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

Abstract title:		Modeling tree growth, harvesting and regeneration from national forest inventory data: A case study of Southern Belgium forest resources evolution
Take-home message:		*We developed an easily replicable methodology to develop harmonized growth and management models from national forest inventory data. These models are compatible with a wide range of forest composition and structure and can be directly applied on forest inventory data or integrated in a forest simulation software.*
Presenter name:		Perin Jérôme
Presenter contact info:		ForestIsLife, TERRA Research Unit, Gembloux Agro-Bio Tech, University of Liège, 2 Passage des Déportés, 5030 Gembloux, Belgium. J.Perin@uliege.be
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.		

Modeling tree growth, harvesting and regeneration from national forest inventory data: A case study of Southern Belgium forest resources evolution

Jérôme Perin [1], Sébastien Bauwens [1], Hugues Lecomte [2], Jacques Hébert [1], Philippe Lejeune [1]

Introduction:

Permanent NFI data are usually used to assess the availability of forest resource and to evaluate the sustainability of its management. Unfortunately, the temporal resolution of these data can sometimes be insufficient in the context of intensive silviculture and plantation of fast-growing tree species. Moreover, the monitoring of an extensive network of permanent sample plots is often considered expensive. Modeling and simulation tools are thus increasingly used to artificially enhance the resolution of permanent inventory data and allow to predict the evolution of forest resources.

Nevertheless, modeling forest growth and management at a national scale can be difficult, especially when these models have to be suitable for a wide spectrum of species composition, structure and density. Southern Belgium is an interesting case-study as its forests are intensively managed, highly fragmented, heterogeneous in structure and composition and undergoing fast change to adapt to new environmental and economic conditions. We attempted to develop harmonized growth and management models generalizable to all the conditions encountered in Southern Belgium forests in order to predict their evolution.

Materials and methods:

The data used in this study were obtained from the Permanent Regional Forest Inventory of Wallonia (IPRFW) database. They consist of measurement collected between 1994 and 2015 on 104 372 trees of 40 different species in 9737 permanent sample plots (PSP) installed in productive forest stands. About one half (4605) of those PSP were monitored twice at 6 to 16 years interval, allowing us to recover a total of 26 930 tree growth segments.

We used distance independent tree level non-linear and binary logistic regression approaches to model the annual growth, harvesting and regeneration for the 20 main tree species using variables that are commonly measured by national forest inventory.

Results:

We developed annual growth, regeneration and harvesting model that take into account the species composition, stand density, sites characteristics, tree size, social status and the type of forest ownership. The tree level approach made it possible to use continuous variables to express the stands composition and structure. These models exhibit a consistent behaviour over the wide spectrum of forest composition, structure and density observed in the studied area.

Conclusion:

Our methodology proved appropriate to develop forest evolution models suitable for a wide range of forests characteristics. These models can be directly applied on forest inventory data and can easily be integrated in a forest simulation software.

1. Forest is life, TERRA Research Unit, Gembloux Agro-Bio Tech, Université de Liège, 2 Passage des Déportés, 5030 Gembloux, Belgium.
2. Directory of Forest Resources, Department of Nature and Forest, DGO3, Public Service of Wallonia, 15 Avenue Prince de Liège, 5100 Namur, Belgium.

J.Perin@uliege.be