Automatic feeding system for mechanized planting; an evaluation of the Risutec automatic plant container (APC)

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VS.

Risutec APC

http://www.youtube.com/watch?v=xTp_UgoEl7Q

Bracke
Risutec APC

- Seedlings are loaded in 16 BCC’s Plantek 81 cultivation trays -> 1296 seedlings in total
- Separate seedling storage rack containing 12 trays (972 seedlings).
- Risutec is still a prototype and has been tested briefly in forest terrain
The aims

• Comparative time study (Risutec APC vs. Bracke)
  – Productivity
  – Time consumption
  – Quality

• Cost calculations comparing these two machines as well as an idealized machine with automatic feeding system (AUT)

• Cost calculations were derived from results of the time study.
## Productivities

<table>
<thead>
<tr>
<th>Device</th>
<th>Operator</th>
<th>Mean, PWh₀</th>
<th>Min.-Max. (SD)</th>
<th>Mean, PWh₁₅</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risutec</td>
<td>Risutec</td>
<td>215</td>
<td>202-235 (15.6)</td>
<td>184</td>
</tr>
<tr>
<td></td>
<td>Bracke</td>
<td>177</td>
<td>169-190 (9.8)</td>
<td>143</td>
</tr>
<tr>
<td>Combined</td>
<td></td>
<td>196</td>
<td>169-235 (23.4)</td>
<td>163</td>
</tr>
<tr>
<td>Bracke</td>
<td>Risutec</td>
<td>199</td>
<td>177-239 (27.6)</td>
<td>199</td>
</tr>
<tr>
<td></td>
<td>Bracke</td>
<td>290</td>
<td>253-317 (27.2)</td>
<td>289</td>
</tr>
<tr>
<td>Combined</td>
<td></td>
<td>244</td>
<td>177-317 (55.5)</td>
<td>244</td>
</tr>
</tbody>
</table>
Quality of the planting work was reasonable with both machines.
## Operating costs

<table>
<thead>
<tr>
<th></th>
<th>Bracke</th>
<th>Risutec APC</th>
<th>AUT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base machine (€/h)</strong></td>
<td>9.91</td>
<td>9.79</td>
<td>9.89</td>
</tr>
<tr>
<td><strong>Planting device (€/h)</strong></td>
<td>6.94</td>
<td>12.30</td>
<td>11.90</td>
</tr>
<tr>
<td><strong>Administrative costs (€/h)</strong></td>
<td>3.25</td>
<td>3.21</td>
<td>3.27</td>
</tr>
<tr>
<td><strong>Fixed costs (€/h)</strong></td>
<td>20.10</td>
<td>25.30</td>
<td>25.06</td>
</tr>
<tr>
<td><strong>Variable costs (€/h)</strong></td>
<td>46.87</td>
<td>45.93</td>
<td>49.20</td>
</tr>
<tr>
<td><strong>Total costs (€/h)</strong></td>
<td>66.97</td>
<td>71.24</td>
<td>74.26</td>
</tr>
<tr>
<td><strong>Unit costs (€/seedling)</strong></td>
<td>0.28</td>
<td>0.39</td>
<td>0.27</td>
</tr>
</tbody>
</table>
Appropriate and effective automatic feeding system could increase productivity

- Proportion of time spent handling seedlings
  - Productivity of 100 seedlings/h
    - 7.1% for Bracke (MAN) and 2.1% with AUT
  - Productivity of 300 seedlings/h
    - 18.5% for Bracke (MAN) and 6.0% with AUT

- Productivity when excluding handling of the seedlings 200 seedlings/h
  - 192 and 174 seedlings/h when including handling of the seedlings for AUT and for Bracke, respectively
Discussion and conclusions

• Risutec performance was not at the same level as Bracke
• However, it remains possible to reduce operating costs with an effective automatic feeding system
• Automatic feeding is an essential component in the future for continuously advancing planting machines with productivity rates several times higher than machines in use today
Thank you

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KNOWLEDGE
Well-being
Know-how

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