

DIVERSIFYING FOREST MANAGEMENT METHODS

3. Provision of ecosystem services - results from Motti DST

The management of Fennoscandian boreal forests is largely based on even-aged forestry. In the Lapland region, continuous cover forestry has in recent years accounted for roughly seven percent of the total harvested area.

In the TRANSFORMIT project, Decision Support Tools (DST) are developed so that they can better consider Integrative Forest Management (IFM) practices and their impacts on the provision of different ecosystem services.

In addition to illustrating the different management options, the owners and forest managers need information on the harvesting opportunities and incomes, development of timber stock, and various other indicators related to multifunctional aspects of forest management.

The demonstration forests in the Rovaniemi area function as forest laboratories (Living Labs) that serve the different needs of forest owners and managers. The main purpose is to illustrate how forest management can be diversified. Visitors are free to observe what different types of harvesting look like in practice and what kinds of effects different harvesting methods have on forest regeneration, growth, and biodiversity. The sites are also used for monitoring and research.



TRANSFORMIT

Effects of management on forest structure

Seven demonstration forest sites were used to compare continuous cover silviculture with even-aged cultivation methods. The sites compare forest structure (see Opening Figure) obtained by the Virtual forest 2.0 (NLS) tool for clearcutting, gap cutting, seed tree cutting and selection cutting with an untreated control area. The height profiles in the management regimes shows a gradient from low and homogeneous canopies under clearcutting, through increasingly heterogeneous but structurally simplified profiles under seed tree and gap cutting, to a more multilayered selection cutting, which resembles a not-harvested control plot.

Across management gradient, forest ecosystem service supply (Figure 1) projected by the Motti DST (see Info-Box for details) shifts from production under clearcutting, achieving the highest NPV (Table 1) through high timber harvesting at the cost of reducing other ecosystem services, toward multifunctionality under selection and gap cutting. These lower intensity regimes generate lower NPV, but maintain higher carbon stocks, dead-

wood availability, non-wood forest products, and recreational values. Seed tree cutting occupies an intermediate position, combining high NPV with moderate levels of cultural and supporting services. Overall, increasing management intensity maximizes wood provisioning, whereas lower intensity and continuous cover systems trade economic value for a balanced portfolio of forest ecosystem services.

TREATMENT	NPV (€, 2% i.r.)	% OF CLEARCUTTING
CLEARCUTTING	7 009.8	100.0
CONTROL	1 996.2	28.5
GAP CUTTING	6 558.2	94.0
SEED TREE CUTTING	6 244.7	89.1
SELECTION CUTTING	6 358.2	90.7

TABLE 1. Relative percent of Net Present Value (NPV) across management treatments.

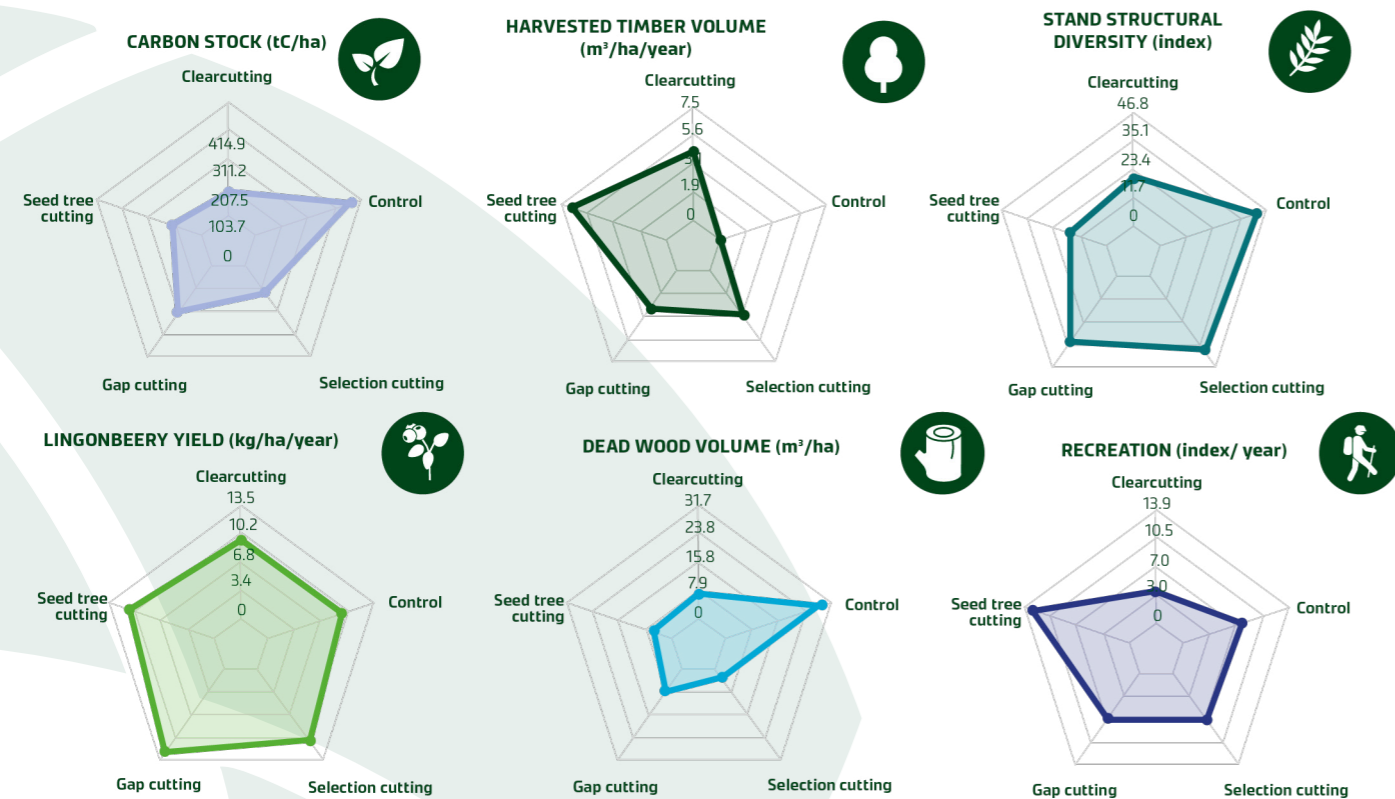


FIGURE 1. Values of Forest Ecosystem Services across management treatments in the Hirvas area averaged across 100-year rotation.

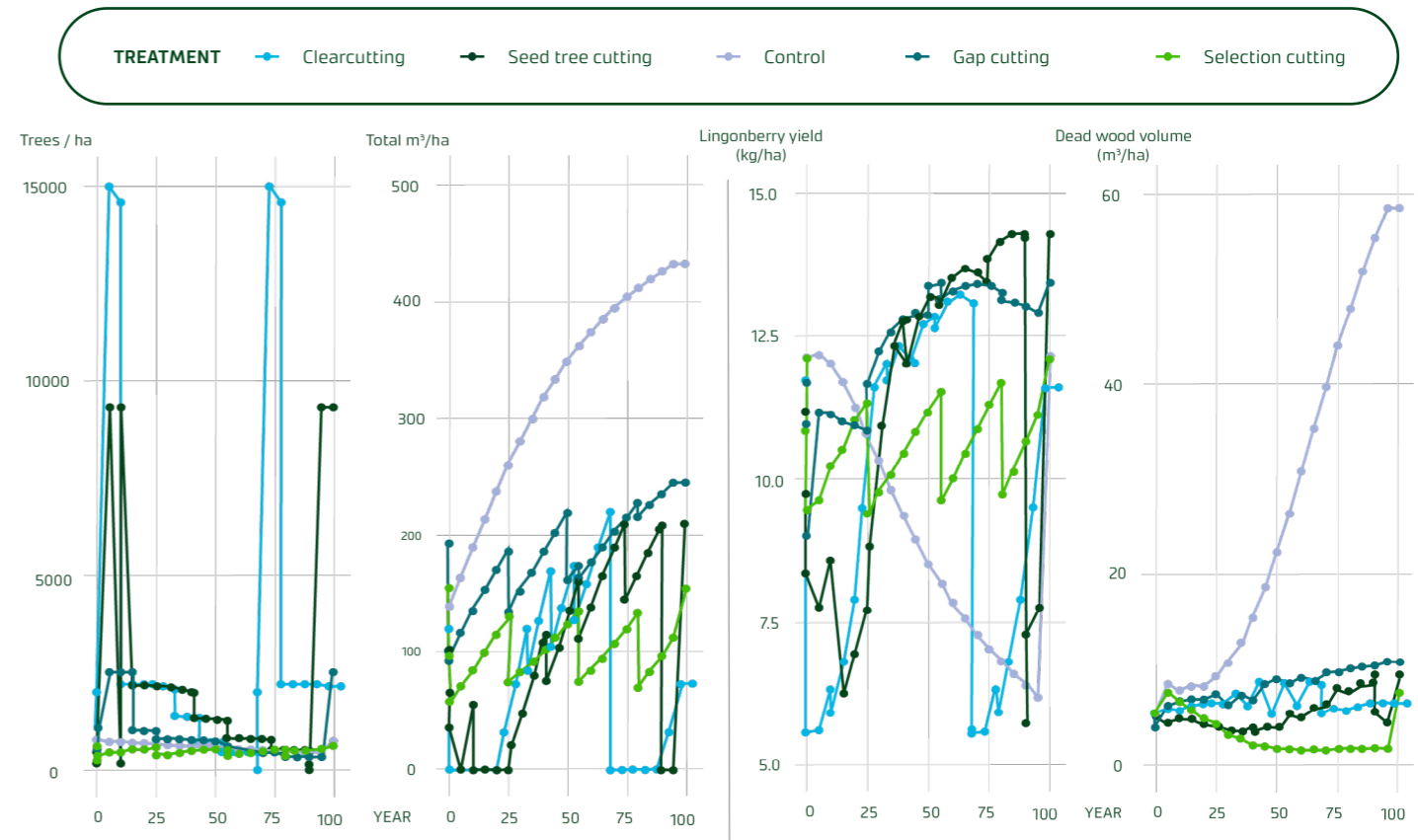


FIGURE 2. Development of indicators of forest structure: tree volume and stand density across management treatments in the Hirvas area across 100-year rotation.

FIGURE 3. Development of ecosystem services: lingonberry yield and deadwood volume across management treatments in the Hirvas area across 100-year rotation.

Forest development over a 100-year period

Tree density and total tree volume (Figure 2) show clear differences among management regimes, which affect the supply of forest ecosystem services. Clearcutting shows strong cyclical fluctuations, with abrupt decline in both density and volume following harvests, followed by rapid regeneration. Seed tree and gap cutting moder-

ate these fluctuations by retaining residual trees. Selection cutting maintains relatively stable tree densities with gradual volume increases, reflecting continuous canopy cover and incremental harvesting. In contrast, no management (control) sustains consistently high tree density and shows a steady accumulation of tree volume throughout the rotation.

Lingonberry yield (Figure 3) increases with lower intensity management, with selection and gap cutting supporting the highest and most stable values, while clearcutting causes strong fluctuations and prolonged post-harvest reductions. Deadwood volume accumulates steadily only under no or very low harvest intensity; all managed regimes maintain low and relatively stable levels, with the strongest depletion under clearcutting and limited retention under gap- and seed tree cutting. Overall, lower management intensity enhances both non-wood forest products and habitat provision through greater structural continuity and biomass retention.

Motti

Motti is a stand-level forest DST developed by Natural Resources Institute Finland (Luke). Motti assesses how alternative silvicultural regimes affect forest structure and ecosystem services.

Virtual Forest 2.0 (VF2.0)

Virtual Forest is a 3D forest visualization tool that supports the analysis of forest management scenarios and landscape-level impacts. It supports multi-objective forest planning by combining simulation and immersive visualization to assess the effects of management actions on forest structure, landscape, and resource use.

THIS BROCHURE IS THE THIRD IN A SERIES OF THREE BROCHURES. ALL BROCHURES CAN BE FOUND ON LUKE'S WEBSITE.





TRANSFORMIT - Integrating societal demands with biodiversity

transformforest.eu/fi/

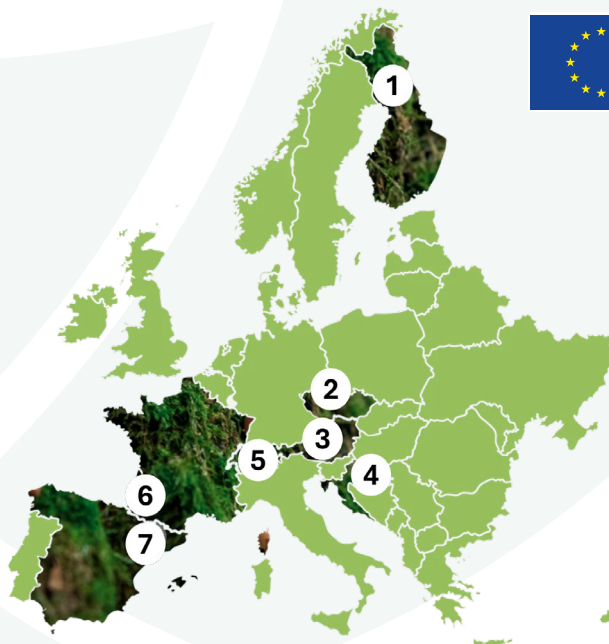
 TRANSFORMIT Project

 European Forest Institute

Transformit tests Integrative Forest Management (IFM) in seven living labs across Europe, aiming to balance economic sustainability with social sustainability and biodiversity.

- Transformit project is a European research and development initiative aiming to **promote sustainable forest management** that balances environmental, economic, and social outcomes across various forest types and contexts.
- In practice, this means Integrative Forest Management.
- The project **tests new forest management solutions** in forest living labs across Europe, including one in Lapland, Finland.
- It also seeks to build **collaboration between researchers and practitioners**.
- The project involves **16 organizations from 12 countries**, including the Natural Resources Institute Finland (Luke). It is coordinated by the European Forest Institute (EFI).
- Funded by the European Union, the project has a budget of €6.9 million under the **Horizon Europe Research and Innovation program** (grant agreement 101135263).

1. **FINLAND:** Lapland
2. **CZECH REPUBLIC:** Central Bohemia
3. **AUSTRIA:** Styria
4. **CROATIA:** Zagreb
5. **SWITZERLAND:** Basel Canton
6. **FRANCE:** Les Landes
7. **SPAIN:** Catalonia



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