Abstract template for the conference "A century of national forest inventories – informing past, present and future decisions"

Dear author. This is a two-page template that in the first page will ask for information on presenter name, topic, and preferred presentation form.

On page two, you are asked to fill in your abstract in the format and font size indicated. Please remember to include authors affiliation information in the footer section of page two. The length of the abstract may not be more than one page including references.

Abstract title:		**What data accuracy suffices for stand management decisions?**
Take-home message:		*Because the decision of stand management is dependent on many other aspects than stand structure described by data, it is recommended not to separate but to integrate the inventory and planning systems for well-informed decisions.*
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General topic, see website: (please double click on the check box and activate the relevant one)	☐	Improving future NFIs by learning from the past
	☐	NFIs today and in the future
	☒	Cutting edge and futuristic inventory techniques and technologies
Preferred presentation form:	☒	Oral presentation
	☐	Poster
Abstracts will be reviewed by members of our scientific committee and you will be given information on decisions in due time after the submission deadline has passed.		

What data accuracy suffices for stand management decisions?

Jari Vauhkonen

Introduction: The use of airborne inventory data to detect and delineate individual trees and to predict total tree diameter distribution (DD) has been studied a lot in recent years. However, it is unclear if the current methods produce a sufficient accuracy for forest management decisions. Even if some studies in this field exist, these are limited to even-aged forestry. The aim here is to study the implications of varying accuracy of inventory data up to the next management activity, depending on a wide set of alternatives also including thinning from above.

Materials and methods: The study is based on DDs with varying shapes and scales due to individual tree inventory approaches studied by Vauhkonen and Mehtätalo (2015) on pure Scots pine stands. All DDs were described using the two-parameter form of the Weibull function. In all alternatives, tree heights were predicted by the same, locally-fitted function. Using the diameter and height, the total stem and assortment volumes were estimated based on taper curves and a simple method mimicking stem bucking. Altogether seven different management alternatives were simulated for each of the tree lists. The alternatives included no-management, clear-cutting, thinning from below, and four different thinnings from above, based on different rules for tree selection (Pukkala et al., 2015; Vauhkonen and Pukkala, 2016). Except for simulating the management alternatives for the different forest structures represented by the plots, each plot was simulated as if it was located on three different sites (either on *Myrtillus* [mesic], *Vaccinium* [sub-xeric], or *Calluna* [xeric] site types) and using interest rates of 2–4%, which affected the productivity of the remaining tree stock and also tree selection rules in some harvesting alternatives. The results of the treatments for the different forest structures were evaluated in terms of two criteria: the present value of the harvested trees and the expectation value based on the bare land and the remaining trees. The present and future values were summed together and the management alternative that produced the highest total value was considered as the most suitable for the plot. The presentation examines the dispersion of the selected alternatives as a function of data accuracy.

Results: When pooled over all combinations of DDs, site fertilities, and interest rates, the predicted management alternative matched precisely that of the reference distribution in altogether 77% of the plots or did not otherwise cause losses in terms of the total SEV. However, management alternatives predicted on 5% of the plots would have caused losses corresponding to at least 6% of the total SEV and as much as 35% at maximum. The biggest losses did not occur with a specific inventory method or forest structure, but were related to the highest interest rates. Developing knowledge-based rules on management alternatives selected on different “site fertility – interest rate” combinations based on the reference data allowed for preventing the simulation of infeasible alternatives. A set of simple rules halved the proportion of highest SEV losses presented above.

Conclusion: The accuracy of forest inventory methods for selecting management alternatives for Scots pine stands was found adequate. However, because the decision of stand management is dependent on many other aspects than stand structure, it is recommended not to separate but to integrate the inventory and planning systems for well-informed decisions.

References:

Pukkala et al., 2015, For. Ecosyst. 2:32, doi: 10.1186/s40663-015-0056-1

Vauhkonen and Mehtätalo, 2015, Can. J. For. Res. 45(3), 353-363.

Vauhkonen and Pukkala, 2016, Eur. J. For. Res, 135(3), 581-592.

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