Productivity and Costs of Whole-tree Bundling System in Early Thinnings

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- The study was conducted by Metsäteho and Metla 2007-2009
- Objectives
  - properties of whole tree bundles
  - productivity of whole-tree bundling and forwarding and long-distance transportation of whole-tree bundles
  - procurement costs of the whole-tree bundling supply chain
The Topic of this presentation

Productivity and cost of whole-tree bundling-forwarding chain

http://www.youtube.com/watch?v=gb29cQqwbrg
Material and Methods

Field measurements in 2009

- 28 plots (20*50 m) in Central Finland:
  - 35-40 years old Scots pine stands, first thinnings in mineral soils
  - average BHD of cut trees 6-11 cm, average height 7.1-11.3 m

- Recordings
  - Time study of Fixteri II (two observers at the same time)
  - Stand data measurings for predicting the removal and the volume before cuttings...were needed for constructing the time consumption models
  - Measuring weight, solid volume, length and moisture content of the bundles
    - In order to analyze the properties of whole-tree bundles and their correlation with stand parameters

Field measurements in 2008

- Time study for forwarding whole tree bundles
  - time consumption of 50 load was recorded
  - 953 whole tree bundles and 160 pulp wood bundles
The productivity of Fixteri II was significantly higher than Fixteri I

Increase in average removal volume from 20 dm³ to 75 dm³ nearly doubled the productivity of Fixteri II
- Whole tree bundling increased the size of grapple load in loading and unloading
- Load size increased significantly compared to conventional forwarding
- The average load size was 22 bundles (0.5 m³/bundle)
- Forwarding productivity 23.8 m³/E₀-hour (whole tree removal 60 m³/ha/forwarding distance 300 m)
- The cost of whole tree bundling is relatively high compared to industrial round wood and energy wood cutting
- Bundling is an additional process which increases the total cost of cutting
The forwarding costs of whole tree bundles were significantly the lowest.

The forwarding costs of whole trees were over double compared to whole tree bundles.

The forwarding costs of conventional pulpwood 60% bigger.
The lowest logging costs were for the whole tree method and integrated of pulpwood and energy wood method.

For energy production the logging costs of whole tree bundles are significantly higher than the logging costs of separate whole trees.
CONCLUSIONS

- The results of this study showed that the productivity of the whole-tree bundler Fixteri II was significantly higher compared with the first prototype Fixteri I

  - For the Fixteri II, the proportion of grapple bunches of not less than 2 whole trees was averagely 80% and the number of trees per grapple bunch averaged 2.9 trees
  - Respective values of Fixteri I 19%/1.3 trees
  - Higher level of simultaneous working processes: For Fixteri II the proportion of simultaneous work elements of the total effective working time was 36%...respectively for Fixteri I 26% (Jylhä and Laitila 2007)
CONCLUSIONS

Important reasons for the increased performance level!

- the improved grapple version was able to feed the trees directly to the bundling unit
- The hydraulic capacity and engine of the base machine of the second prototype was bigger compared to the first version
Development suggestions

- Decreasing the crane cycle time and increasing the number of whole trees per grapple bunch strengthening the construction of the accumulation head
- The movements of the harvester head can be rationalized by automating the crane functions
- Placing the feeding table and the bundling on the front side of the machine
Our study revealed the developing potential of the whole-tree bundler Fixteri II in early thinnings

- The optimal scope of application for whole-tree bundling is in first-thinning stands with a removal stem size of 7-10 cm bhd
- The most competitive method for whole-tree bundling is the integrated procurement of pulpwood and energy wood

The wood procurement chain of whole-tree bundling from young stands is not yet competitive

- The efficiency of the whole-tree bundling supply chain must be improved from it’s current level
THANK YOU FOR YOUR ATTENTION!

Shut your mouth, Roger! BUNDLING HAS A FUTURE!