Non-Destructive Pre-Harvest Measurement of Diameter Profiles of Standing Mature Pine Trees by Terrestrial Laser Scanning (TLS)

Per Otto Flæte
Norwegian Institute of Wood Technology

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www.treteknisk.no
Terrestrial laser scanning applied in forest inventories

• Project partners:
  - Viken Skog BA
  - Treemetrics Ltd
  - GeoPlan AS
  - Scanpole Norge AS
  - Norwegian Forest and Landscape Institute
  - Norwegian University of Life Sciences
  - Norwegian Institute of Wood Technology
Objective

• evaluate TLS as a potential technique for non-destructive prediction of diameter profiles of standing mature Scots pine trees

Why?

• support as a non-destructive tool for pre-harvest stand value and wood quality assessment
>90 % of harvested volume: fully mechanised cut-to-length system
Choises made when bucking a tree into logs strongly affects the following stages in the wood conversion chain.
Material and methods

- 27 mature Scots pines
  1. diameters manually callipered
  2. Scanning with TLS
Terrestrial laser scanning
Material and methods

• 27 mature Scots pines
  1. diameters manually callipered
  2. Scanning with TLS
  3. Harvesting
Harvester
Material and methods

• 27 mature Scots pines
  1. Diameters at 1.3 m manually callipered
  2. Scanning with TLS
  3. Harvesting
  4. TLS data processed and converted to StanForD stem files (Treemetrics)
  5. Stem files from the harvester collected
# Results - Diameter at bh

<table>
<thead>
<tr>
<th></th>
<th>Reference (R)</th>
<th>Dbh (mm)</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Harvester (H)</td>
<td>TLS</td>
</tr>
<tr>
<td>Mean</td>
<td>244</td>
<td>242</td>
<td>246</td>
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<tr>
<td>St. dev.</td>
<td>45</td>
<td>49</td>
<td>55</td>
</tr>
<tr>
<td>Min</td>
<td>178</td>
<td>151</td>
<td>150</td>
</tr>
<tr>
<td>Max</td>
<td>353</td>
<td>355</td>
<td>390</td>
</tr>
</tbody>
</table>
Results – Diameter profiles I
Results – Diameter profiles I

![Graph showing diameter profiles](image)
Results – Diameter profiles II
Results – Diameter profiles II

![Graph showing diameter profiles vs height in tree (m) for Harvester and TLS methods.](image-url)
Enables bucking simulations prior to harvesting
Thank you for your attention!