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“Bridging the gap between increasing knowledge and decreasing resources”

Aboveground Stand Biomass Dynamics in a Chinese Fir [(*Cunninghamia lanceolata* (Lamb.) Hook] Plantation in Shitai County, China

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Abstract

China has the worldwide largest area of plantations, and Chinese fir [(*Cunninghamia lanceolata* (Lamb.) Hook] is among the most common plantation tree species in subtropical China, covering an estimated area of 8.54 million ha and amounting to about 21% of total plantation area. Several studies have been conducted in Chinese fir plantations, but still there are uncertainties regarding its potential and dynamics to sequester carbon in biomass as a function of stand type. Tree ring analysis is an appropriate tool to study growth dynamics, but the application of tree ring analysis to evaluate aboveground biomass (AGB) dynamics of Chinese fir stands is rare.

In this study, tree ring analysis was applied to exam AGB dynamics in a 17-year old Chinese fir plantation in Shitai County, Anhui Province, China. A total of 12 plots were established, and 18 trees were felled for stem analyses: 6 dominant, 6 co-dominant and 6 suppressed trees. 24.6 %, 47.4 % and 28.0 % of all trees in the fir plantation were considered as dominant, co-dominant and suppressed trees, respectively.

Annual DBH and biomass increment of dominant trees were significant higher than that of co-dominant and suppressed trees, but no significant difference was observed between co-dominant and suppressed trees. Stand biomass increased from 1.85 t ha⁻¹ at age 3 to 108.12 t ha⁻¹ at age 17, which was similar to comparable studies of Chinese fir. AGB of dominant, co-dominant and suppressed trees contributed 50.1 %, 36.4 % and 13.5 % to total stand AGB, respectively, and remained stable after age 10. Tree ring analysis offered a powerful methodology for a quick estimation of annual AGB, and potentially linked AGB dynamics of Chinese fir plantation in view of carbon market and alleviating climate change.

Keywords: Biomass increment, DBH increment, sigmoidal model, tree ring analysis