

Response to Anonymous Referee #3

black = referee comments

blue = authors answers

General Note from the Authors:

We thank the reviewers for their constructive and helpful comments, which have contributed to improving the database, manuscript and supplementary information.

Note that during the revision, we identified two calculation errors. The SoEF extrapolation was implemented over five rather than three years. The CRAFT calculation used “EuFor-estimate” instead of “EuFor-harmonized” harvest data. Further, we updated the forest area harmonization process, which affected the countries Spain, Latvia, Finland, Slovakia and Slovenia. This slightly changed the results but not their overall interpretation. All analyses and corresponding results have been updated accordingly.

Dear authors,

This manuscript presents the EuFor dataset, which compile forest area, growing stock, harvest, and increment statistics from national forest inventories, forest censuses, SoEF, FAOSTAT, and other sources. The dataset addresses an important need for spatially and temporally consistent forest statistics. The separation between reported and harmonized subsets is useful, and the effort required to collect information from fragmented national sources is substantial. However, some aspects should be improved. Specific comments are as follows.

1. Although the target definitions and processing steps are documented, the manuscript does not yet demonstrate whether estimates obtained through different harmonization pathways have a comparable basis. I suggest the authors examine whether the resulting values differ systematically according to the principal data sources or processing methods, and clarify the extent to which EuFor-harmonized improves comparability across countries and regions, and identify any remaining limitations associated with differences in data sources and processing methods. Any remaining limitations for comparing absolute values across countries and regions should be stated explicitly in section 3.3.

We thank the reviewer for this suggestion. Our objective in developing EuFor-harmonized was to establish a comparable basis across countries and regions by bringing the data to common definitions, spatial units, and annual time scales that will allow use intensity calculations. Achieving this required different reconstruction methods for each

indicator, reflecting differences in data availability and the different characteristics and temporal dynamics of forest area, harvest, and growing stock. However, by bringing the data to a common reference definition, we provide a consistent basis for comparison across countries and regions.

The comparison with SoEF (Figure 5) provides an additional check of the resulting harmonized series: no variable showed a consistently large deviation across countries, suggesting that the harmonization procedure did not introduce a pronounced systematic bias at the European scale. We additionally provide CRAFT model performance statistics (Figure S4), which provide an indication of the ecological plausibility of the input data. CRAFT optimizes the biomass stock trajectory based on the ecological relationships between biomass stock, harvest, and increment, such that the resulting stock dynamics are consistent with these interacting components. The model performance therefore provides an additional indication of how well the reported input data can be reconciled within these ecological constraints. The generally good model performance and plausible resulting stock trajectories provide support for the consistency of the underlying data.

At the same time, we acknowledge that remaining differences and uncertainties cannot be fully assessed within the harmonization procedure itself, as many of their underlying sources arise from the NFIs and their differing definitions, methodologies, and data availability. We have therefore added text to Section 3.3 in lines 890-904 to explicitly acknowledge this limitation and to clarify the appropriate use of reconstructed data. In particular, we caution against over-interpreting extrapolated values and short-term variation in reconstructed annual series, while highlighting the calculation and provenance flags that allow users to identify and filter data according to their specific requirements.

- 2.** The SoEF dataset contributes to the construction of parts of EuFor and is subsequently used in the data-agreement assessment. The degree of independence therefore varies among variables and countries. Please identify where EuFor and SoEF share input data or harmonization information, reconsider the description of SoEF as an “independent international forest statistics dataset”. The results would be more accurately presented as data agreement rather than independent validation. Furthermore, the assessment could be supplemented with suitable observations or datasets not used in constructing EuFor, including withheld source observations. If no sufficiently independent reference is available, this limitation should be acknowledged more explicitly.

We thank the reviewer for this important point. Referee #2 raised a similar point in comment #3. We agree that the comparison with SoEF should not be considered as an independent validation. We have revised the corresponding sections accordingly and

now consistently refer to these analyses as assessments of data source agreement. These sections are intended to compare the EuFor-harmonized database with the only other available pan-European database claiming some degree of internal consistency and comparability across countries. Independent validation with an external dataset would be valuable. However, we are not aware of a consistently available independent dataset at the European scale that could serve this purpose. We deliberately did not use remote-sensing products as a reference, as our objective was to construct a statistics-based database from national and international forest statistics. We have made these points explicit in lines 582-589.

We also agree that out-of-sample validation would be appropriate where sufficient independent observations are available. However, the fragmented nature and limited temporal coverage of the underlying national data do not provide enough observations for meaningful hold-out validation. For countries with only two available NFIs, for example, withholding one observation would leave insufficient data to assess the temporal reconstruction reliably.

We nevertheless consider the reconstructed time series presented in EuFor-harmonized valuable for the intended application, as they provide a consistent and complete representation of changes in forest-use intensity across Europe, where temporal consistency required some trade-off against the accuracy of individual annual estimates.

However, the revised flagging system now provides detailed information on the provenance and processing of each harmonized entry (as described in point 4 below), allowing users who require higher accuracy to filter and select the data accordingly.

- 3.** The manuscript states that the SoEF comparison covers only the years for which matched observations are available rather than the complete 2000-2023 EuFor-harmonized record. However, the corresponding agreement statements in the abstract and conclusions do not carry these temporal qualifications. I suggest the authors report the temporal coverage and number of matched observations more clearly and state that the most recent years have not been assessed through the SoEF comparison. If independent observations are available for later years, please consider supplementing the comparison.

We thank the reviewer for this suggestion. We now clarify in the Abstract that the SoEF comparison is based on matched years and have added the temporal coverage to the Figure 5 caption. We also explicitly note in the main text (lines 690-693) that the most recent EuFor-harmonized years could not be assessed, because at the moment of data acquisition no newer data were available.

4. The uncertainty-envelope analysis assess how differences between datasets propagate into forest-use intensity estimates, but the interpretation remains limited. Please clarify which input variables and data combinations are mainly responsible for contradictory trends, and discuss why these cases occur. Relating the results to the data agreement and processing methods would make the analysis more useful for identifying countries and indicators for which the estimated changes are robust or should be interpreted cautiously. A brief case-focused discussion would be sufficient.

We thank the reviewer for this suggestion. We have completely revised this analysis and now refer to it as a cross-source sensitivity test assessing the robustness of forest-use intensity changes to data-source differences, described in Section 2.4.2. We have moved these results in Section 3.2 before the Agreement of Use Intensity Change Across Indicators, following the presentation of the forest-use intensity results in Figure 6, to improve the flow of the text. The results are described now in lines 797-825 and summarized in Table 5.

We no longer present uncertainty envelopes, but instead explicitly show the four possible combinations of EuFor-harmonized and SoEF harvest and denominator data in Figure S13.

We further assessed the source of each contradiction by distinguishing harvest-driven, denominator-driven, and combined cases. For cases attributable to a single variable, we related the driving variable to the data-agreement results to assess whether larger discrepancies between EuFor and SoEF were associated with the contradictory outcome. The resulting case-specific discussion is presented in Section 3.2, lines 806-819 and summarized in Table 5.

5. Figures 4 and 6 use the same visual treatment for estimates with substantially different levels of support from source observations. Although this information is available through the calculation flags, a concise spatial or regional summary would improve interpretation of the maps. For example, the Supplement could report the latest available observation and the prevalence of interpolation, extrapolation, CRAFT modelling, or spatial allocation for each variable and region. This would help users identify areas where the mapped patterns depend more strongly on reconstructed values.

We thank the reviewer for this suggestion. We have added several maps to the SI that provide additional spatial information on data availability and reconstruction procedures, to help users identify where result maps relied more strongly on reconstructed values. Figure S4 shows the data availability used for the CRAFT modelling, including the number of available years for each input variable. Figure S7 shows the latest available primary data underlying the reconstruction of the EuFor-

harmonized time series. In addition, Figure S13 shows the spatial distribution of contradicting use-intensity trends for each indicator, helping to identify areas where different indicators provide divergent patterns.

Overall, the EuFor dataset has the potential to become a valuable resource for analyses of European forest dynamics and forest-use intensity. Addressing the points above would improve the traceability of the processing workflow, clarify the reliability of the dataset, and provide users with more appropriate guidance for using the dataset.

Thank you for these positive comments.