Feedback to operators based on harvester data

NB-NORD workshop on Big data from forest machines
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High demands are put on the operator!

- Accurate measurements, identify stem defects, productivity...
- Digitalisation and big data offer great opportunities to develop tools and systems for feedback and decision support
Continuous feedback is fundamental!

- **Manual control measurements** of 1-2 stems per 8 hour shift

- **Feedback** from auditor every two weeks

- **Field visit** by auditor 1-2 times annually

- Increasing interest and good results!
Continuous feedback is fundamental!
New tools for identifying bad diameter measurements and advice on settings

Improved measurement precision

Increased pressure on delimming knives
Next step – broadening the scope to quality certification of harvesting operations

<table>
<thead>
<tr>
<th>KPIs log production and quality</th>
<th>PINE</th>
<th>SPRUCE</th>
<th>BIRCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average stem size (m3sub)</td>
<td>0.518</td>
<td>0.361</td>
<td>0.127</td>
</tr>
<tr>
<td>Volume (m3sub)</td>
<td>😊 786.1</td>
<td>😊 318.4</td>
<td>😞 3.7</td>
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<tr>
<td>Timber share (%)</td>
<td>😊 84</td>
<td>😊 63</td>
<td></td>
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<tr>
<td>Share of manual cuts in timber (%)</td>
<td>😊 15</td>
<td>😊 4</td>
<td></td>
</tr>
<tr>
<td>Share of defect wood in timber dimensions (%)</td>
<td>😊 5</td>
<td>😞 23</td>
<td>😊 100</td>
</tr>
<tr>
<td>Top diameter at last cut (mm)</td>
<td>😞 93</td>
<td>😞 81</td>
<td>😞 86</td>
</tr>
<tr>
<td>Top diameter at last timber cut (mm)</td>
<td>😞 169</td>
<td>😊 148</td>
<td></td>
</tr>
<tr>
<td>Obtained distribution (%)</td>
<td>😞 84.9</td>
<td>😊 87</td>
<td></td>
</tr>
</tbody>
</table>
Automatic follow-up of thinning operations
Excellent results and fast implementation

First thinning
Manual measuring: 33.7%
Harvester prognosis: 33.0%
Standard dev. 2.9%

Second thinning
Manual measuring: 25.9%
Harvester prognosis: 25.0%
Standard dev. 2.8%
Digital forestry – harvester big data
National laser scanning – digital terrain and canopy models
Depth-to-water maps for "traceless logging"

- Different models
  - Skogforsk – the UNB model
  - Swedish forest agency – the Cowi model
- 800 evaluation points, similar results are reached
- The model often indicates too much wetness (ditches, roads, soil types etc.)
Fast implementation – fantastic results!

- 80% of damages with leakages to water arise within blue areas
- 60% of all damages arise within blue areas
- During 3 years of using DTW and adopted methods, serious damages has decreased with 80%
Experiences from machine operators

- Discover wet areas in time
- Facilitates passages (streams and wet areas)
- Facilitates planning of strip roads and landings
- DTW maps are used in most of the logging machines today
Success factors

• Standardization and infrastructure
• Tight collaboration between research – companies – contractors – machine manufacturers
• Companies that want to take the lead and share experiences
• Demo programs