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:		**Two-phase estimation of wood productivity of poplar plantations in northern Italy exploiting Sentinel-2 data as auxiliary information**
Take-home message:		*The use of Sentinel-2 data is performed in a model-assisted framework in order to improve a two-phase completely design-based estimation of wood production of poplar plantations.*
Presenter name:		Agnese Marcelli & Piermaria Corona
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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:	X☐	Oral presentation
	☐	Poster
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Two-phase estimation of wood production of poplar plantations in northern Italy exploiting Sentinel-2 data as auxiliary information

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Introduction: Forest surveys carried out over a large scale involve several phases of sampling. In this study we use a two-phase sampling strategy to estimate the total of wood production from poplar plantations in Northern Italy. The first phase is performed by means of tessellation stratified sampling (TSS), which involves covering the study region by a grid of regular polygons of equal size and randomly and independently selecting one point per polygon. The first phase points are subsequently recognized by very high-resolution air-borne imagery available for the whole study area and all the poplar plantations including at least one sampling point are selected and mapped. A set of 1736 mapped poplar plantations is obtained from the first phase. In the second phase, a subset of 57 poplar plantations are randomly selected from the first-phase sample by means of stratified sampling and visited on the ground to collect dendrometric attributes.

Materials and methods: The total area of poplar plantations is estimated in a design-based framework by means of the fraction of the first-phase sampled points fallen within them, while the total of their wood production is estimated by an approximate Horvitz-Thompson two-phase estimator suggested by Baffetta et al. (2011). Vegetation indices derived from Sentinel-2 satellite data, freely available over the entire territory, have been used as auxiliary information in a model-assisted linear regression estimator, to improve precision with respect to the pure design-based estimation.

Results: Stated the relatively high correlation observed between Sentinel-2 vegetation indices and the wood production of poplar plantations, the exploitation of such auxiliary information provides a relevant increase of precision of the resulting estimator of the total of wood production, as revealed by the variance estimates.

Conclusion: Freely available Sentinel-2 data can be suitably exploited for assisting the estimation of wood production by poplar plantations under a continuous inventory framework where the survey must be frequently repeated due to the short rotation of plantations and the high rate of land use change.

References: Baffetta et al., 2011, Environ Ecol Stat, 18, 147-167.

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