ForestEcoSecurity - Management methods and technology for young boreal forests for adaptation to sustainable forest management goals in a changing climate

Focusing on young forest management, we summarize the Nordic forestry objectives, their target measures and current state of the forests. Based on the Nordic Boreal Forestry area study results, we review the current young stand management systems. Finally, we analyze the strengths and weaknesses of the systems to assess the roadmap for further development.

Integrated biomass and roundwood harvesting. Photo: Mikko Tirkkonen, MatFutureVision.

In total, 46 articles in the 2000s were selected and analyzed by using an integrative literature review method

The reviewed categories are:

I) digital tools for pre-planning of cutting areas

II) mechanical harvesting work methods and technologies,

III) monitoring of wood procurement resourcing,

IV) transfer of research and development knowledge to practical implementers and forest owners.

Background

Despite the overall Aurora region forestry promotion strategy, the Nordic Boreal Forestry's problems are the growing area of poor condition young forests and their unexploited raw material. One of the reasons for neglecting young forests is the forest owners' low willingness to manage young forests and sell small-diameter wood because the management is costly and the revenue from sales is very scarce. The changing structure of forest owners has significantly increased the importance of ecological and social values for their forests

Forwarding whole trees. Photo: Yrjö Nuutinen, Luke.

Partners and funding

The project was conducted in cooperation with Luke and SLU

Funding: Interreg Aurora and Regional Council of Lapland

Young forest thinning. Photo: Mikko Tirkkonen, MatFutureVision.

Results

I) Digital tools for pre-planning of cutting areas
Remote sensing methods connected with logging machine's tree specific production files.
More detailed tree level recording lies in the potential of drone-mapping using deep learning algorithms.

II) Mechanical work methods and technologies
A road map for Nordic silvicultural implementation systems, methods and technologies should be written.
For small-diameter stands is boom-tip controlled harvester head for continuous felling the trees.

III) Monitoring of wood procurement resourcing
Contractors need more practical tools, e.g. calculation platform of integrated energy wood and pulpwood harvesting

IV) Transfer of research and development knowledge to practical implementers and forest owners
Nordic data transfer network: through the cooperation between research, actual forest professionals and teaching a network model of data transfer to ensure the transfer of new research and development data to practical forestry

Future development steps

- Digital pre-planning tools based on remote sensing systems in targeting cutting areas: information in the logging machine's tree-specific production files (HPR-data) is connected to remote sensing data from the same stand to test the possibilities of remote sensing.
- Drone, 360 degrees cameras, LIDAR data for harvesting planning: determine the working environment of young forests based on stand structure (tree diameter and length, stand density) and terrain properties.
- Virtual reality technologies for harvesting planning: support decision making during harvesting.
- Silvicultural methods and technologies: describe work methods and suitable technologies for young dense forests; and develop a harvester working location based, boom corridor thinning model.
- Monitoring resourcing and profitability: calculation platform of integrated energy and pulpwood harvesting for contractor.
- Data transfer network: through the cooperation between research, forest professionals and teaching, a network model of data transfer to ensure the transfer of new research and development data to practical forestry.

Further information:

Yrjö Nuutinen (yrjo.nuutinen@luke.fi)

Dan Bergström (dan.bergstrom@slu.se)

Johanna Routa (johanna.routa@luke.fi)

Luke NATURAL RESOURCES INSTITUTE FINLAND

SLU

Interreg Aurora

Co-funded by the European Union

REGIONAL COUNCIL OF LAPLAND

https://www.luke.fi/en/projects/forestecosecurity
http://urn.fi/URN:NBN:fi-fe2024092775051