SMALL WOOD

May 2022

INFOSHEET

# Motor-manual thinnings: case study SLOVENIA

*Globalization led to a dramatic decline in economic return for timber due to constantly increasing labor costs. The key is to find forest management techniques leading to higher stem quality, ensuring positive economic effects. The scope of this study was to examine the response of new forest management techniques developed abroad. All field studies will include a reference alternative, meaning a conventional design and working method currently used to handle the different types of small-diameter tree stands. Some advantages of innovative thinning methods were found. However, we must remember that the presented results are preliminary due to a short research period and the fact that the research did not include any repetition.*

## Introduction

The basic definition of silviculture according to the IUFRO classification is that silviculture is a science that uses scientific tools and covers the fields of conservation, care, exploitation, restoration, and rehabilitation of forests. It produces models that predict the evolution of forests. Today's guiding principle in forest management is sustainability, as defined at the 1992 international conference in Rio. We are talking about sustainable management, which seeks to preserve forests for posterity as we know them today. To achieve sustainability, we must ensure three main functions: economic, ecological, and social. All these requirements are met through multifunctional management, which must remain economic but be more environmentally and socially appropriate. Forest management is about balancing the relationship between interests and renewable resources. The opposite is the principle of dividing the landscape into urban, productive, and protective ecosystems.

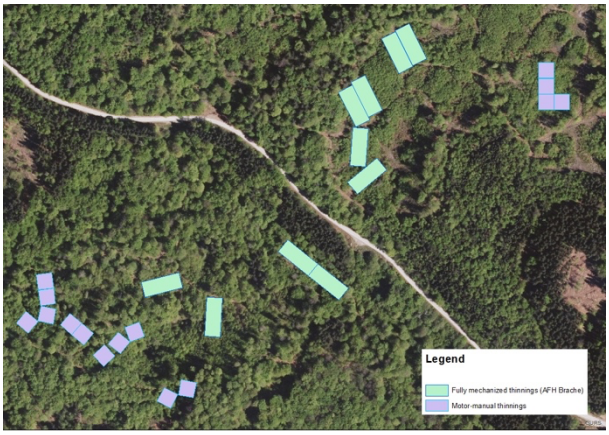
Slovenia is a nation rich in forests covering 58.4% of its land area. The total growing stock of small-diameter trees in Slovenia is estimated to be up to 8 million m3 (Slovenian forestry institute, 2017). According to data from forest management plans thinning operations are planned on nearly 10 000 ha of SDS yearly. Still, the realization of planned thinning operations in private forests was only 22 % (Slovenia forest service, 2017). The Slovenian Forestry Institute has been active in the field of potential wood assessments. Our previous research indicates a low utilization rate of Slovenian forests, especially as far as privately owned forests are concerned. The situation is worse with thinning in small diameter stands. The main reasons for the low realization of first thinning are high harvesting costs and no income since the felled trees are left on the ground.

The rough economic situation in European and world markets has led to several ideas to rationalize forest production. After technical and organizational optimization of work has already been at the forefront in the past, the optimization of forest cultivation is now emerging as an entirely new concept. Forest management means the planned, non-violent, rational orientation of forest development towards silvicultural objectives. Management means guiding forests towards a target state and nurturing the forest so that its positive biological and economic characteristics are permanently promoted. In contrast, the negative ones are attempted to be suppressed.

## Methods and Materials

The Slovenian field trials were carried out in southeastern Slovenia near the town Kočevje. The felling head was used in younger small diameter beech pole stands. The terrain conditions were unfavorable for mechanized harvesting but reflected Slovenia's common terrain conditions and ground challenges. Sinkholes are depressions in terrain representing a unique feature of karst landscapes with which several impacts and hazards can be associated. Due to sinkholes, the slope of the terrain can change very quickly over very short distances. Even though the

stand is located on hilly terrain with a slight inclination, the slopes may exceed technology capabilities when sinkholes appear.



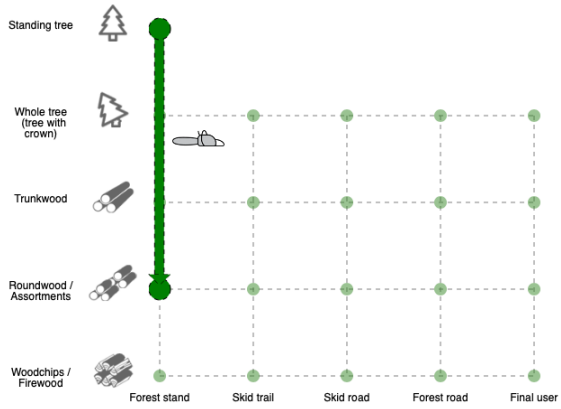

*Picture 1: Study was design in a similar stands to studies of fully mechanized thinnings*

The forest stands are mainly located in the rockiest and least suitable locations for agricultural use. These are oak-beech habitats on gentle slopes with sinkholes and hidden valleys in a hilly area. Easy accessibility and proximity to the former villages and the town of Kočevje are the main reasons forests have been used more intensively for a long time. In the past, many areas were in extensive agricultural use - pastures and litter, so the stands are of lower quality. In Slovenia, in the next 20 years, vast areas of beech small diameter stands will need thinning. Therefore, finding more effective ways to ensure forest tending is also highly interesting.

*Table 1: Characteristics of individual stands.*

| | Summarized | Selective thinnings | Minimal (situation) thinnings |
|---|---|---|---|
| **Plots** | 15 | 6 | 7 |
| **Age of the stand** | 20 years | 20 years | 20 years |
| **Species** | 99% beech, 1% other broadleaves | 99% beech, 1% other broadleaves | 99% beech, 1% other broadleaves |
| **Mean DBH** | 3.6 cm | 3.59 cm | 3.67 cm |
| **Mean density (trees ≥1 cm)** | 11 565 / ha (4 200–20 300) | 11014 / ha | 11212 / ha |
| **Mean density (trees ≥4 cm)** | 3 430 / ha (1 900– 5 600) | 3785 / ha | 3412 / ha |
| **Mean standing volume (stem+branches)** | 104 $m^3$ / ha | 104 $m^3$ / ha | 144 $m^3$ / ha |
| **Biomass removal** | 56 $m^3$ / ha | 69 $m^3$ / ha | 44 $m^3$ / ha |

From a technological aspect, the forestry links of the forest wood supply chain are made up of a series of production processes through which the natural resources from forests are transformed into products and services. On the right side, I will present an essential tool for describing harvesting systems: the matrix, which visualizes cutting and hauling from the standing tree in the stand to the forest products at the end-user. On the ordinate axis, the changes in the state of tree processing are depicted. On the abscissa axis, the course of hauling or transport is presented, from the standing tree via different categories of forest roads to loading areas on forest roads, and finally to the end-user. Intersections in the matrix indicate where specific operations are carried out or where the state of tree processing changes (limbing or crosscutting, for example, can be implemented in the stand on a skid-road or even a forest road).




*Picture 2: Conventional reference system predicts only motor-manual thinnings without extraction of biomass*

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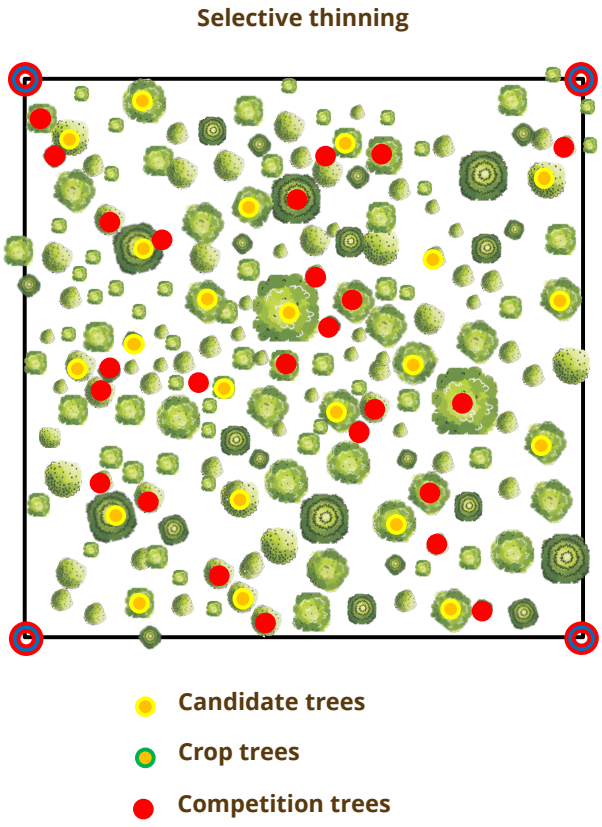
Matrix presents our traditional pre-commercial thinning, where all the processes are carried out in the stand at the tree stump. You can notice from this picture that no actions occur on the abscissa axis, as there is no transport. The small diameter trees are felled to the ground and left on the site to root and fertilize the soil.

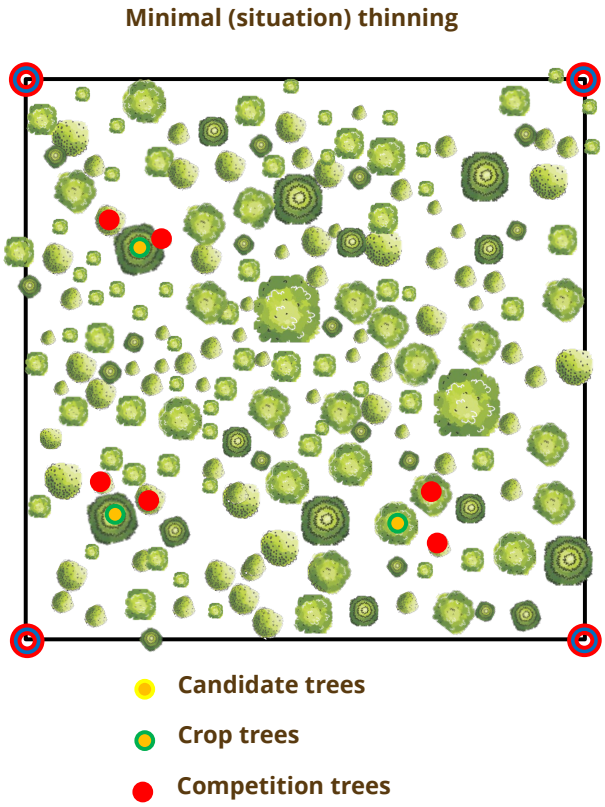
Our study investigated the traditional selective thinning method with more novel minimal or situation thinning. The particular thinning start early in pole stands. The thinning of the forest plays a vital role in the development of mature stands. However, due to natural disturbances, it represents a relatively uncertain investment in the future forest. Selective thinning from below is the most common thinning method used in Europe, but its understanding differs slightly. Generally, with selective thinning, the subdominant, suppressed, and potentially damaged trees (i.e., low-quality trees with poor growth potential) are usually removed.

*Picture 3 Time studies were recordered with small action camareas*

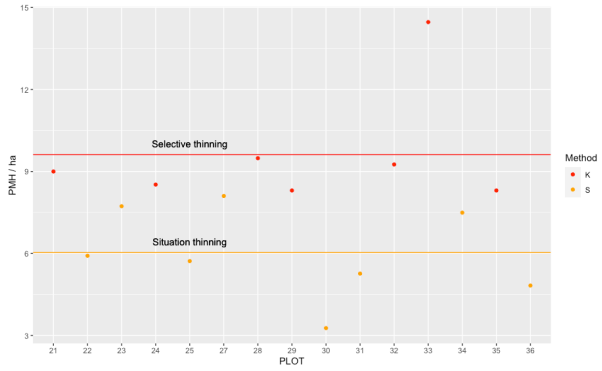



*Picture 3 Selective thinning method*

In Switzerland, Schutz and Ammann have developed situation thinning un the influence of rationalization of selective thinnings. (Biologische Rationalisierung - Ammann, 2013, 2014): Tending concepts are proposed which rely on biological rationalization and future tree thinning to achieve future trees as vigorous as possible. These are not only more effective but are also significantly less expensive. Situational tending focuses on approx—100 of the most valuable crop trees per hectare, depending on the species.




## Results




## Discussion

We can confirm that by following the picture, which shows lower time consumptions per hectare in the case of thinnings. Due to the lower number of crop trees, there is also less processing of trees and more operator movements in case of situation thinnings. Therefore the operator covers a much greater area at the same time.

*Picture 4 Minimal (situation) thinnings*

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## References:

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Funded by the Horizon 2020 Framework Programme of the European Union

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