Towards more effective application of multi-tree handling through educational video

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Abstract:
Thinnings are fast entering a new era of multi-tree handling, integrated wood harvesting, and crane scale measurement. Together with its cooperation partners, Metsäteho has produced a training package aimed at promoting and enhancing multi-tree cutting practices and has provided practical demonstrations on integrated harvesting and the use of crane scales. The educational material has been developed using John Deere and Ponsse forest machines and is readily available via the Metsäteho website: http://www.metsateho.fi/opetusvideot. The training resource includes key tips and advice, such as ideal conditions for multi-tree cutting and how to utilize the method to best effect. Furthermore, the educational videos explain the potential pitfalls of the multi-tree technique. The material is intended to increase awareness of new methods of efficiency improvement in wood harvesting and to serve as a teaching resource for forest machine operator training.

Keywords: education, energy wood, harvesting.

1 Introduction

1.1 Need for more multi-tree handling in early thinnings

Three years ago Metsäteho carried out an investigative survey of potential methods for improving wood harvesting efficiency in young stands (Oikari et al. 2008; 2010). Wood harvesting contractors, forest machine and equipment manufacturers, employees of wood supply organisations, and researchers in the field of thinning wood supply were interviewed to investigate their views.

The dominant view among those interviewed was that there was considerable room for efficiency improvement in young stand harvesting. In particular, interviewees highlighted the potential of multi-tree handling for improved efficiency in industrial roundwood harvesting, the use of crane-mounted scales, and integrated harvesting of industrial roundwood and energy wood (Oikari et al. 2008; 2010).

1.2 Integrated harvesting

Integrated harvesting means the combined harvesting of energy wood and industrial roundwood. Use of the so-called ‘two-pile cutting method’ for integrated harvesting of small-diameter roundwood and energy wood in early thinning stands has become strongly established in recent years (Kärhä 2008; 2011; Kärhä & Mutikainen 2008; Kärhä et al. 2009a; 2009b; 2010; 2011a; 2011b).

According to the method, industrial roundwood and energy wood are separated during cutting into two separate piles. The energy wood can be either whole trees harvested, i.e. without delimbing, or produced as delimbed stemwood. The roundwood fraction is designated for forest industry and the energy wood fraction for energy generation.

1.3 Multi-tree handling and use of crane-mounted scales

Integrated roundwood and energy wood harvesting combines the following efficiency improvements, as proposed by the Metsäteho study interviewees: 1) multi-tree handling, i.e. the processing of two or more stems in a single grapple load during cutting, is utilized as long as possible in the harvesting of both roundwood and energy wood. 2) the harvested output – of energy wood as well as pulpwood – is measured in situ by scales mounted on the forwarder crane. – Without the use of multi-tree handling and crane scales, integrated wood procurement from young stands would not be possible.

Multi-tree handling of pulpwood-sized timber is not a new concept; the method was piloted extensively in Finland in the 1990s with positive results (e.g. Lilleberg 1991; 1994). In the early days, though, multi-tree harvested pulpwood received a cold reception at the pulp mill, as logs often presented branch stub problems and were not always up to spec in terms of top diameter and length of poles. Since then, the situation has changed considerably, as multi-tree harvested pulpwood is now a valued part of the raw material base for pulping.

With respect to integrated wood procurement, the use of crane scales has been a vital piece of the puzzle: crane scales have been installed on hundreds of forwarders for on-site measurement of energy wood output in recent years which has ensured the wide availability of these devices also for the measurement of multi-tree harvested pulpwood.

1.4 Demand, flexibility and procurement costs of energy wood

Other than widespread acceptance of multi-tree harvested pulpwood and use of crane scales, what other factors have spurred the growth of integrated harvesting? Three key factors are evident (Table 1):

- *Good demand for energy wood*. Integrated harvesting has extended the raw material base for forest chips to also include ‘traditional’ first thinnings. This has improved the availability of forest chips and helped meet the strong demand for energy wood.
- *Flexibility*. In integrated harvesting, the size of the pulpwood and energy wood fractions can be easily adjusted according to the market, and pulpwood can be alternatively supplied to other fiber industry as necessary (Fig. 1).
- *Competitive procurement costs.* Integrated harvesting of early thinning stands can achieve lower procurement costs compared to separate wood procurement over a wide range of harvesting conditions (Fig. 2).

Table 1: The main strengths and weaknesses of integrated wood harvesting in early thinnings

Strength
- Expanding the recovery of forest biomass, including traditional first thinnings.
- Improving the availability of forest biomass.
- Multi-tree handling.
- Flexibility (changes for top diameter of pulpwood poles).
- The quality of multi-tree processed pulwood.
- Crane scaling of both fractions.
- Cost-efficiency.
- No burning of pulpwood.
Weakness
- If undergrowth hinders traditional pulpwood cutting, it also hinders integrated harvesting.
- Low pulpwood and/or energy wood removals.
- Variety of timber assortments.
- Felling heads in cutting.
- Bucking of small logs.
- Terrain with poor carrying capacity in harvesting operations undertaken during the summer.

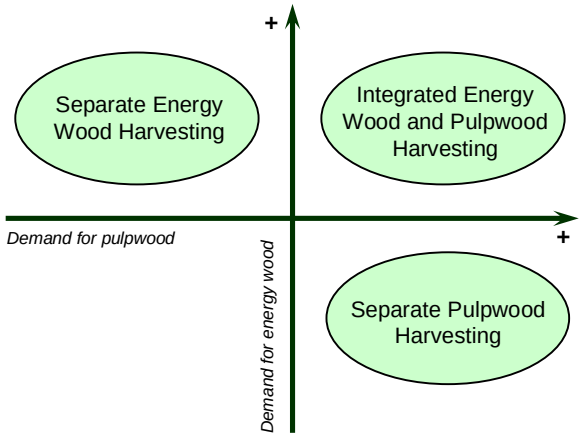

Figure 1: Principal impacts of the market situation (demand for pulpwood and energy wood, and their stumpage prices and prices at the mill/plant gate) on the volumes of integrated harvesting (Kärhä & Mutikainen 2008; Kärhä et al. 2009a; 2009b).

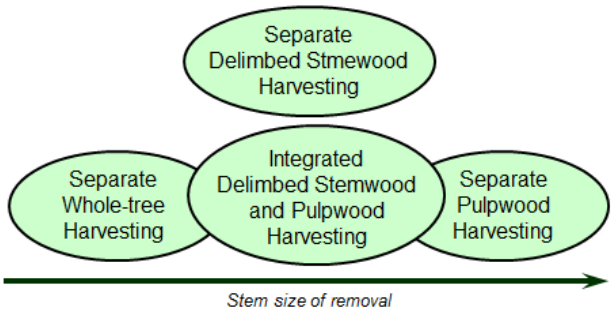

Figure 2: Different wood harvesting methods for different harvesting sites in young stands. The ideal allocation of stands for harvesting methods as a function of removal in stand.

2 Educational material for multi-tree cutting

In cooperation with its partners, Metsäteho has produced a training package aimed at promoting and enhancing multi-tree cutting practices and has provided practical demonstrations on integrated harvesting and the use of crane scales. The educational material has been developed using John Deere and Ponsse forest machines (Figs. 3 and 4) and is readily available via the Metsäteho website: http://www.metsateho.fi/opetusvideot.

Figure 3: The John Deere H412 multi-tree harvester head in action in pulpwood thinning

Figure 4: Software-based multi-tree cutting of roundwood-sized timber with a Ponsse H7 harvester head, as viewed from a Ponsse Fox cab

The training resource includes key tips and advice, such as ideal conditions for multi-tree cutting and how to utilize the method to best effect (Fig. 5). Furthermore, the educational videos explain the potential pitfalls of the multi-tree technique.

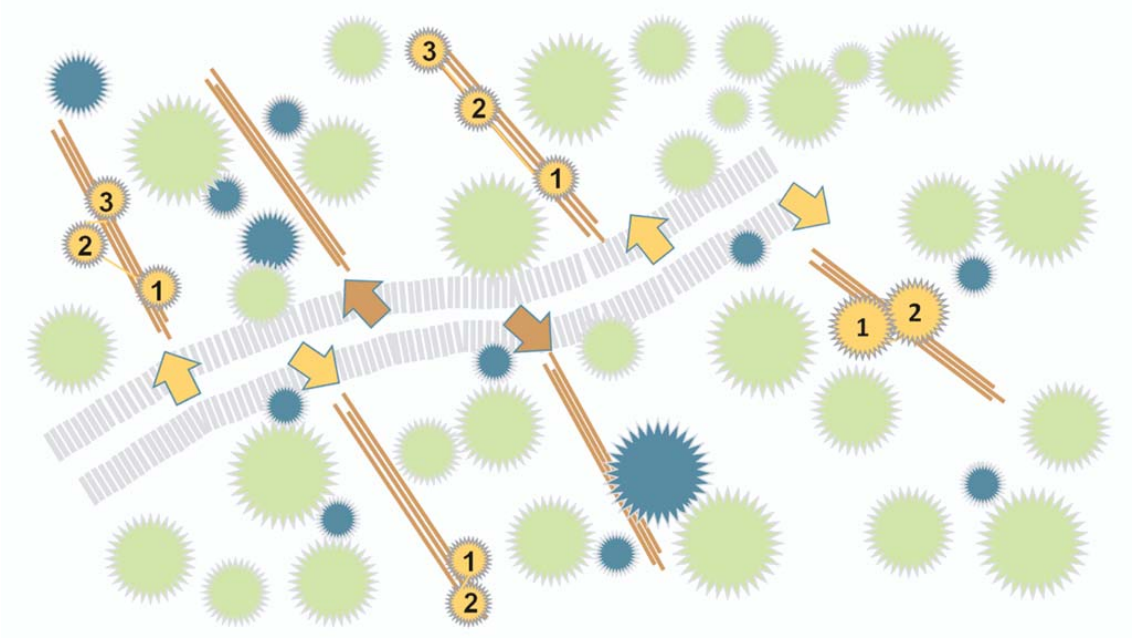

Figure 5: Examples of multi-tree cutting in early thinning stand

The material is intended to increase awareness of new methods of efficiency improvement in wood harvesting and to serve as a teaching resource for forest machine operator training. There is currently a clear need for training material in this area as the efficiency improvement methods mentioned here are not yet well known and – as several studies have highlighted – there is considerable potential for improved efficiency in the multi-tree handling of pulpwood-sized thinnings (Kärhä 2008; 2011; Kärhä & Mutikainen 2008; Kärhä et al. 2009a; 2009b; 2010; 2011a; 2011b).

3 References

Kärhä, K. 2008. Integration of small-diameter wood harvesting in early thinnings using the two-pile cutting method. In: World Bioenergy 2008, Proceedings of Poster Session. World Bioenergy 2008 Conference & Exhibition on Biomass for Energy, 27th–29th May 2008, Jönköping, Sweden. p. 124–128.

Kärhä, K. 2011. Integrated harvesting of energy wood and pulpwood in first thinnings using the two-pile cutting method. Biomass and Bioenergy 35(8): 3397–3403.

Kärhä, K. & Mutikainen, A. 2008. Integrated cutting of first-thinning wood with a Moipu 400ES. TTS Research, Forestry Bulletin 726.

Kärhä, K., Högnäs, T., Kumpare, T., Kovettu, A. & Mutikainen, A. 2009a. Ponsse H53e ensiharvennusmännikön integroidussa hakkuussa. (Integrated cutting of Scots pine first-thinning wood with a Ponsse H53e). Metsäteho Tuloskalvosarja 5/2009. (http://www.metsateho.fi/uploads/Tuloskalvosarja_2009_05_Ponsse%20H53e_kk.pdf).

Kärhä, K., Högnäs, T., Mutikainen, A. & Pajuoja, H. 2009b. Integrated energy wood and pulpwood harvesting in first-thinning stands. In: Savolainen, M. (Ed.). Book of Proceedings, Part I. Bioenergy 2009 - Sustainable Bioenergy Business, 4th International Bioenergy Conference, 31st August - 4th September 2009, Jyväskylä Paviljonki, Finland. Finbio Publications 44: 383–389.

Kärhä, K., Mutikainen, A., Keskinen, S. & Petty, A. 2010. Integroidusti vai erilliskorjuuna – koko- vai rankapuuna? (Integratedly or separately? – As whole trees or delimbed stemwood?). Metsäteho Tuloskalvosarja 2/2010. (http://www.metsateho.fi/uploads/Tuloskalvosarja_2010_02_Integroidusti_vai_erilliskorjuuna_kk_1.pdf).

Kärhä, K., Kumpare, K., Keskinen, S. & Petty, A. 2011a. Ponsse Ergo/H7 rankapuun hakkuussa ensiharvennuksella (Cutting delimbed small-diameter energy wood in first thinning with a Ponsse Ergo/H7). Metsäteho Tuloskalvosarja 1/2011. (http://www.metsateho.fi/files/metsateho/Tuloskalvosarja/Tuloskalvosarja_2011_01_PonsseErgoH7_kk_ym.pdf).

Kärhä, K., Mutikainen, A., Keskinen, S. & Petty, A. 2011b. Valmet 901.4/350.1 rankapuun hakkuussa ensiharvennuksella (Cutting delimbed small-diameter energy wood in first thinning with a Valmet 901.4/350.1). Metsäteho Tuloskalvosarja 11/2011. (http://www.metsateho.fi/files/metsateho/Tuloskalvosarja/Tuloskalvosarja_2011_11_Valmet_901_350_kk.pdf).

Lilleberg, R. 1991. The thinning method and multi-tree handling in mechanized first thinning of pine stands. Metsäteho Report 406.

Lilleberg, R. 1994. A multi-tree harvester FMG 990/756 H in first thinning of pine. Metsäteho Review 8/1994.

Oikari, M., Kärhä, K., Palander, T., Pajuoja, H. & Ovaskainen, H. 2008. Increasing the cost-efficiency of wood harvesting from young stands in Finland. Metsäteho Review 36. (http://www.metsateho.fi/uploads/Katsaus_36_1.pdf).

Oikari, M., Kärhä, K., Palander, T., Pajuoja, H. & Ovaskainen, H. 2010. Analyzing the views of wood harvesting professionals related to the approaches for increasing the cost-efficiency of wood harvesting from young stands. Silva Fennica 44(3): 481–495. (http://www.metla.fi/silvafennica/full/sf44/sf443481.pdf).