Impact of Small and Middle Sized Forwarders to Soil Compaction During Mechanized Thinning in Young Stands

Scientific conference “Industrial Scale Bioeconomy and its Requirements”
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The aim of the study

- The aim of this study is to compare influence of different types of forwarders (middle size, small and tracked) on soil compaction in young forest stands with different soil bearing capacity.
Sampling design

- Measurements down to 80 cm;
- Measurements was done after forwarding, on and between the striproads.
## Bearing capacity groups & machines

<table>
<thead>
<tr>
<th>Soil bearing capacity</th>
<th>Code</th>
<th>Penetration resistance at 0...80 cm depth (MPa)</th>
<th>Forwarder</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>John Deere 810E</td>
</tr>
<tr>
<td>poor</td>
<td>PBC</td>
<td>0.5...1.0</td>
<td>X</td>
</tr>
<tr>
<td>weak</td>
<td>WBC</td>
<td>1.0...1.5</td>
<td>X</td>
</tr>
<tr>
<td>moderate</td>
<td>MBC</td>
<td>1.5...2.0</td>
<td>X</td>
</tr>
<tr>
<td>good</td>
<td>GBC</td>
<td>2.0...2.5</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Producer</th>
<th>Model</th>
<th>Power of engine (kW)</th>
<th>Drive</th>
<th>Own weight (tonnes)</th>
<th>Load capacity (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Deere</td>
<td>810 E</td>
<td>95</td>
<td>8 tyres</td>
<td>12.9</td>
<td>9.9</td>
</tr>
<tr>
<td>Timbear</td>
<td>Light logg C</td>
<td>97</td>
<td>4+2 caterpillar trucks</td>
<td>12.0</td>
<td>10</td>
</tr>
<tr>
<td>Rottne</td>
<td>F10B</td>
<td>116</td>
<td>8 tyres</td>
<td>12.9</td>
<td>9</td>
</tr>
<tr>
<td>Vimek</td>
<td>610</td>
<td>44</td>
<td>6 tyres</td>
<td>4.9</td>
<td>5</td>
</tr>
</tbody>
</table>
Compaction on soils with poor bearing capacity (PBC, John Deere 810)
Soil compaction on soils with weak bearing capacity (WBC)
Soil compaction on soils with moderate bearing capacity (MBC)
Soil compaction on soils with good bearing capacity (GBC)
Conclusions

- Soils with bigger soil penetration resistance are subjected of higher risk of the soil compaction than soils with smaller soil penetration resistance.

- Small Vimek and tracked Timbear compacts only topsoil. It is advisable to use these machines in PBC and WBC.

- The use of tracked machines in MBC and GBC is questionable. Impact on topsoil is higher, but less impact on deeper soil layers.
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