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

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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:		Usefulness of past inventory data as prior information in the future inventory
Take-home message:		*When auxiliary information as accurate as new Lidar data is used to assist in estimating the parameters of interest, the usefulness of prior information from previous inventories is not self-evident. When the auxiliary data is efficiently used at each time point, and a composite of the resulting estimates is made, it is possible to achieve marked reductions in the variance. If a growth model is not used to update the old data, the resulting estimate will be biased, but with updating the bias can be markedly reduced although unbiasedness of the estimates cannot be guaranteed.*
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General topic, see website: (please double click on the check box and activate the relevant one)	x	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:	x	Oral presentation
	☐	Poster
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Usefulness of past inventory data as prior information in the future inventory

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Introduction: It is possible to utilize prior information from the previous inventory in order to improve the current estimates. Early examples from this are the Kalman filter approach presented by Kangas (1991) and mixed estimator approach presented by Korhonen (1993). When accurate auxiliary information such as lidar or digital aerial photogrammetry data is available, utilizing prior information from old data may produce only marginally better results than using just the most recent data (Nyström et al. 2015). Thus, there is need to utilize the prior information as efficiently as possible to make use of it.

Materials and methods: The data is from Våler Norway (Næsset 2002, Næsset et al. 2015), including AGB measurements from 176 field plots measured at 1999 and 2010, and Lidar data from both time points. From these data, a Copula population of 10 000 units is formulated. We present different approaches to utilize data from old inventory as prior information and assess their accuracy in a simulation study. First, it is possible to make a composite estimator using field samples from both timepoints. Second, it is possible to use a Kalman filter to update the old sample using a growth model and combine it with the new sample information. However, it is also possible to make composite estimates of model-based or model-assisted estimates of the AGB at the different time points, i.e. to use both the old inventory data and the auxiliary information.

Results: Composite of 1999 and 2020 SRS estimates was clearly more accurate than the SRS estimate using solely 2010 data, but a composite of two model-assisted estimates was even more accurate. However, if the old sample plots were not updated, the resulting estimate for the 2010 AGB was clearly biased. A composite estimate of model-based estimate of mean AGB in 2010 based on updated 1999 data and model-assisted estimate of mean AGB using 2010 data reduced both the bias and the variance.

Conclusion: Prior information from old inventory data can be useful also when connected to highly accurate auxiliary information, when both data sources are efficiently used.

References:

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