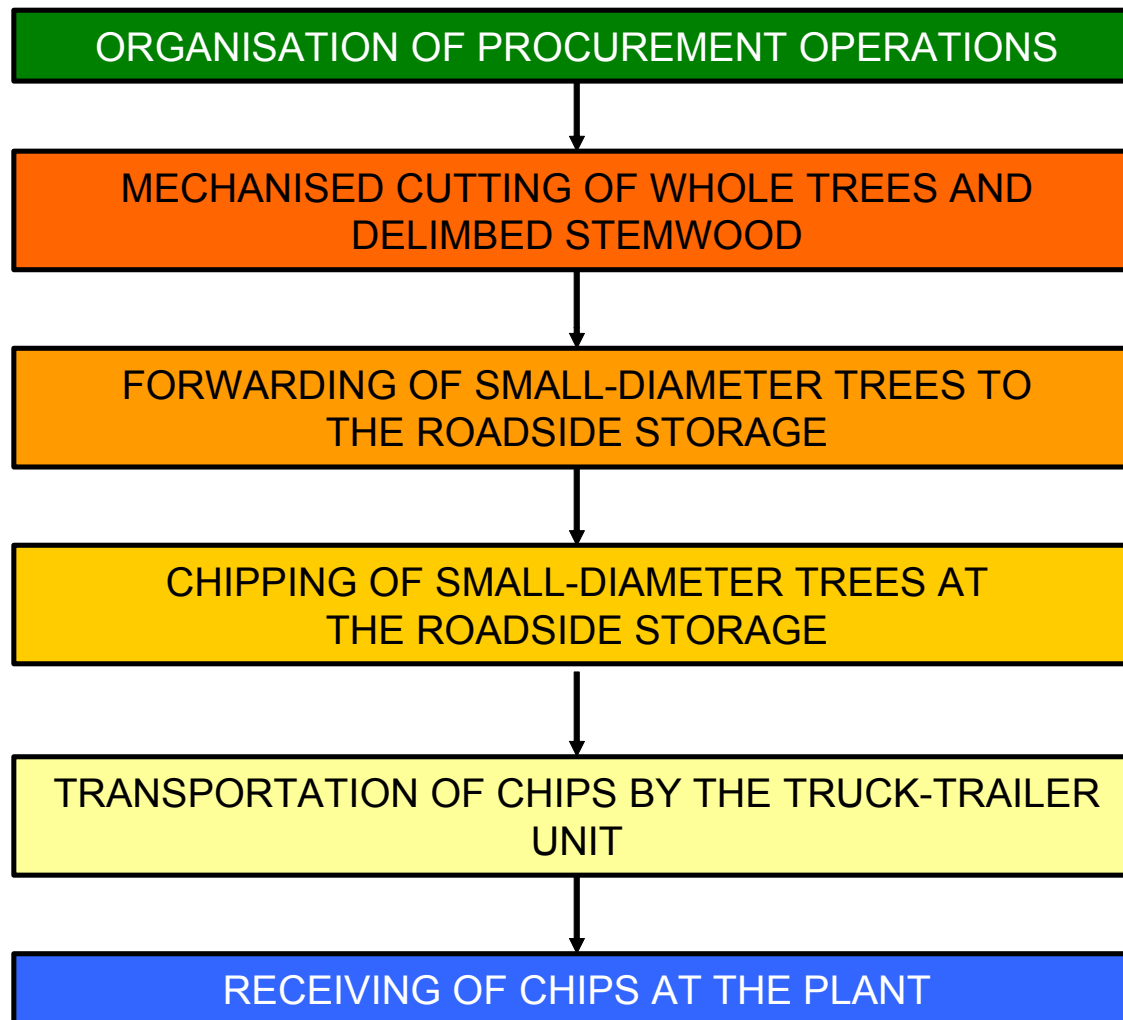


## Aim of the study

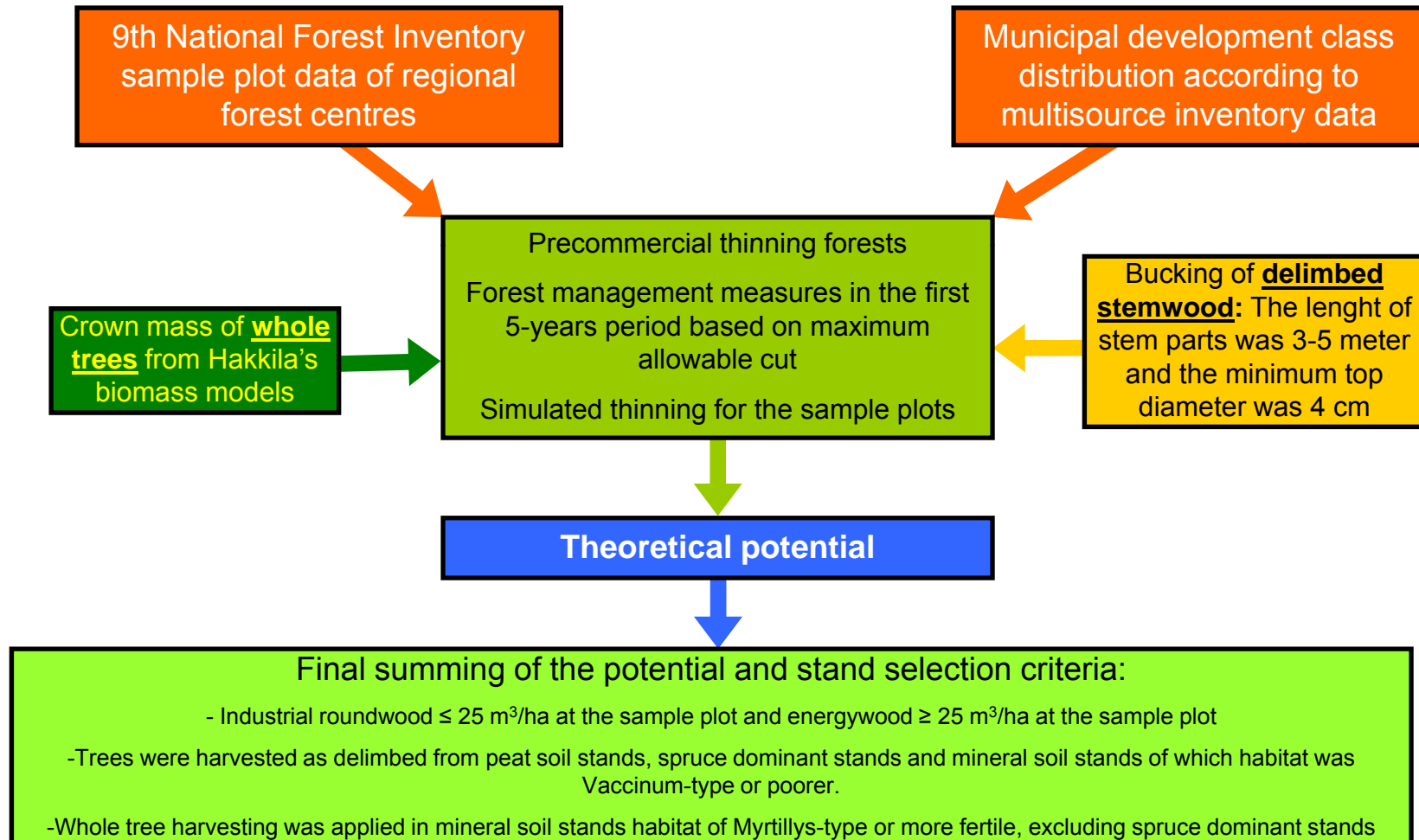


- Estimate and compare the harvesting cost and cost structure of whole tree and delimbed stemwood chips
- Estimate the potential of whole trees and delimbed stemwood around Jyväskylä when using different stand selection criteria or combinations of those
- Estimate the procurement cost of whole tree and delimbed stemwood chips to Jyväskylä when using different stand selection criteria or combinations of those

# Supply chain of fuel chips from early thinnings

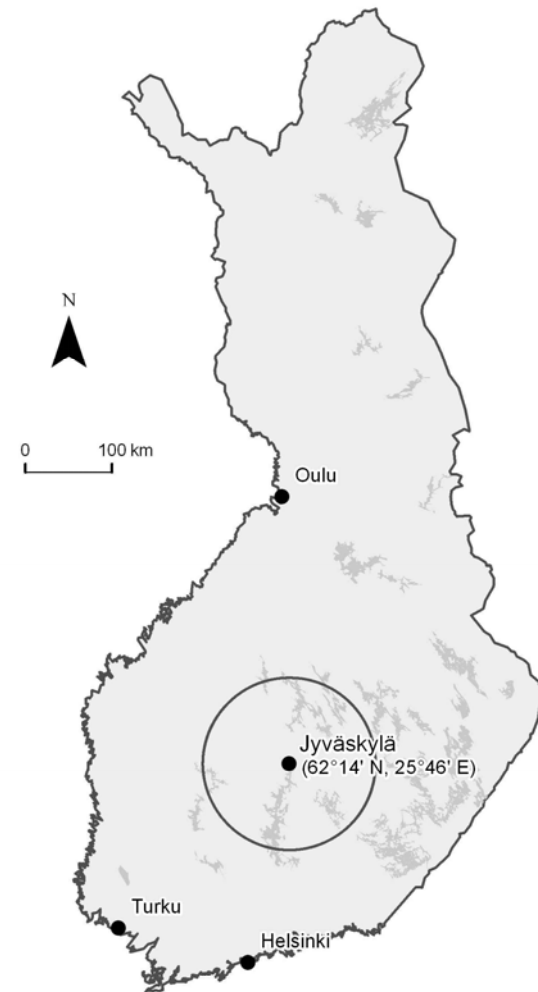


# Estimation of whole tree and delimbed stemwood potential



# GIS-analysis

- Average transporting distances from the municipalities to Jyväskylä via existing road network  
(Asikainen et al. 2001, Ranta 2002)
- Maximum transportation distance 100 km
- Average forwarding distances in municipalities from the stand databases of forestry integrates  
(Asikainen et al. 2001, Ranta 2002)

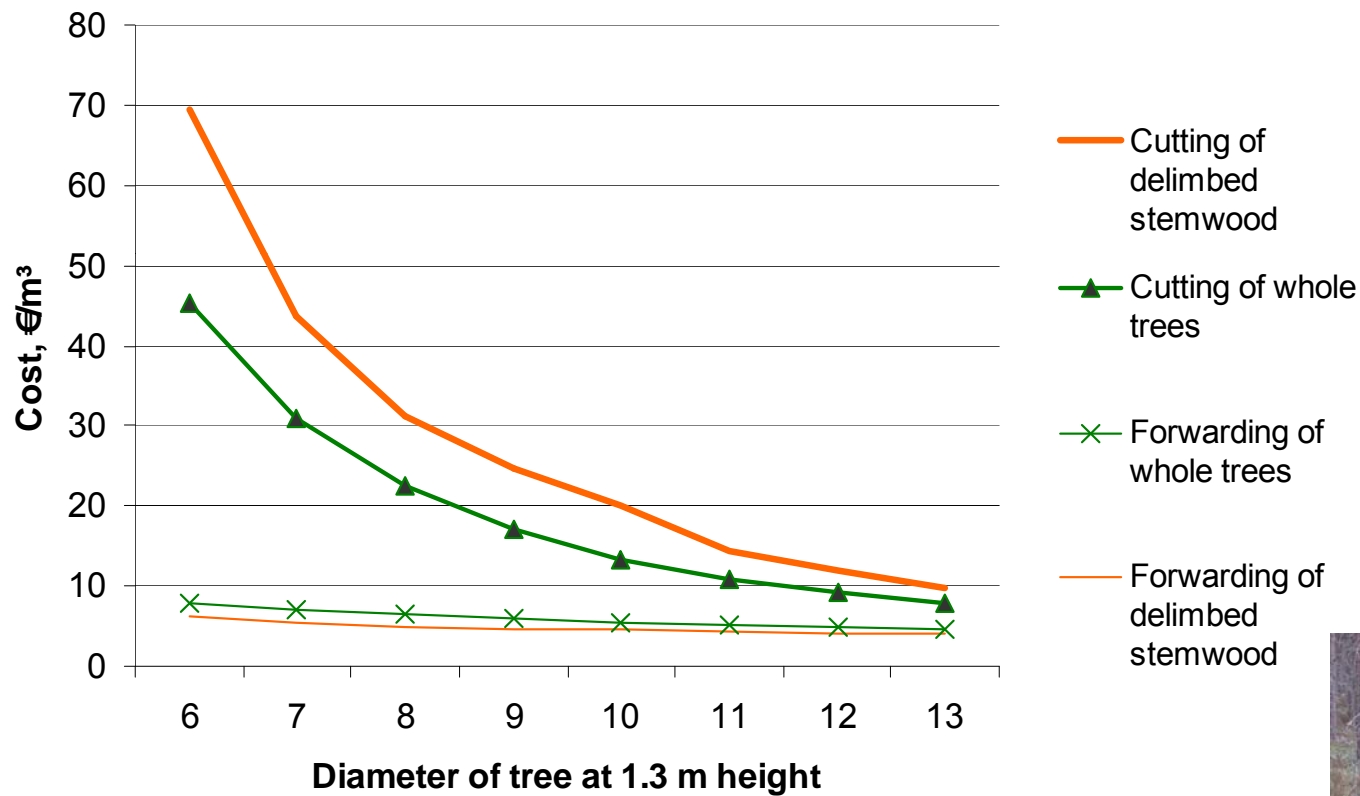


STORAENSO

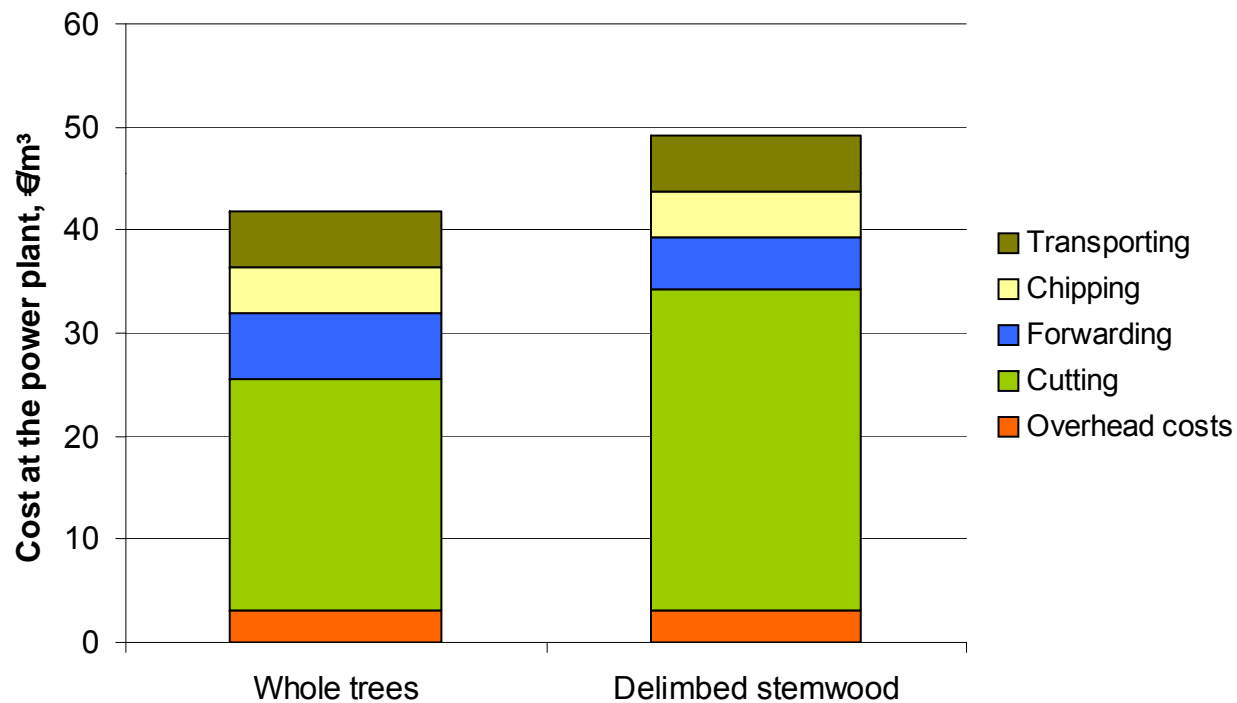


Metsäliitto

# Logging costs of delimbed stemwood and whole trees

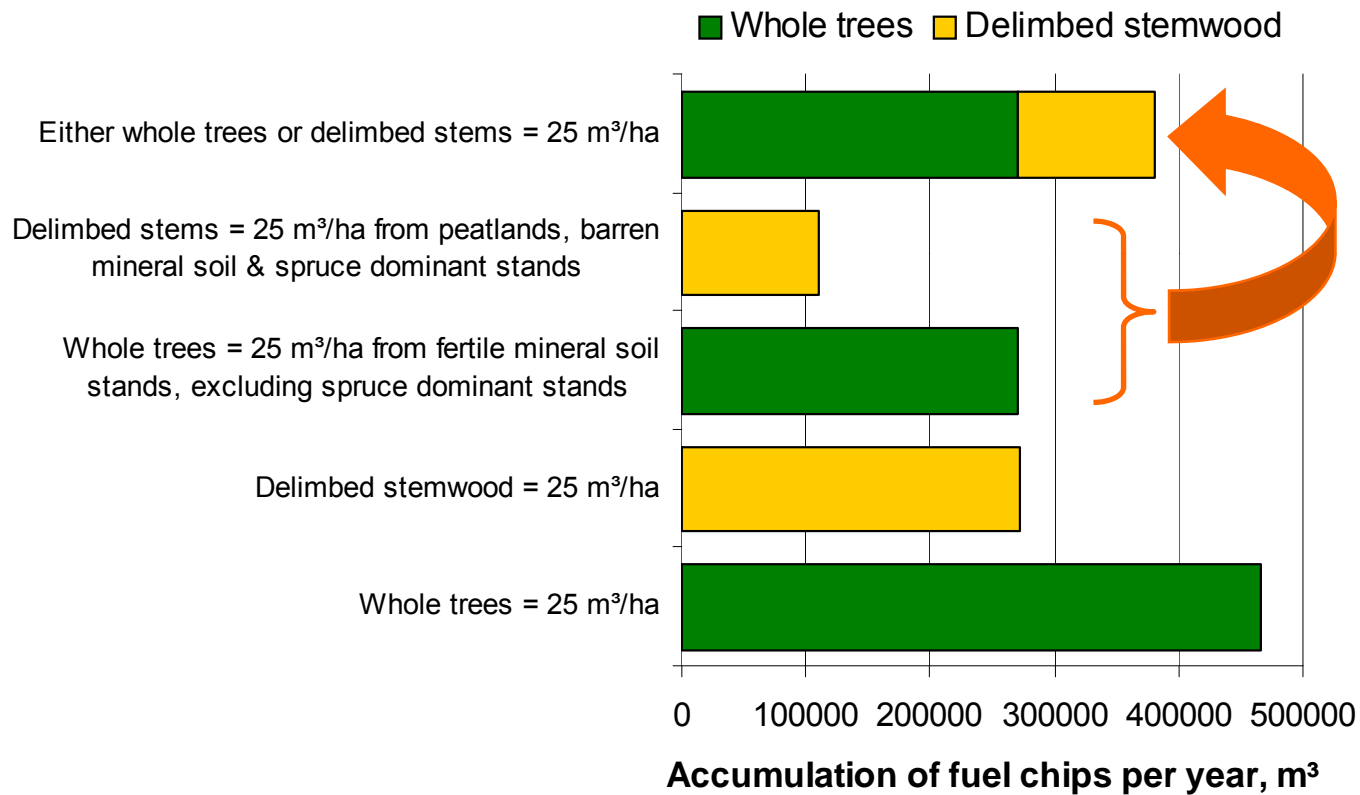


# Cost structure of delimbed stemwood and whole tree chips

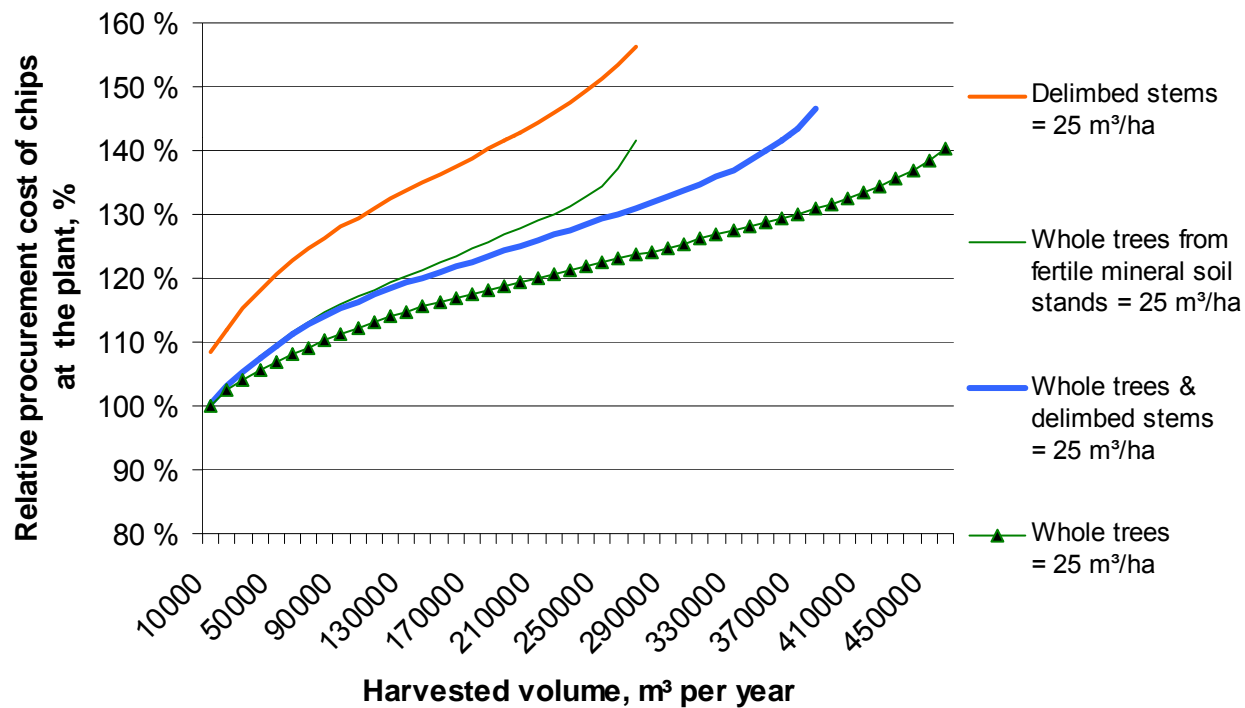


dbh 8 cm, cutting removal 41 & 29 m<sup>3</sup>/ha, forwarding distance 230 m and transportation distance 50 km

# Accumulation of delimbed stemwood and whole trees from young stands



# Relative procurement cost of delimbed stemwood and whole tree chips to Jyväskylä



# Conclusions

- The study showed that the forest energy potential is increased and procurement costs are reduced, if delimbed stemwood is harvested from stands, where the whole tree harvesting is not acceptable due to nutrient loss or other ecological reasons
- The low-energy intensity and transport economy is the problem related to forest fuels. Intelligent selection of cutting methods for different stands enables minimizing of transport distance and controlling of procurement cost

# Conclusions

- From the contractor point of view the multi-purpose-harvester head is versatile and enables harvesting of industrial roundwood and energy wood from the same stand without extra installation work or investment to the purpose built energy wood harvester head
- Logging sites in thinnings often comprise several compartments and multi-purpose-harvester head might reduce the need for machine transfers and thus increase the operational efficiency in energy wood and industrial roundwood harvesting



**Thank you  
for your  
attention !!!**