

Climate Change 2019: Forest management and C-allocation of beech (*Fagus sylvatica*)- Johannes Eichhorn, The Nordwestdeutsche Forstliche Versuchsanstalt

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Abstract

Statement of the Problem: Does forest management contribute towards assuring carbon storage in beech forests? Forests store carbon to a large extent above and below ground. Solid volume beech shows a high increasing above-ground C supply of about 120 t C/ha. The below-ground value is about 160 t C/ha (excluding moors; Evers et al., 2019, Wördehoff et al., 2011). The stability of C-supplies in forests depends mainly on the vitality of aboveground biomass. As exemplary indicators the annual mortality rate, fructification and the foliation of beech are presented.

Methodology and Theoretical Orientation: The basis of the data stems from the forest monitoring in north-west German federal states ranging from 1984 up to now (2018). Governing indicators: atmospheric conditions and meteorological variables, forest management information. Evaluation through resilience analysis, deduction of decision-making guidance for forest management.

Findings: Annual mortality is an essential indicator of tree vitality. The so-far low mortality rate of beech remained unchanged up to the end of 2018 despite that year's drought; an indication of the high adaptability of beech to changing environmental conditions. The C-allocation of beech is a contributing factor. Three impact-indicators are to be presented, and also C-sinks: fructification, foliation, and diameter increment.

Fructification Beech (in Hesse) fructifies at present at shorter intervals (1988 to 2018 Hesse) there was a mast every 2.6 years; 1839 to 1987: 4.7 years (Paar et al., 2011), widely synchronised over a number of locations. A significant reason for this is global radiation. But also influences which can be controlled by forest management (Jandi et al.: 2007, Jarvis, 2005).

Sink properties through growth and interaction In 2018, Beech diameter growth starts above average. However, growth ends and remains absent from mid of June on water limited sites (Wagner et al. 2019). There is a connection between diameter increment and weather conditions, as well as interaction with fructification.

Conclusion and Significance: So far annual beech mortality is low, yet external influences cause alterations in the C-allocation but without exceeding threshold values of stable sylvan development. More frequent fructification supports a more natural sylvan development with natural rejuvenation, mixed forest structures and multi-functional forests (WBGU, 2009; Jarvis, 2005). Taking possible long-term consequences of the extreme summer of 2018 into account, this positive result for beech must be regarded with a question mark.

Bottom Note: This work is partly presented at 6th World Conference on Climate Changes September 02-03, 2019

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