Evaluation of the Flowcut prototype head designed for early, biomass dense, thinnings

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How to reach profitability

Logging profitability

Number of stems*E₀h⁻¹
- 300
- 500
- 700

Average tree dry weight (kg DM)
The problem

- Early thinnings
  - Silviculture (future timber)
  - Biomass dense (energy)
- Costly
- More trees and more speed
- Simulated potential
The aim

Evaluate the functionality and performance of the Flowcut prototype felling head

Point out areas in the design that call for improvement
How it was done (1/2)

Time study

Boom tip scale

Maximum speed
How it was done (2/2)

- 5 study plots (strip roads) 59-76 m
- Komatsu 911.4
- Measurements before
  - Tree data
- Measurements after
  - Tree data
  - Boom-corridors
  - Damages
The study plots

<table>
<thead>
<tr>
<th>Plot</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stems per hectare</td>
<td>7700</td>
<td>6150</td>
<td>7700</td>
<td>9600</td>
<td>12250</td>
</tr>
<tr>
<td>Diameter, breast height (mm)</td>
<td>34</td>
<td>36</td>
<td>28</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>Species (%) (pine/spruce/other)</td>
<td>57/0/43</td>
<td>61/1/38</td>
<td>56/2/42</td>
<td>74/3/21</td>
<td>81/0/19</td>
</tr>
</tbody>
</table>

- Mainly scots pine (*Pinus sylvestris*)
- Very small trees
Harvester performance

Performance (tonnes DM$+E_0$/h$^{-1}$) vs. Average tree dry weight (kg DM)
Harvester efficiency

Average tree dry weight (kg DM) vs. Efficiency (harvested stems*E_h-1)
Further results

- 0.6-1.0 m/s max speed
- 4.1-6.2 trees accumulated
- 25-31 % area thinned
Damages

- 1.1-3.5% damaged
- Partially cut
- Up-rooting
- Dropped trees
Discussion & Conclusions

• Functionality and performance
  • Functional
  • Competitive, but not doubled, performance

• Improvement
  • Shearing
  • Accumulation