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LETTER TO THE EDITOR

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Setting aside forests or harvesting them for bioenergy: Short-term benefits for climate protection are still unknown

Forests play an important role in climate protection: they sequester carbon dioxide from the atmosphere by means of annual increment and can store carbon for decades or even centuries. Bioenergy use of wood harvested from forests can substitute fossil fuels, but it releases biomass-stored carbon back into the atmosphere. What will be more advantageous for short-term climate protection in the next decades and for the decarbonization of the national economy and society in Germany in the years and decades to come (Climate Action Plan 2050, BMUB, 2016): the promotion of carbon storage in forests (BMUB, 2016, p. 67) or the harvesting of wood for bioenergy use and the substitution of fossil fuels (BMUB, 2016, p. 45)?

This question has led to a scientific debate in GCB Bioenergy between Schulze et al. (2020a) who advocate in their opinion paper carbon balance gains from the use of wood for bioenergy compared to setting aside forests, and Welle et al. (2020) who criticize Schulze et al. (2020a) in a letter to the editor for having cited and used unsuitable data for carbon stock changes in protected forests of the Hainich National Park (Thuringia, central Germany). Both papers cite data from a report presenting analyses from two forest inventories conducted in the Hainich NP in 2000 and 2010 (NV Hainich, 2012). This protected forest area was used—in both publications—as an example for non-harvested forests. Based on other data of the Hainich report (NV Hainich, 2012), Welle et al. (2020) reach an opposite conclusion than Schulze et al. (2020a): setting aside forests has more benefits for climate protection in Germany than the harvesting for bioenergy use.

In this letter, we will evaluate both publications by answering the questions whether (a) Schulze et al. (2020a) cited incorrectly from the Hainich report which led to the use of unsuitable data; (b) the data cited and used by Welle et al. (2020) have more significance for the Hainich area; and (c) the results of the Hainich inventory are a representative example of set-aside forests in Germany. The latter question is specifically important for general assessments of the climate protection benefits from either the non-harvesting of forests or their harvesting for bioenergy use.

1 | CORRECTNESS OF CITATIONS

Both publications quoted different values for standing living wood volume in the Hainich NP for the year 2010—originating from the same inventory report (NV Hainich, 2012) in which both numbers can be found. Schulze et al. (2020a) used a reported standing volume of 367.5 m^3/ha derived from 1,421 inventory plots in their calculations. This approach refers—for both inventory dates—always to the entire forest stratum including a remarkable increase in forest area and inventory plots by 18% since 2000. The additional forest area is dominated by successional forests with low volumes mostly below 100 m^3/ha. Welle et al. (2020), in contrast, excluded plots in successional forests from their calculations and referred to the forest area in the year 2000 with only 1,200 plots—predominantly composed of old forests with an average standing volume of 453 m^3/ha in 2012. Compared to the living standing wood volume of 363.5 m^3/ha in the year 2000, volume increase between 2000 and 2010 should have attained either 0.4 $m^3\ ha^{-1}\ year^{-1}$ according to Schulze et al. (2020a, value rounded) or 9 $m^3\ ha^{-1}\ year^{-1}$ in compliance with Welle et al. (2020, value rounded). Since the values Schulze et al. (2020) used within their publication can be found in NV Hainich (2012), the citation of Schulze et al. (2020) is not formally incorrect because authors are not obliged to quote both numbers and referring calculations and statements if they do not follow them. However, it would have been prudent if Schulze et al. (2020a) had discussed their choice in greater detail.

2 | TRANSPARENCY AND SIGNIFICANCE OF THE UNDERLYING INVENTORY DATA

There are several criteria for transparent and valid references for scientific publications like (a) an easy access to the cited publication and information; (b) reliability due to peer-reviewed

This article is Letter to the Editor on Schulze et al., 12, 186–197 and Welle et al., 13, 286–287.

See also Response to this Letter by Welle et al., 13, 367–368.

information; and (c) transparency of included data, values and statements. In all three categories, we are seriously concerned about the inventory report (NV Hainich, 2012) as underlying data source for both publications. The report is only available in printed form (no online version), and included links in the text referring to online descriptions of the inventory methods are either not valid (NV Hainich, 2012, p. 51) or refer to another report (NV Hainich, 2008) that only deals with the first inventory. The report has not been peer-reviewed, it is only available in German, and there are no authors specified for the inventory chapters. There are no reference or additional data available in the inventory report (NV Hainich, 2012) or addendums that support the stated standing wood volume increase of 9 m^3 ha^{-1} $year^{-1}$ (also stated in Großmann et al., 2013). Notable methodological differences between the 2000 and 2010 inventories like differently sized inventory plots and different QA/QC approaches (only 'desk' corrections in 2000, but control field assessments in 2010) make any comparison of the mean living standing wood volume of both inventories questionable. This is also supported by a comparison of the averages of standing wood volume for subdivisions of the Hainich National Park (NV Hainich, 2012, p. 75, tables 3–9). Applying the methods for volume estimation of the 2000 inventory to the 2010 inventory plots resulted in systematic and partly significant deviations of the mean standing wood volumes compared to those calculated with the methods from 2010. Due to these methodological issues, we do rather not support using data from this report as reference. This is not to say that data from the inventories should not be used, but these data need to be analysed beforehand in a correct and consistent way (e.g., single tree comparisons considering in-growth and volume losses to dead wood as well as cut trees within the reference period) and this needs to be documented and presented much more transparently.

3 | REPRESENTATIVITY OF THE HAINICH NATIONAL PARK FOR SET-ASIDE FORESTS IN GERMANY

The forests in the Hainich National Park grow on shell limestone sites with varying loess (silt) cover (Großmann, 2006) and such (weathered) carbonate bedrock sites can be found at only 9% of the forest sites in Germany (Wellbrock et al. 2019). In addition, the specific forest use and management—including coppice with standard systems, the 'plenterwald' system and clearcuts for military use and subsequent succession (Huss & Butler-Manning, 2006)—are rather unique for both managed and non-managed forests in Germany. Largely varying forest development stages with successional stages in the 'Kindel' area, 'optimal' phases with high volumes in 'Weberstädter Holz', and nearly absence of destruction phases (until 2010) emphasizes this specific characteristic. The exemplary use of the Hainich National Park and its limited representativity has been already discussed in the response letter of Schulze et al. (2020b) to the commentaries of Booth et al. (2020) and Kun et al. (2020).

4 | CONCLUSION

Based on the analyses of both publications and the underlying inventory report, we conclude that Welle et al. (2020) fail in revealing both formal citation and methodological failures of Schulze et al. (2020a). However, the low representativity of the Hainich National Park for set-aside forests in Germany limits its general significance in comparisons of managed and unmanaged forests. We strongly recommend to expand the underlying data basis for the evaluation of short-term advantages of either setting aside central European forests or using them for bioenergy in climate protection, because exclusively using aggregated inventory data from NP Hainich will not answer this question due to methodological restraints and poor transferability.

DATA AVAILABILITY STATEMENT

There are no data available.

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