DESIGNING A SMALL-SCALE FELLER-BUNCHER FOR BIOMASS OPERATIONS

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INTRODUCTION

- Large share of timber supply on small tracts;
- Harvesting equipment have become larger with time;
- Past research of harvesting system with the primary purpose of supplying wood for energy use;
- Targets: trees with DBH <20cm;
- Implementation criteria:
  1. Environmentally friendly;
  2. Low capital costs;
  3. Low operational costs;
  4. Fuel efficient.
FELLING

- Small excavator
- Shear head
- $100,000
- Weight – 9.5 tons
- 40 kW (54HP)
- $26,01/SMH
SKIDDING

- Turbo Forest
- $70,000 – $90,000
- Weight – 5 tons
- 37 kW (50 HP)
- $24,06/SMH
CHIPPING

- Morbark® Typhoon Chipper
- $110,000
- Weight - 10 tons
- Small loader to feed
- 240kW (325 HP)
- $38,16/SMH
RESULTS

**Total system cost:** $300,000 ≈ <50% of the cost of a conventional mechanized system

<table>
<thead>
<tr>
<th>Process</th>
<th>Productivity</th>
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<tbody>
<tr>
<td>Felling</td>
<td>10.6 m³/PMH</td>
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<tr>
<td>Skidding</td>
<td>10.4 m³/PMH</td>
</tr>
<tr>
<td>Chipping</td>
<td>18 m³/PMH</td>
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NEW PROJECT

Focus on the felling section;

Feller-buncher investments:

1. Boom;
2. Auxiliary hydraulic pump;
3. Shear head and saw head;

Safety improvements.
METHODOLOGY – FELLING

- Small excavator (80 VX)
- Shear and saw head
- Weight – 9,05 tons
- 41,9 kW (56,3HP)
- Add a 26,1kW (35HP) motor
METHODOLOGY – FELLING HEADS

Fecon shear head

DFM saw head
METHODOLOGY – BOOM

Original boom
METHODOLOGY – BOOM

Straightened boom
METHODOLOGY – BOOM

≈ 2,5m reach

≈ 5m reach
METHODOLOGY – AUXILIARY MOTOR

26.1kW Motor

Motor and driver protective cage
METHODOLOGY – DATA COLLECTION

- Pine stands (and hardwood);
- Data recorders;
- Videotape;
- Manual recording;
- Production study.
EXPECTED RESULTS

- 50% more efficiency than previous felling method;
- Lower felling cost;
- Raise on total system production of 5 truckloads per day.
CONCLUSION

- Easier on soils;
- Less damage to residuals trees;
- Cost effective Timber Stand Improvement (TSI) for small landowners;
- Opportunities for small tracts of timber;
- Feed the biomass market when it develops.
Acknowledgements

Questions?

Thank you!